FEASIBILITY STUDY
OF
REMEDIAL OPTIONS

Robbins Property
Uncontrolled Hazardous Substance Site

Ellsworth, Maine

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SECTION ONE

INTRODUCTION

1.1 BACKGROUND

The Robbins Property Uncontrolled Hazardous Substance Site is a former waste oil storage facility, one of the Portland Bangor Waste Oil group of sites owned and operated by George West. This site is located on US Route 1A in the Town of Ellsworth, Maine. Now the unoccupied property of the Maine Department of Environmental Protection, purchased from Ernest and Sundae Robbins, the site's overburden soils contain non-aqueous phase liquids (NAPLs) comprised of chlorinated and non-chlorinated hydrocarbons. A thin layer of floating, light NAPL (LNAPL) is present on the perched water table within the source area. A dense NAPL (DNAPL) is present in the soils at the contact between the sand and gravel and the underlying clayey silt unit. The NAPLs present are suspected of contributing to the dissolved phase contaminants present in four nearby bedrock water supplies. A soil sample from within the source area failed TCLP for Tetrachloroethene (PCE).

The total volume of contaminated shallow overburden soil present at the site is estimated to be 1,100 yd^3 +/- 50%. Currently, the known horizontal area of contamination is approximately 100 feet by 50 feet. The vertical area of contamination begins approximately 2 feet below ground surface (bgs). The subsurface investigations terminated in the clayey silt unit (6'-8' bgs) to prevent vertical spreading of the contamination. Therefore, the depth of contamination is not known at this time. The seismic refraction data in the area of contamination estimates the depth to bedrock to be approximately 35 feet below ground surface. Five monitoring wells installed radially from the contamination area on May 30 – June 1, 2000 encountered bedrock from 22' – 38' bgs.

Borehole geophysical measurements and Packer sampling of the site water supply well indicate significant chlorinated hydrocarbon contamination in the water-bearing bedrock fracture located in the 33'-43' Packer zone.

1.2 PURPOSE AND SCOPE

The purpose of the FS is to identify and evaluate remedial technologies to address potential risks at the site. The FS considers both source control and management of migration issues, but only includes a detailed evaluation of source control alternatives. Due to the data gaps associated with the nature and extent of impacts to groundwater, the report does not include a detailed evaluation of management of migration alternatives. Instead, a summary discussion of technologies for addressing the off-site migration of groundwater is included. A comprehensive evaluation of remedial alternatives to address groundwater may be performed at a later date, as needed, following further investigation and evaluation of the impact of source control measures.

The preparation of the FS included the following activities:

- Determination of the remedial action objectives and the proposed remedial technologies
- Identifying and screening remedial technologies and process options
- Performing detailed evaluation of comprehensive remedial alternatives
- Preparing the FS report

Conceptual engineering cost estimates are included as part of the FS process. The cost estimates presented in this report were prepared for comparison purposes; actual costs may vary. More detailed cost estimates should be prepared as part of the pre-design activities. The scope of the FS did not include conducting any treatability studies, modeling of site conditions, or preparation of design documents.

1.3 REPORT ORGANIZATION

The Feasibility Study Report contains the following sections:

Section 1.0..... Background, Purpose and Scope

Section 2.0..... Site description and history, summary of investigation activities, and summary of risk assessment

Section 3.0..... Identification of regulatory requirements, remedial action objectives, and summary of areas requiring remediation

Section 4.0..... Identification and screening of technologies to address the remedial action objectives (source control and management of migration)

Section 5.0..... Development of and detailed evaluations of source control alternatives

Section 6.0..... Comparative analyses of source control alternatives

Section 7.0..... List of references used in the preparation of this report

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SECTION TWO

SITE CHARACTERIZATION

2.1 Site Description

The Robbins Property Uncontrolled Hazardous Substance Site (Site), CERCLIS # MED985286939, is a residential lot approximately one acre in size. The lot (Ellsworth Tax Map # 49, Lot 3) contains one residential dwelling, occupied by the current owners, Ernest and Sundae Robbins. It is located in a sparcely populated, rural area off of US Route 1A in the township of Ellsworth, Maine (Figure 1).

2.2 Site History

From 1963 until 1980, a Mr. George West owned and operated a waste oil storage facility at the site. The company, known as the Portland Bangor Waste Oil Company (PBWOC), received unknown quantities of waste oil from military bases, auto dealerships, municipalities, local garages, industries, and utility companies. The composition of the waste oil is unknown. It is likely that the waste oil contained a variety of hydrocarbons including chlorinated hydrocarbons. Driver's logs indicate that large quantities of waste oils and other liquids were delivered to the site.

The waste oil was stored in five or six 2,000-gallon storage tanks. The tanks were reported to be partially buried (Robbins 1994) within a bermed area (Figure 2). Once the oil settled in the storage tanks it became stratified. PBWOC decanted the lighter oil and sold it to paper mills as a fuel supplement. PBWOC sold the heavier oils to towns and race tracks as a dust suppressant for dirt roads.

In 1980, PBWOC ceased its operation at this facility. The tanks were subsequently sold to a scrap metal dealer. Visibly stained soils were removed to an unknown location and fill was reportedly brought in.

In 1982, Mr. West sold the property to Mr. Jasper Carter. Mr. Carter used the land as a storage yard. The details of ownership between 1982 and 1988 are not well understood. It appears that Mr. Ernest Robbins and Mr. Dale Maddocks owned the property prior to March 1986. The property deeds indicate that Dale Maddocks transferred ownership to Mr. Ernest Robbins in March 1986. Mrs. Sundae Robbins, wife of Ernest Robbins, received the property from Ernest Robbins in June 1988 (Smith 1994).

Mr. and Mrs. Robbins apparently built a house on the site in 1988 (Robbins 1994). Currently, the Robbins live in the house and use the site for storage of logging equipment and other heavy vehicles.

2.3 Site Investigations

The Maine Department of Environmental Protection (MEDEP) first investigated the site in August 1989. Groundwater samples were taken from the site well in 1990. Sample results indicated the presence of a significant VOC plume in the area. The MEDEP analyzed neighboring water supplies for the presence of VOCs. Three private water supplies and one public water supply had positive detections of VOCs. Figure 3 presents the locations of the water supplies with positive VOC results. In 1991, the MEDEP placed granular activated carbon (GAC) filters on the Robbins well, the three residences, and the Boggy Brook Vocational Center (BBVC) water supply. Since 1991, the MEDEP has maintained and monitored the filtration systems.

For administrative purposes the MEDEP is investigating the BBVC separate from the Robbins Property Site. Investigations at the BBVC have not found any source on the property. There is indirect evidence to suggest that the source at the Robbins property may be contributing VOCs to the BBVC water supply. However, there is no direct evidence to link the two sites, therefore, they continue to be addressed separately.

In March 1992, MEDEP completed a Screening Site Inspection (SSI) Report for the Robbins Property. Additionally, MEDEP investigated the site under USEPA CERCLIS. A final SIP was completed on December 2, 1994.

Subsequent to the investigations under CERCLIS, MEDEP completed a Source Investigation Report in January 1997, a Source Area Remedial Alternatives Memo in February 1997, and a Preliminary Soil Pre-Remedial Goals Memo in July 1997. Remedial Investigation Activities took place in October 1997 and July 1998. On May 18, 2000, a Remedial Investigation Update was prepared. MEDEP completed additional investigations In May, June, and July 2000. The additional investigations focused on the deep overburden aquifer and the bedrock aquifer at the Robbins Property Site.

2.4 Summary of Nature and Extent of Contamination

This section provides a brief summary of the nature and extent of known contamination, based on the investigations completed to date.

2.4.1 Shallow Overburden Contamination

The Source Investigation completed in 1996 identified a significant shallow overburden source of contamination. Remedial Investigations completed in October 1997 and July 1998 further delineated the horizontal extent of the shallow overburden contamination. A source area comprised of dense and light non-aqueous phase liquid (NAPL) is present within 8 feet of the ground surface in the parking lot of the Robbins Property.

Geologically, the source is present in a pocket of sand and gravel, apparently bounded on all sides by a fractured fine-grained silt and clay deposit. The exact thickness and extent of the fine-grained deposit at the base of the sand and gravel pocket is not known, but is expected to be approximately five-foot thick. There is a perched water table within the sand and gravel pocket that acts as a potential migration pathway for highly concentrated dissolved phase contaminants to the underlying sand and gravel aquifer below the silt and clay unit and the underlying bedrock aquifer.

Both soil and groundwater samples were used to delineate and estimate the horizontal extent of the shallow source area. To further complicate the investigation and future selection of a remedial option, the sole residential dwelling may cover a portion of the shallow overburden contamination area. Soil and ground water sampling shows contamination up to the concrete foundation of the structure. It is likely that significant contamination is present in the shallow overburden soils underneath the foundation. In addition, the exact vertical extent of the source area can not be determined without posing a risk of NAPL mobilization into the underlying aquifers. Once the shallow source is remediated, additional investigations can be completed into the deeper aquifer, directly beneath the shallow source area, to determine if a deep source area exists at the site.

2.4.2 Deep Overburden Contamination

During the Remedial Investigation, one boring was advanced into the fine-grained silt and clay unit, outside the shallow source area, to determine the stratigraphy of the deeper overburden and possibly determine the depth to bedrock. GP-205 identified a deeper sand and gravel deposit below the fine-grained unit, at approximately 16 feet below the ground surface. In May and June 2000, five monitoring wells were drilled into the underlying sand and gravel unit. All monitoring wells were placed outside the shallow overburden source area. Three of the deep overburden monitoring wells are located horizontally downgradient of the shallow source area. In late June 2000, the wells were sampled and VOCs were detected at concentrations exceeding MEGs and MCLs. The concentrations indicate that contamination from the shallow source area has migrated to the deeper sand and gravel unit. It is possible that either highly concentrated dissolved phase contamination or possibly DNAPL has migrated downward through the fine-grained aquitard. The horizontal gradient measured in the five wells indicate that groundwater is flowing in the general direction of the bedrock water supply. The vertical gradients indicate a downward vertical gradient from the shallow perched aquifer to the deeper overburden aquifer.

2.4.3 Bedrock Contamination

Bedrock wells in the area continue to show elevated VOC contamination. The bedrock well at the Robbins Property continues to record the highest levels of contamination. Therefore, a borehole investigation of the Robbins well was completed to determine the location and yield of water bearing fractures in the Robbins Well. Additionally, the

fracture zones were isolated using inflatable packers and samples were collected to determine the relative concentrations within the borehole.

Based on water levels measured in the in the shallow overburden, the deep overburden, and the bedrock well, it appears that the vertical gradient in downward. Based on analytical results. it appears that contamination from the shallow source area is contaminating the deep overburden and bedrock aquifers.

2.5 Summary of Risk Assessment

2.5.1 Overview

The purpose of the risk assessment is to determine whether contaminants detected at the site pose a current or future risk to human health or the environment.

2.5.2 Human Health Risk Assessment

This human health risk assessment considered risks associated with contaminants detected in soil and groundwater. Analytical results from groundwater and soil samples collected were compared to available drinking water standards, Remedial Action Guidelines (RAGs) for contaminated soils and Site Screening Levels (SSLs).

Both carcinogenic and noncarcinogenic risks were evaluated. The MEDEP threshold for carcinogenic risks is 10^{-5} and for noncarcinogenic risks is unity. The human health risk assessment included a summary evaluation of the following exposure scenarios:

Scenario	***Exposure Pathway***
Residential	Incidental ingestion of soil Ingestion of tap water Dermal contact with soil and tap water Inhalation of fugitive dust, tap water vapors, and groundwater vapors
Commercial /Industrial	Incidental ingestion of soil Ingestion of tap water Dermal contact with soil Inhalation of fugitive dust and groundwater vapors
Visitor / Trespasser	Incidental ingestion of soil Dermal contact with soil Inhalation of fugitive dust

Many groundwater samples exceed drinking water guidelines, including the concentrations in four bedrock residential water supplies in the area. GAC filters installed and maintained

by the MEDEP are removing contaminants as point of entry treatment systems for the water supplies, including the Robbins bedrock well.

No soil samples collected in the upper two feet exceed the SSLs or the RAGs for ingestion or inhalation. Several soil samples collected below two feet exceed SSL and RAG values for ingestion and inhalation. Currently the site is a residential property with no restriction on subsurface excavations or soil removal. Therefore, while there is no immediate risk for dermal contact or inhalation of vapors from surface soils, there is a potential future risk. Additionally, there is a potential long term inhalation risk to property occupants.

Several subsurface soil samples below four feet exceed guidance values for risk to groundwater. Therefore, the subsurface soils and NAPLs continue to be a source of groundwater contamination. Given that there is no alternate source of potable water, area residences and businesses will continue to rely on groundwater resources. The use of point of entry treatment is effective for removing the immediate risk of groundwater contamination. However, there is a potential future risk to new and existing water supplies in the area.

Based on the limited risk assessment, there are sufficient potential risks to warrant remediation of the shallow source area.

2.5.3 Ecological Risk Assessment

Not done.

SECTION THREE

REMEDIAL ACTION OBJECTIVES

3.1 REGULATORY REQUIREMENTS

This section identifies state and federal standards, requirements, criteria, limitations and guidelines that are relevant to the site or that may have a bearing on the remedial actions selected for the site. The compliance of the alternatives with the requirements is evaluated in Section 5.0 of this report. The requirements are presented in Table 2 and are summarized below.

3.1.1 Soil

Soil is the primary source of risk at the site and is also the primary source of impact to groundwater. A variety of remedial activities may be performed to remediate the soil. A listing of regulatory requirements that could affect the remedial alternatives is provided below:

- Federal Toxic Substances Control Act (TSCA; 40 CFR 761.60 - 761.69) - The requirements of TSCA are neither relevant nor appropriate because the PCBs have not been detected at this site.

- Maine Remedial Action Guidelines (Draft) - The document establishes guidelines for hazardous soil cleanup, based on human health requirements.

- Maine Hazardous Waste Regulations (Chapters 800 and 850, et seq.) - The Maine Hazardous Waste Regulations implement the requirements of the federal Resource Conservation and Recovery Act (RCRA) regulations (40 CFR 260 - 265). Since there is no indication that the facility received or disposed of regulated hazardous wastes after 19 November 1980, the site itself is not regulated by the Hazardous Waste Regulations. However, PCE is a listed waste under Chapter 850, Section 3(C). In addition, some soil samples exceed the RCRA TCLP threshold of 0.7mg/L for PCE. Therefore, those soils must be managed in accordance with the requirements of the Hazardous Waste Regulations.

- Maine Solid Waste Regulations (Chapter 400 et seq.) - The Maine Solid Waste Regulations establish the requirements of disposal of solid wastes. Remedial alternatives that include the on-site disposal (i.e., construction of a landfill) would need to be performed in accordance with the requirements of the Solid Waste Regulations.

- Maine Erosion and Sedimentation Law under the Natural Resources Protection Act (38 MRSA 480) - The law requires that that the remedial activities be managed in a manner that minimizes erosion and impacts to protected natural resources.

- Federal Occupational Safety and Health Administration (OSHA) Regulations (29 CFR 1910, 1926, and 1904) - These regulations outline health and safety requirements associated with the implementation of the remedial activities.

3.1.2 Groundwater

Groundwater in the vicinity of the site is a source of drinking water. Therefore, the following drinking water standards were identified (groundwater regulations are promulgated by the Department of Human Services, Bureau of Health, Division of Health Engineering):

- Maine Primary Drinking Water Regulations (Chapter 231, Section 7) The regulations primarily adopt federal Maximum Contaminant Levels (40 CFR 141 Subparts B, G, 1). MCLs have been promulgated for several organic and inorganic compounds. The MCLs regulate the concentration of the compounds in public drinking water supplies, but may also be considered relevant for groundwater aquifers used for drinking water.

- Maine Rules relating to: Testing of Private Water Systems for Potentially Hazardous Contaminants (Chapter 233, Appendix C). The regulations establish Maximum Exposure Guidelines (MEGs) and Action Levels for contaminants in residential water supplies.

- Maine Waste Water Discharge (38 MRSA 413: 2G (1)) - The law does not require a license for the discharge of groundwater generated during remedial activities if the discharge is in compliance with DEP requirements.

- Maine General Provisions for Solid Waste Facilities (06-096-400) - The solid waste facility provisions prohibit the migration of contaminants above MEGs beyond the solid waste management boundary.

- Maine General Provisions for Solid Waste Facilities (06-096-854) - The solid waste facility provisions for hazardous waste management units prohibit discharges of contaminants in groundwater above background or other risk-based standards.

3.1.3 Wetlands

All remedial action activities located within or adjacent to wetland areas will have to be implemented in a manner that minimizes their destruction, loss or degradation. In addition, if wetlands are destroyed, then they would need to be restored or mitigated. Therefore, the following regulatory requirements were identified:

- Maine Natural Resources Protection Act (38 MRSA 480-A to 480-U), Permit by Rule Regulations (Chapter 305) and Wetlands Protection Regulations (Chapter 310) - The regulations describe permitting requirements for activities that affect greater than 4,300 square feet of wetlands.

- Federal Clean Water Act (33 USC 1344), US Army Corps of Engineers Nationwide Permit Program (33 CFR 330), and Federal Guidelines for Specification of Disposal Sites (40 CFR 230) - Specifies that impacts to wetlands shall be minimized describes actions to minimize adverse impacts to the wetlands.

- Town Shoreland Zoning Ordinances and State Minimum Guidelines - The guidelines and ordinances apply to activities proposed within 200 feet of high-water mark of a stream or other body of water.

3.1.4 Air

On-site remedial activities could generate air emissions. Therefore, the following regulations were identified:

- Maine Air Regulations - Establishment of Ambient Guidelines and Emission Standards (38 MRSA 584 and 585) - The law establishes Ambient Air Guidelines to protect ambient air quality.

- Maine Air Regulations (Chapter 101, 103, 105, 110) - The regulations establish air quality standards and allowable discharges from emission sources.

3.2 REMEDIAL ACTION OBJECTIVES

The remedial objectives for the Robbins Property site objectives are listed below:

- Soil - Reduce to protective levels the present and future public health and environmental risks from direct contact, ingestion, and/or dermal absorption with the shallow contaminated soils located on-site.

- NAPL - the continued investigation of the deep source area is contingent on the effective and expeditious removal of the NAPL present in the shallow source area. Any chosen remedial action of the shallow source area must not require extensive time to completion.

3.3 COMPLIANCE BOUNDARY

MEDEP has defined the compliance boundary as the site boundary. The site boundary is shown in Figure 2.

3.4 SUMMARY OF AREAS REQUIRING REMEDIATION

Based on the review of the risk assessment and the site remedial action objectives, the areas of concern were evaluated to determine which should be carried forward in the Feasibility Study. In general, areas of concern were carried forward if they were considered as a source area, posed a significant risk to human health or the environment, or were not in compliance with regulatory requirements.

The basis for deciding whether or not each area of concern was carried forward is provided below.

- Shallow Overburden Contamination Area was carried forward because the soil poses a human health risk (as described in Section 2.5.2). Risks associated with groundwater in this area will be addressed as a site-wide issue (see below).

- Deep Overburden Contamination Area was not carried forward. Although the soil may pose a human health risk (as described in Section 2.5.2), risks associated with the Deep Overburden Contamination Area will be addressed at a later date.

- Site-Wide Groundwater was not carried forward since groundwater will be addressed at a later date.

Based on the above evaluation, shallow soil is the one media of concern. Soil refers to impacted materials from the residual NAPL. Source control will be the primary focus of the evaluation of technologies to address soil.

3.5 SOIL VOLUME ESTIMATES

Estimates of the volumes of impacted soil use the MEDEP draft Remedial Action Guidelines as action levels.

For the purpose of the FS, the volume estimate of contaminated soils from the Shallow Overburden Contamination area only includes soils categorized as RCRA Wastes: soil that exceed TCLP standards for hazardous waste or contain a listed waste. For planning purposes, the contamination area is estimated at 50ft wide by 100ft long by 10ft deep. This equates to a estimated in-the-ground volume of 50,000 cubic feet or approximately 1,850 cubic yards. The volume of excavated soil is estimated as 3 times the in ground volume due to the loosening of compacted soil. This equates to an excavated volume of approximately 5,500 cubic yards.

The actual volume of material requiring remediation will depend on site-specific clean-up limits, as well as the results of a more intensive sampling program that would be performed as part of the remedy implementation. Site-specific clean-up limits would be developed based on the future use scenarios.

SECTION FOUR

IDENTIFICATION AND SCREENING OF TECHNOLOGIES

4.1 OVERVIEW

4.1.1 Source Control

Technologies for addressing source control issues are identified and screened in this section. Media-specific general response actions are identified to address the remedial action objectives. Remedial technologies are then identified and screened to determine which ones should be included in source control alternatives. The following table summarizes the general response actions developed to address source control issues.

Summary of Media and General Response Actions

Media	General Response Action
Soils	Institutional Controls
	Containment
	In-situ Treatment
	Excavation / On-Site Treatment
	Excavation / Off-Site Treatment
	Excavation / Off-Site Disposal
Water	Direct Discharge
	On-Site Treatment and Discharge
	Off-Site Treatment and Disposal

A summary of the screening process for the source control technologies is provided in Table 3 **(to be produced).**

4.1.2 Management of Migration

Technologies for addressing the management of off-site migration of contaminants in groundwater are identified and discussed in this section, but are not carried forward in the development of remedial alternatives. A more detailed evaluation of alternatives for addressing groundwater issues could be conducted following the implementation of overburden source control measures and/or the gathering of additional site data.

4.2 SCREENING CRITERIA

The screening process is intended to identify the source control options that warrant detailed analysis as part of comprehensive remedial alternatives. The source control technologies were evaluated with respect to the following criteria:

- Implementability - compatibility with site physical conditions, including geology and hydrology
- Effectiveness - ability to achieve the remedial action objectives
- Cost - a balancing criteria based on capital and operation and maintenance costs

4.3 IDENTIFICATION AND SCREENING OF SOURCE CONTROL TECHNOLOGIES

This summary of the identification and screening of source control technologies is separately presented for each of the two main matrices: soil and water.

4.3.1 Soil

Six source control technologies were initially identified for evaluation of acceptability for the remediation of contamination in site soils:

- Institutional Controls
- Containment
- In-Situ Treatment
- Excavation and On-Site Treatment
- Excavation and Off-Site Treatment
- Excavation and Off-Site Disposal

The effective implementation of all source control technologies, with the exception of Institutional Controls, would likely require the removal or destruction of the Site residential dwelling prior to implementation.

4.3.1.1 Institutional Controls

Institutional controls are intended to prevent or reduce exposure to impacted material. Institutional controls considered for the site are described below.

- Land-Use Restrictions could consist of a deed notice prohibiting certain future activities at the site, such as residential use, or to restrict subsurface excavation activities. A survey of the site would be performed and the land-use restriction would apply to the designated area. Land-use restrictions would be effective at reducing the potential for exposure to the contaminated soils, would not be difficult to implement, and have a low cost. Therefore, this option was carried forward.

- Fencing / Signs around the site could be used to physically limit access to the site. Fencing and signs would be effective at keeping trespassers off of the site and would have a low cost. Therefore fencing and signs were carried forward.

4.3.1.2 Containment

Containment would involve placing some form of cover over the impacted soil to isolate it from direct contact. As described below, there are several approaches available for providing containment of the contaminated soil.

- Cap In-Place - Capping in-place would involve minimal excavation activities. The shallow overburden would be dewatered and the site would be regraded as necessary to achieve the necessary slopes. A low permeability cap would cover the Shallow Overburden Source Area.

  This technology could be effective at preventing direct contact with the impacted soil and would reduce the rate of water infiltration through the impacted materials. However, much of the soil is in contact with groundwater, and therefore, the area would remain as a source of impact to groundwater. Therefore, this option was not carried forward.

- Barrier Wall would involve the construction of an impermeable barrier, such as a slurry wall, around the perimeter of the site. This technology could be used in conjunction with capping the material in place. The effectiveness of the barrier wall would depend on the integrity of the bedrock and the cap. The wall would most likely require a permanent dewatering system to maintain a depressed water table. Such a system would be costly and difficult to operate since the water would likely require treatment prior to discharge. Therefore, this alternative was eliminated from further consideration.

- Consolidate / Cap would involve excavating and consolidating the impacted material at one location at the site. A landfill, including a liner and cover, would be designed to satisfy the technical requirements of the Maine solid waste regulations. Excavation of the soils would likely require dewatering and the soils might require treatment prior to placement in the landfill. Long-term maintenance of the cap would be required.

  This technology could be effective at preventing direct contact with the impacted soil and would reduce the rate of water infiltration through the impacted materials. However, the site has little open area on which to build a landfill that would meet state requirements, plus the site's close proximity to residential and public water supplies would prevent from meeting the prohibitive site criteria of Chapter 401. Therefore, this option was not carried forward for further evaluation.

4.3.1.3 In-situ Treatment

The in-situ treatment alternatives would involve treating the soil in-place and would not include excavation activities. A summary of the in-situ remedial technologies is provided below.

- Soil Vapor Extraction / Air Sparging (SVE/AS) is an in-situ process that removes organic compounds by inducing airflow through the impacted media. SVE primarily addresses the vadose zone and air sparging is targeted for impacts below the groundwater table. The flowing air carries the organics to extraction wells and the off-gas is treated as necessary.

  SVE / AS is most effective at addressing volatile organic compounds (VOC), the primary contaminants of concern at the site. However, the need for a field pilot test and the long project duration expected to remove the contaminants would prevent the timely completion of the remediation. Therefore, this option was not carried forward for further evaluation.

- Thermally Enhanced Soil Vapor Extraction (TE-SVE) is an in-situ process that uses steam or hot air injection, or electric/radio frequency heating to increase the mobility of semivolatiles and facilitate extraction. While primarily designed to treat SVOCs, it will effectively treat VOCs. The process is otherwise similar to standard SVE/AS. Therefore, this option was also not carried forward for further evaluation.

- Multi-Phase Vacuum Enhanced Extraction (MPVEE) is an in-situ treatment technology that is used to collect NAPL, groundwater and soil vapor simultaneously. MPVEE uses standard two or four-inch monitoring wells. A drop tube is placed in the well and the well is sealed at the top with a special cover. The pump, oil/water separator, water treatment and vapor treatment equipment is located above ground in a treatment building. Several wells can be manifolded together to provide treatment over a large area.

  MPVEE is effective at simultaneously addressing VOC's in multiple contaminated media. Like SVE, it works best with compounds, like PCE, that have high vapor pressures, high Henry's Law Constants and lower boiling points. Also like SVE, MPVEE works best in higher permeability soils, although soil permeability can be enhanced through pneumatic fracturing or mixing in additional sand and gravel. Therefore, this option was carried forward for further evaluation.

- Soil Flushing is an in-situ process that can remove both organic and inorganic contaminants from soils within the vadose zone. Contaminants are mobilized from the soil by flooding the area with an appropriate flushing solution. Flushing solutions may include water, acidic aqueous solutions, basic solutions and surfactants. The solution and contaminant mixture pass through the soil and into the groundwater, where it is collected in a series of extraction wells for treatment, disposal or reuse.

The installation of an effective extraction system to capture the flush solution would be difficult. Further, the introduction of potential toxins within the flushing solution into the local groundwater is undesirable. Therefore, this option has been eliminated from further consideration.

- Vitrification is an in-situ, thermal treatment process that converts contaminated materials into chemically inert and stable glass and crystalline materials. This treatment alternative consists of the insertion of large electrodes into the contaminated materials. The electrodes heat the soils to approximately 3,600°C. At this temperature, any soil or rock component of the waste material will melt, organic compounds will chemically change into the glass matrix, and many metallic materials will either fuse or vaporize.

  Vitrification is extremely energy intensive and has a corresponding very high cost. The availability of sufficient high-voltage electricity from the existing distribution system is suspect. In addition, this treatment method has not been proven through significant application at Superfund sites. Therefore, it has been eliminated from further consideration.

- Solidification / Stabilization is an in-situ process used to either encapsulate contaminants within a solid matrix, or convert them to their least soluble form. It is achieved by injecting a solidifying/stabilizing agent into the soil and mixing the soil/agent mixture with a drill.

  This technology is best suited for locations with deep contamination. Due to the shallow and heterogeneous nature of the subsurface material, as well as the proximity to groundwater, this method was eliminated from further consideration.

- Bioremediation can be performed in-situ. Nutrients and oxygen would be injected into the subsurface to promote biological activity and the destruction of contaminants. Bioremediation generally takes longer than most of the other chemical and physical treatment processes. It is generally very effective at breaking down VOC's. However, bioremediation is not effective on NAPL. Therefore, this option was not carried forward for further evaluation.

- Natural Attenuation is an in-situ, passive technology that relies on natural processes to attenuate contaminants. Attenuation can involve physical, chemical and/or biological processes that limit the amount of contaminant migration. Significant monitoring is require to determine the processes actively attenuating the contaminants. Natural attenuation can be used in conjunction with many other remedial options. It is normally only used as the primary remedial option where exposure pathways are known and risks are low.

  Due to the strength of the source area, natural attenuation will not be considered as a primary remedial option for the source area. Natural attenuation may be later

reconsidered as a remedial option for the dissolved phase contaminants in the bedrock aquifer.

4.3.1.4 Excavation and 0n-Site Treatment

The excavation/on-site treatment technologies would involve the excavation and stockpiling of soil at the site. The stockpiled soil would then be treated on-site using one of the processes described below.

- Low Temperature Thermal Desorption (LTTD) is an ex-situ treatment technology that uses heat to physically separate volatile and semi-volatile contaminants from the soil particles. A mobile treatment unit would be brought to the site. Contaminated soils would be heated to between 90° - 320°C (200° - 600°F). to volatilize the organic contaminants. Vapors generated in the process are treated in a gas treatment system before being discharged to the atmosphere. Water saturated soils require de-watering prior to treatment. Very fine grained soils also require pretreatment.

  This option is a proven technology that while primarily targeting non-halogenated VOCs and fuels, would reduce the concentrations of this Site's Contaminants of Concern through treatment. Based on the volume of soil that could require treatment, the on-site treatment costs would be moderate to high. Therefore, this alternative was carried forward for further evaluation.

- High Temperature Thermal Desorption (HTTD) is an ex-situ process that uses heat exchange to volatilize organic contaminants from soil. A mobile treatment unit would be brought to the site to process the soil. The contaminated material would be heated in a rotary dryer at temperatures between 320° and 560°C (600° - 1,000°F) for up to 10 minutes. In some configurations, the contaminants are driven from the material and destroyed in an oxidizer. After exiting the oxidizer, the flue gases are cooled then passed through a baghouse to remove particulates. The treatment system off-gases would be treated as necessary to satisfy the requirements of the Maine air pollution regulations.

  This option is a proven technology that while targeting SVOCs, would reduce the concentrations of VOCs through treatment. Based on the volume of soil that could require treatment, the on-site treatment costs would be moderate to high. Therefore, this alternative was carried forward for further evaluation.

- Incineration is an ex-situ process that uses thermal decomposition via oxidation at temperatures usually ranging from 870° - 1,200°C (1,400° - 2,200°F) destroy the organic compounds in the soil. Rather than transferring the contaminants to air, as thermal treatment does, incineration destroys the volatile contaminants through volatilization then combustion (in the presence of oxygen).

This alternative would be difficult to implement due to air pollution permitting concerns. Community acceptance of incineration of remediation wastes is also a concern. In addition, the cost for incineration is high. Therefore, this technology was eliminated from further consideration.

- Soil Washing is an ex-situ process that reduces the volume of contaminated material by separating fine, highly contaminated soils from less contaminated sands and gravels. The highly contaminated materials are then handled separately for treatment. Leaching agents, surfactants or solvents are often used to remove the organics from the soil particles.

  Soil washing is an innovative technology that has not been widely used. The target contaminant groups from soil washing are SVOCs, fuels and inorganics. Select VOCs and pesticide reduction is possible. This technology requires excessive material handling, both during excavation and the separation process. Additionally, this method will generate substantial volumes of contaminated water that will require treatment prior to disposal. Therefore, this technology was eliminated from further consideration.

- Solidification / Stabilization can be applied as an ex-situ process where excavated materials are mixed with stabilization agents to bind the contaminants and reduce the potential for contaminant leaching. In many cases the treatment process can be incorporated into asphalt and cement processing. Alternatively, the treated soil can be used as backfill.

  Solidification and stabilization would immobilize contaminants, but would not significantly reduce their concentrations. Therefore, this technology would need to be used in combination with another technology. Bench-scale testing would need to be performed to identify the appropriate mix of additives to address the contaminants. For example, asphalt emulsions are commonly used to stabilize organic wastes.

  This option is commonly used to treat remediation wastes and is easy to implement. The cost would be moderate. Therefore, this technology was carried forward.

- Bioremediation can be performed ex-situ by treating the contaminated soils in a constructed remediation basin. The soil could be placed in biopiles or land farms. In either case, the soil would be mixed with nutrients (manure), sand and gravel to improve the permeability and generate a microbe-rich environment.

  - Biopiles - Perforated pipes are placed between the mixture lifts and connected together. An impermeable cover is placed over the pile(s) to prevent infiltration and uncontrolled vapor loss. A blower can be placed on the perforated pipe to draw a vacuum on the pile. Compounds that are not susceptible to biodegradation are volatilized and removed through the perforated pipe. Vapors are treated

before being discharged to the atmosphere. The time frame to achieve the remedial action objective could be several years.

- Land Farming – Contaminated soils are spread a few inches thick over a large unlined area. Frequent roto-tilling allows VOCs to vaporize to the atmosphere without treatment. Land farming is not an option for soils characterized as hazardous waste.

The surface area requirements to implement either biopiles or land farms cannot be met at this site. In addition, the performance of bioremediation of stockpiled soils could be adversely affected by cold weather conditions, further increasing the time required to complete remediation. Therefore, this alternative, in either form, was eliminated from further consideration.

4.3.1.5 Excavation and Off-Site Treatment

The excavation/off-site treatment technologies would involve the excavation and stockpiling of soil at the site. However, this option is not viable as the contaminants of concern include a listed hazardous waste which eliminates off-site treatment.

4.3.1.6 Excavation and Off-site Disposal

This general response action would involve excavating and stockpiling the soil on-site. A sampling program, which could be performed prior to or after the excavation activities, would be necessary to characterize the soil for disposal purposes. Based on the sampling results, the soil would be transported off-site by truck to a landfill facility approved to handle the particular contaminants. Two general types of landfill facilities are described below:

- RCRA Subtitle C Landfills are permitted to accept regulated hazardous wastes. The landfills have been designed to satisfy the requirements of the hazardous waste regulations, with associated construction, operation and maintenance, and closure requirements.

  The use of a RCRA Subtitle C landfill would be easy to implement for most of the soil at the site. The use of a RCRA Subtitle C landfill would be effective at removing the contaminants from the site. Depending on contaminant concentrations, stabilization may be required to meet the requirements of the Land Disposal Restrictions. The cost for use of a RCRA Subtitle C landfill is relatively high. This option was carried forward because it is a commonly used technology that would provides a means of permanently removing the contamination from the site.

4.3.2 Water

As part of the implementation of remedial alternatives to address soil, the shallow overburden will likely need to be dewatered and groundwater may need to be pumped during excavation activities, if any. Therefore, technologies for handling the groundwater are discussed below.

- Treatment and Discharge would involve treating the water on-site and then discharging the water to the surrounding area or to an infiltration chamber. The water would likely be pumped into a holding tank prior to treatment. The treatment system would likely involve a combination of filtration and carbon adsorption. The treatment system would be designed to achieve drinking water standards as required by the remedial action objectives.

  The treatment and discharge option would use technologies that are commonly used at remediation sites. The operation of the treatment system would require operator attention and the costs would be moderate. Since this option would achieve the remedial objectives and is a proven technology, it was carried forward.

- Off-Site Treatment / Disposal would involve pumping the water into a holding tank and then transferring the water to trucks for off-site treatment. Due to the high volume of water potentially involved, possibly fifty thousand gallons, the number of trucks required to transport the water could be high. As the Town of Ellsworth would not likely accept the water, it would need to be transported to a commercial facility. Due to the relatively high volume of water anticipated to require handling as part of the remedial activities, this alternative was not carried forward.

SECTION FIVE

DEVELOPMENT AND DETAILED EVALUATION OF SOURCE CONTROL ALTERNATIVES

5.1 OVERVIEW

This section provides a detailed evaluation of source control alternatives. The alternatives were developed by combining source control technologies from Section 4.3. The comprehensive alternatives were developed to present a range of discrete options, each of which addresses the entire site.

A total of four comprehensive alternatives are evaluated in this section. The alternatives are listed below:

Alternative #1 - No Action
Groundwater monitoring

Alternative #2 - Excavation and On-site Treatment
Institutional controls, such as a deed notice and fencing
Soil excavation and on-site treatment
Water treatment during remedial activities
Groundwater monitoring

Alternative #3 - Excavation and Off-site Disposal
Institutional controls, such as a deed notice
Soil excavation and off-site disposal
Water treatment during remedial activities
Groundwater monitoring

The evaluation criteria are described in Section 5.2 and the evaluations are presented in Section 5.3 through 5.6. In Section 6.0, a comparative analysis of the comprehensive alternatives is presented.

5.2 DETAILED EVALUATION CRITERIA

5.2.1 Threshold Criteria

Threshold criteria refer to two of the evaluation criteria that relate directly to statutory findings. The threshold criteria are:

- Overall Protection of Human Health and the Environment

- Compliance with State Standards, Requirements, Criteria, Limitations, and Guidelines

5.2.2 Balancing Criteria

Balancing criteria refer to three of the evaluation criteria that represent the primary criteria upon which the detailed evaluation is performed. The balancing criteria are:

- Degree of Permanence and Waste Reduction
- Implementability
- Cost

5.2.3 Modifying Criteria

The modifying criteria refer to the evaluation criteria which is evaluated following comment on the FS report and the proposed plan and will be addressed prior to making a final decision (i.e., this criteria is not evaluated as part of this report). The modifying criteria is:

- Community Acceptance

5.3 EVALUATION OF ALTERNATIVE 1: NO ACTION

5.3.1 Description

The *No Action* alternative is presented to provide a baseline for evaluation of the other alternatives. The *No Action* alternative would involve monitoring site conditions over time; no remedial actions would be performed at the site. The site would be subject to review every five years to evaluate site conditions. Based on the review, the need for remedial actions would be reevaluated.

5.3.2 Overall Protection of Human Health and the Environment

The *No Action* alternative would not reduce existing risks and would not satisfy the remedial action objectives. Human health risks associated with ingestion, inhalation, or dermal contact with the source area would remain. Similarly, the ecological risks to environmental receptors would not be addressed. It is not anticipated that the risks identified in the baseline risk assessment would either increase or decrease significantly over the next 30 years.

5.3.3 Compliance with State Standards, Requirements, Criteria, Limitations and Guidelines

An evaluation of the compliance of the *No Action* alternative with regulatory requirements is presented in Table 4. The *No Action* alternative would not comply with regulatory requirements because the PCE wastes would not be managed in accordance with the regulatory requirements. In addition, the no action alternative would not improve groundwater quality.

5.3.4 Degree of Permanence and Waste Reduction

The *No Action* alternative would not be an effective or permanent solution. The soil would continue to constitute a source of contamination to groundwater. The risks would be the same as under current conditions. Access to the site would be unrestricted and future use would not be controlled.

Natural processes such as dilution, volatilization, biodegradation, adsorption, and subsurface chemical reactions could gradually reduce contaminant concentrations in soil and groundwater. However, the *No Action* alternative is not likely to significantly reduce the concentration of contaminants in the source area.

5.3.5 Implementability

There would be no physical or technological impediments associated with this option. However, it would be difficult to obtain approvals from federal, state, and local agencies to implement the *No Action* alternative. Therefore, the *No Action* alternative would be difficult to implement.

5.3.6 Cost

There would not be any significant costs associated with the *No Action* alternative.

5.4 EVALUATION OF ALTERNATIVE 2: EXCAVATION AND ON-SITE TREATMENT

5.4.1 Description

The primary components of the on-site treatment alternative include the following:

- Site Preparation – purchase of property, site clearing, to include removal of the residential structure and other personal property

- Excavation - excavation and stockpiling of soil, with dewatering, as necessary

- On-site Treatment - treatment of soil using a combination of thermal treatment and stabilization

- Site Closure - site regrading and fencing, and land-use restrictions

- Monitoring - groundwater monitoring to evaluate the impact of source control measures on groundwater quality

5.4.1.1 Site Preparation

Before excavation begins, the ground surface would be cleared of brush and trees. A surveyed grid would be established to track excavation activities and volumes. Geotextiles could be used to separate the gravel from impacted soils. Erosion and siltation controls would be installed around the perimeter of the remediation area to minimize impacts of stormwater runoff to wetlands and receiving surface waters.

The water from the shallow overburden would be pumped through an on-site treatment system that would discharge to an on-site infiltration gallery or to the surrounding area (the discharge location would be selected during the design phase). The treatment system would be designed so that the effluent would meet drinking water standards. The exact configuration of the treatment system would be selected during the design phase. However, for the purpose of the FS, it is assumed that the treatment system would include a 20,000 gallon fractionation tank, a filter system, and two 2,000-pound carbon adsorption units in series. The carbon would need to be changed periodically to prevent contaminant breakthrough. Operation of the treatment system in the winter season would require measures to prevent the system from freezing.

5.4.1.2 Excavation

Saturated (water/PCE) soils would be excavated and dewatered. The dewatering system could simply involve a gravity drain system or use of a filter press to minimize the volume of soil. The selection of the type of dewatering system could be made during the design phase. For the purpose of the FS, we have assumed that a gravity drain system that utilizes a collection basin lined with plastic would be used to drain excess water. In either case, water generated by the dewatering operation would be pumped into the fractionation tank for treatment.

The remaining soil would be excavated and securely stockpiled on site. Depending on the time of year and groundwater conditions, the excavation may need to be dewatered during soil excavation. If this were the case, a sump would be constructed to collect groundwater. The groundwater would be pumped to the on-site treatment system. The amount of dewatering would be heavily dependent on the elevation of the groundwater table and the quantity of precipitation during the excavation activities.

Depending on the specific treatment process, a limited sampling program could be required to supplement the existing site soil data. Provisions would also be made for dust control and decontamination of remediation equipment.

5.4.1.3 On-site Treatment

The soil would be treated using a combination of on-site thermal treatment and stabilization.

A staging area would need to be constructed for the operation of the soil treatment systems and for stockpiling the soil prior to and between treatment processes. Soil would be covered with plastic sheeting prior to treatment to minimize the potential for contaminants to volatilize.

A portable thermal treatment unit would be used to thermally treat the soils. Thermal treatment typically consists of a soil feed unit, a rotary dryer, a thermal oxidizer, and a heat exchanger. Fugitive emissions would be minimized through the use of a pugmill to rehydrate the soil prior to stockpiling and the use of baghouses to remove particulates from the off-gases. Large rocks, roots, and other debris would need to be screened prior to treatment. In addition, the soil would need to be blended prior to treatment to maintain a consistent waste stream through the treatment process. The production rate could average 500 tons per day.

Soils classified as hazardous waste (approximately 5,500 cubic yards) would be treated using on-site stabilization. Soil would be stabilized on-site using a pug mill. The soil would be placed on a conveyor belt that feeds into a mixing plant. Materials such as kiln dust, lime, or other stabilizing agent, would be added to the mixing plant. The mix ratio would be determined initially through bench scale tests and could be adjusted after confirmation testing. The production rate could average 1,000 tons per day. Once stabilized, the soil would no longer be regulated as a hazardous waste.

Sampling would be performed following each stage of treatment to verify that the remedial goals were achieved. The treated soil could be used as backfill at the site.

5.4.1.4 Site Closure

If necessary, a chain link fence would be installed to limit access to the site.

The disturbed portion of the site would be backfilled with treated soil and regraded as necessary to prevent ponding. The stabilized wastes would be buried to minimize the potential for direct contact. The stabilized soils would be buried above the water table and the location could be surveyed onto a plot plan and recorded with the deed or a physical barrier, such as a geotextile, could be used to mark the location of the stabilized material.

A land-use restriction or other institutional controls would be used to ensure future site uses are consistent with potential risks and that the landfill cap is properly maintained.

5.4.1.5 Maintenance and Monitoring

Following the completion of remedial activities, groundwater and surface water sampling would be conducted periodically to evaluate the impact of the source control measures. A long-term monitoring plan would be developed, specifying locations and sampling parameters. The results of the monitoring program would be used in the evaluation of the actions necessary to address the migration of contamination in groundwater.

5.4.1.6 Schedule

It is estimated that this alternative would require approximately four months to complete.

5.4.2 Overall Protection of Human Health and the Environment

The on-site treatment alternative would achieve the remedial action objectives for soil, air and dust. By treating the soil the source of local contamination for groundwater and surface waters would be eliminated. Over time, through elimination of the source, concentrations of residual contaminants are expected to decline, further achieving the remedial action objectives for these media. On-site treatment would also eliminate the potential human health and ecological risks identified in the baseline risk assessment.

5.4.3 Compliance with State Standards, Requirements, Criteria, Limitations and Guidelines

An evaluation of the compliance of the on-site treatment alternative with regulatory requirements is presented in Table 4. This alternative would satisfy the soil regulatory requirements.

Soils that are classified as a hazardous waste either would be stabilized on-site following thermal treatment. Therefore, this alternative would comply with the requirements of the hazardous waste regulations.

Off-gas controls for the on-site thermal treatment system would be designed to satisfy the air emission limits.

Compliance with regulatory requirements associated with groundwater quality would be evaluated as part of this alternative. However, this source control alternative may not achieve the groundwater standards.

5.4.4 Degree of Permanence and Waste Reduction

On-site thermal treatment would permanently destroy the majority of organic contaminants. Residual contaminants would remain in-place at the site, but would not be expected to pose a significant risk.

Treatment of the soils would eliminate the primary source of impact to groundwater. Over time, contaminant concentrations in groundwater would be expected to decrease as

advection, dispersion and degradation reduced the contaminant concentrations at and downgradient of the site.

The on-site treatment alternative would not have any long-term maintenance requirements. The land-use restrictions would minimize exposure to residual contaminants.

5.4.5 Implementability

On-site treatment could be difficult to implement at the site. The excavation of soils would not be difficult to implement but dewatering may be difficult due to the high groundwater conditions. There is limited available space on site where a staging area for treatment equipment could be constructed.

On-site thermal treatment and stabilization are proven technologies that are readily available and have been used at many remediation sites in New England. Both technologies utilize relatively simple processes. Testing performed following each treatment process would evaluate their effectiveness. Materials that do not meet the design criteria would be reprocessed until the objectives were met.

Off-site disposal services would be required for the spent activated carbon from the water treatment system. Disposal services for those wastes would be readily available.

Permitting issues would need to be evaluated for the discharge from the water treatment system and air emissions associated with the thermal treatment system.

5.4.6 Cost

The cost estimate for the on-site treatment alternative is summarized in Table 6. The total projected cost for this alternative ranges from $5,300,000 to $7,200,000, for commercial /industrial use and residential use, respectively. This alternative is not expected to have any significant on going O&M costs.

5.5 EVALUATION OF ALTERNATIVE 3: EXCAVATION AND OFF-SITE DISPOSAL

5.5.1 Description

The primary components of the off-site disposal alternative include the following:

- Site Preparation - site clearing
- Characterization - sampling to satisfy requirements of receiving facility, which could be performed in-situ, prior to excavation or once the soil has been excavated and stockpiled

- Excavation - excavation and stockpiling of soil, with dewatering, as necessary
- Disposal - transportation, and disposal at off-site facilities
- Site Closure - site regrading and a land-use restriction, depending on the clean-up level
- Monitoring - groundwater and surface water monitoring to evaluate the impact of source control measures on groundwater quality

5.5.1.1 Site Preparation

Site preparation activities would be similar to the Excavation and On-Site Treatment Alternative. As with the on-site treatment alternative, a surveyed grid would be established to track excavation activities and volumes and to delineate soil contaminant types.

5.5.1.2 Characterization

A characterization program for the soil would need to be developed to satisfy the requirements of the receiving facilities. Sample parameters and sample frequency would be specified by the permit requirements of the selected disposal facilities. In order to facilitate excavation and segregation of soils, the characterization program could be performed in-situ in advance of the excavation activities. Alternatively, existing data could be used to segregate the soils and the characterization program would then be performed on the stockpiled soils. The selection of the type of sampling program would be made as part of the design activities.

5.5.1.3 Excavation

The soil would be excavated and stockpiled as described for the on-site treatment alternative.

5.5.1.4 Disposal

- A RCRA Subtitle C Landfill, such as Max Environmental in Pennsylvania, is permitted to receive RCRA wastes. Typical costs for transportation and disposal range from $200 to $250 per ton.

As with the other alternatives, groundwater pumped during excavation activities would be treated onsite.

The RCRA wastes would be stabilized on-site using a process similar to the one described under the on-site treatment alternative. The wastes would then be loaded into trucks and transported to the appropriate facilities. Assuming 10 to 15 trucks per day would leave the site, approximately 200 - 300+ tons per day would be transported off-site.

5.5.1.5 Site Closure

Site closure activities would be the same as for the on-site treatment alternative.

5.5.1.6 Maintenance and Monitoring

Monitoring activities would be performed as described for the on-site treatment alternative.

5.5.1.7 Schedule

It is estimated that this alternative would require approximately three months to complete.

5.5.2 Overall Protection of Human Health and the Environment

The off-site disposal alternative would achieve the remedial action objectives for soil, air and dust. By transporting the soil off-site, the source of local contamination for groundwater would be eliminated from the site. However, this approach could also create off-site liability. In addition, there would be risks associated with the off-site transportation of the wastes.

Over time, through elimination of the source, concentrations of residual contaminants are expected to decline, further achieving the remedial action objectives for these media. Off-site disposal would also eliminate the potential human health and ecological risks identified in the baseline risk assessment.

5.5.3 Compliance with State Standards, Requirements, Criteria, Limitations, and Guidelines

An evaluation of the compliance of the off-site disposal alternative with regulatory requirements is presented in Table 4. This alternative would satisfy the soil regulatory requirements.

Soil that is classified as a hazardous waste would be sent off-site to a RCRA Subtitle C landfill. Therefore, this alternative would comply with the requirements of the hazardous waste regulations.

Compliance with regulatory requirements associated with groundwater quality would be evaluated as part of this alternative. However, this source control alternative may not achieve the groundwater standards.

5.5.4 Degree of Permanence and Waste Reduction

The off-site disposal alternative would provide long-term risk reduction and permanence. Off-site disposal of the source would permanently eliminate many of the risks posed by the site. Over time, contaminant concentrations in groundwater would be expected to decrease

as advection, dispersion and degradation reduced the contaminant concentrations at and downgradient of the site. .

Off-site disposal would not reduce the contaminant concentrations significantly, but would reduce their mobility.

The off-site disposal alternative would not have any long-term maintenance requirements. Depending on the cleanup level obtained, land-use restrictions could minimize exposure to residual impacts.

5.5.5 Implementability

The off-site disposal is technically feasible. The excavation of soils would not be difficult to implement but dewatering may be difficult due to the high groundwater conditions.

The off-site disposal alternative should not trigger any significant administrative requirements. It is not anticipated that any permitting would be required. Provisions would be made for dust control and to minimize the impact of trucks traveling through residential neighborhoods.

Off-site disposal services would be required for all of the soil, as well as, spent activated carbon from the water treatment system. Disposal services for those wastes would be readily available.

Permitting issues associated with disturbing the wetlands would need to be addressed and coordinated with federal, state, and local agencies. Permitting issues would also need to be evaluated for the discharge from the water treatment system.

5.5.6 Cost

The cost estimate for the off-site disposal alternative is summarized in Table 7. The total projected cost for this alternative ranges from $5,700,000 to $7,600,000, for commercial /industrial use and residential use, respectively. This alternative is not expected to have any significant on going O&M costs.

SECTION SIX

COMPARATIVE EVALUATION OF SOURCE CONTROL ALTERNATIVES

6.1 OVERVIEW

This section presents a comparative evaluation of the three source control alternatives evaluated in Section 5.0. The same evaluation criteria as described in Section 5.2 serve as the basis for comparison. The following alternatives are compared in this section:

- Alternative #1 - No Action
- Alternative #2 - Excavation and On-site Treatment
- Alternative #3 - Excavation and Off-Site Disposal

6.2 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The two action alternatives provide a similar level of overall protection of human health and the environment. They would address the potential human health and environmental risks identified in the baseline risk assessment. The two action alternatives could be implemented in similar time frames: three to six months following the completion of design activities.

A deed notice would be implemented in both action alternatives to minimize the potential for contact with residual contamination and to prevent the installation of drinking water wells at the site.

The no action alternative would not achieve the remedial action objectives in the foreseeable future. The soil would continue to constitute a source of contamination to groundwater and surface water The no action alternative is the least protective of human health and the environment.

6.3 COMPLIANCE WITH STATE STANDARDS, REQUIREMENTS, CRITERIA, LIMITATIONS AND GUIDELINES

Both action alternatives would be managed in accordance with all the regulatory requirements, except for those associated with groundwater. Monitoring would be performed following the completion of remedial activities to evaluate the impact of the source control measures on groundwater quality. There would not be any significant difference between the action alternatives with respect to their ability to satisfy the regulatory requirements.

The no action alternative would not comply with several of the regulatory requirements. The soil would not be managed in accordance with the solid waste regulations. Groundwater impacts would continue indefinitely beyond the compliance boundary.

6.4 DEGREE OF PERMANENCE AND WASTE REDUCTION

The primary difference between the action alternatives is that the majority of soil would remain on-site following remediation in the on-site treatment alternative. In contrast, the soil would be permanently removed from the site in the off-site disposal alternative.

The on-site treatment alternative would have the greatest degree of waste reduction. The remediation of organic contaminants using thermal treatment is an irreversible process. Stabilization of the soil is expected to permanently immobilize the residual contaminants. However, the volume of impacted soil would increase approximately 10% due to the addition of stabilizing agents.

The off-site disposal alternative provides the next highest degree of waste reduction. This alternative would also provide a high degree of permanence, since all of the wastes would be removed from the site. However, the off-site disposal of wastes creates the potential for liability at other locations.

The no action alternative would not be effective in the long-term because no actions would be taken to prevent contact with the impacted soil or to control the source of groundwater contamination. Current risks would not change significantly in the future and there would not be any controls to reduce the risk levels. The no action alternative has the least short-term effects since no remedial actions would be performed. However, this alternative would not achieve the remedial action objectives.

6.5 IMPLEMENTABILITY

Although both action alternatives would be relatively easy to implement, the off-site disposal alternative would be the easiest alternative to implement. The off-site disposal alternative would involve the least on-site waste handling and off-site disposal facilities are readily available.

The on-site treatment alternative would be the next easiest alternative to implement. The soil would be remediated using portable treatment systems. A staging area could be set up and there may be sufficient space at the site to operate the treatment equipment and stockpile the soil.

The no action alternative would be the easiest option to implement technically, but the inability to obtain approvals from regulatory agencies would be make this alternative very difficult to implement administratively.

6.6 COST

A table summarizing the present worth costs of each of the alternatives is provided below.

Summary of Estimated Remedial Costs

Alternative	***Cost per Ton***[i]	***Est. Tonnage***	***Total Cost***
No Action	$0	8,300	NA
On-site Treatment	$110 - $330	8,300	$913,000 to $2,700,000
Off-site Disposal	$270 - $450	8,300	$2,200,000 to $3,800,000

As listed above, the no action alternative would not involve any significant costs. The only costs for that alternative would be the periodic monitoring of site conditions.

6.7 SUMMARY OF COMPARATIVE ANALYSIS

Three alternatives for achieving the source control remedial action objectives were identified and evaluated in this FS. The two action alternatives would result in a similar overall protection of human health and the environment. The primary differences between the alternatives relate to whether the remediated materials remain at the site or are removed from the site.

Since both action-alternatives provide similar protectiveness at similar costs (the same order of magnitude), the selection of the preferred remedy will largely depend on the future plans for the site. In the absence of any development plans for the site, the consolidation/capping alternative would likely be the most favorable, since it achieves the objectives at the lowest cost. In contrast, if unrestricted residential development is planned, then off-site treatment and disposal would likely be the preferred option since the impacted soil would be permanently removed from the site. In the event that the site was restricted from development, the on-site treatment option might be preferred since it would not involve the construction of a landfill and would also not have the extra costs and transportation issues associated with off-site treatment and disposal.

In all cases, the no action alternative is the least preferable because it would not achieve the remedial action objectives in the foreseeable future. The site would continue to serve as an uncontrolled source of groundwater and surface water contamination and no actions would be taken to preclude direct contact with the soil.

SECTION SEVEN

TABLES

SECTION EIGHT

FIGURES

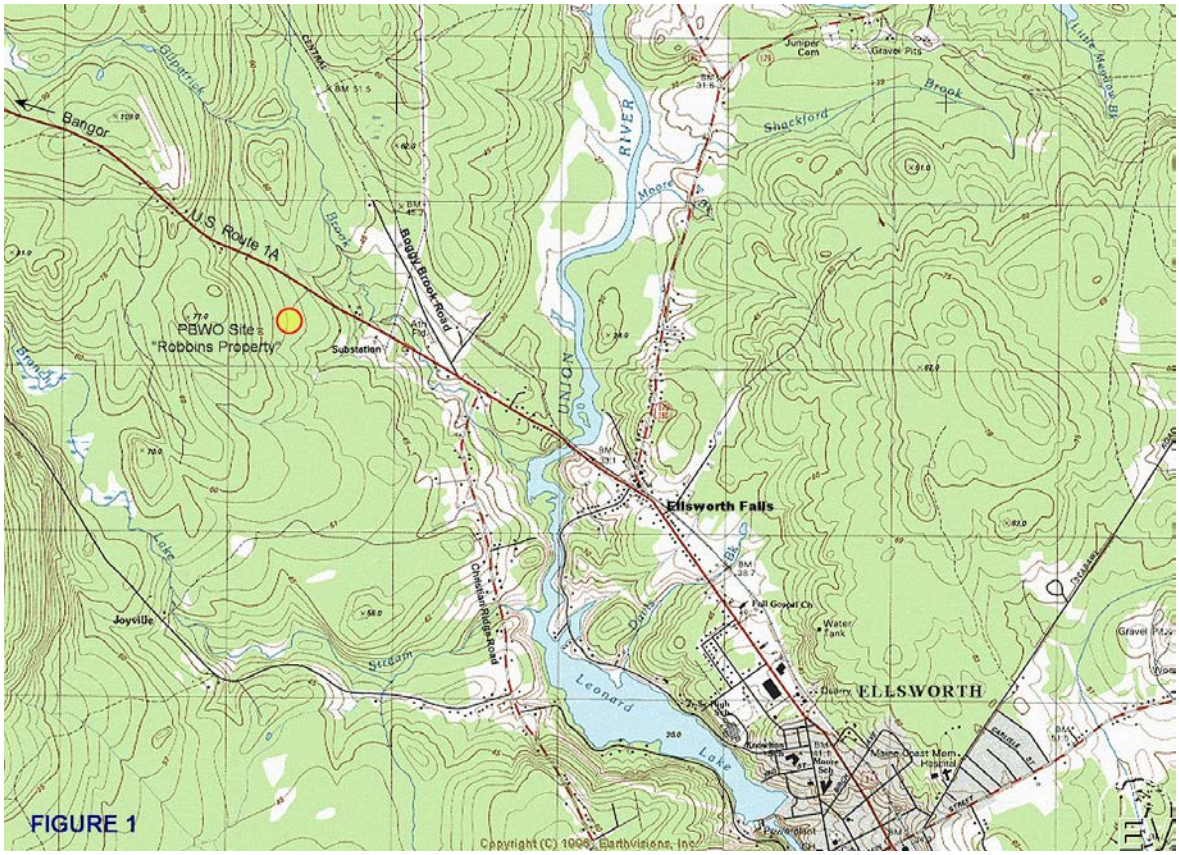

FIGURE 1

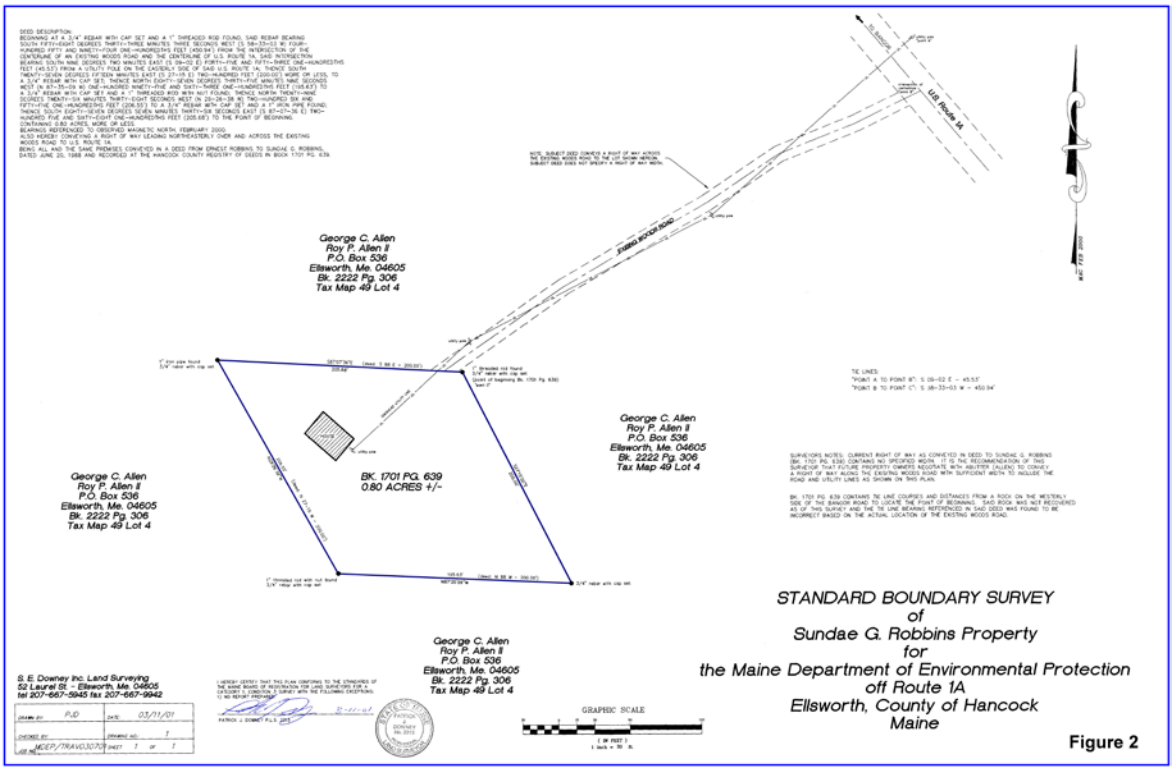

Figure 2

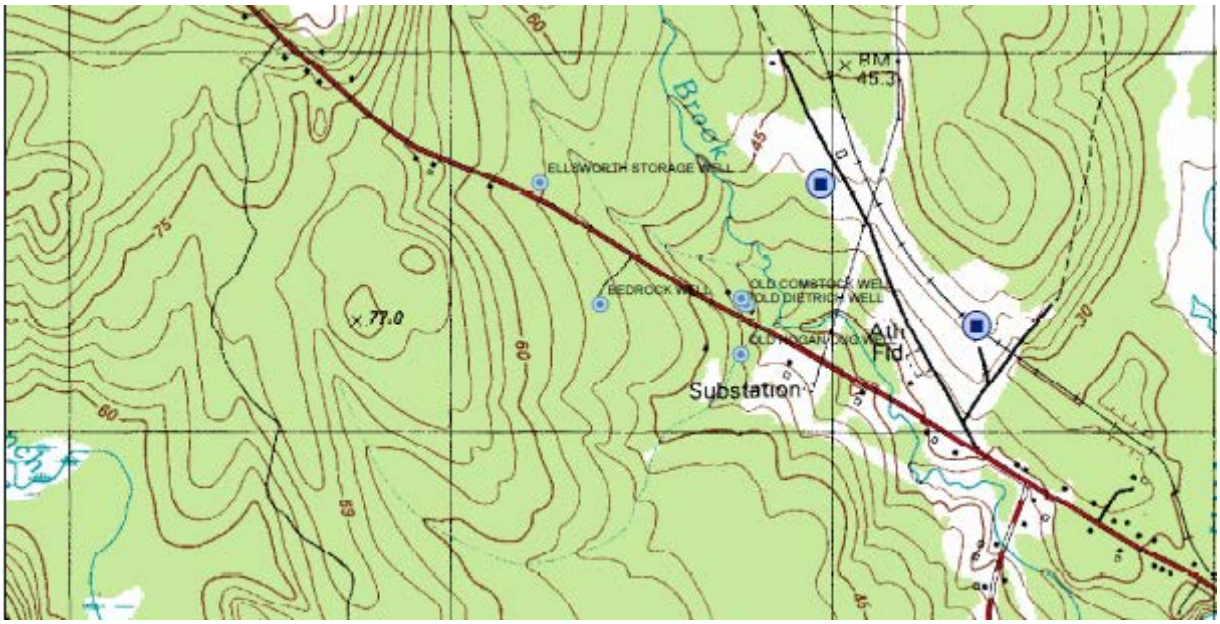

Figure 3: Water supplies with positive VOC results.

SECTION NINE

REFERENCES

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[i] Remediation Technologies Screening Matrix and Reference Guide, 2nd Ed., October 1994
DoD Environmental Technology Transferr Committee; EPA/542/B-94/013; NTIS PB95-104782

Table 1

All Soil Results for Robbins Site(ug/kg, ppb)

Location	GP-101	GP-101	GP-102	GP-102	GP-102	GP-103	GP-105	GP-105	GP-105	GP-105	GP-106	GP-107	GP-111	GP-113	GP-113	GP-115	GP-116	GP-116	GP-117	GP-119	GP-124
Depth	0-2'	2-4'	0-2'	2-4'	4-6'	4-6'	0-2'	2-4'	4-6'	6-8'	2-4'	4-6'	4-6'	2-4'	4-6'	2-4'	2-4'	4-6'	4-6'	4-6'	4-6'
Headspace	0	3	0	0	0	2	3	3	3	3	6	263	6	6	1564	N/S	15	122	6	4	N/S
TPH								4,800J			N/A	10,000J		N/A	46,000J		N/A				
B	3U	5U	3U	4U	3U	2U	3U	28	3U	3U	N/A	2100U	2U	N/A	2900U	2U	N/A	5U	2U	2U	3U
T	13	5U	3U	4U	3U	2U	3U	36	3U	3U	3U	2100U	2U	3U	2900U	2U	36	5U	2U	2U	20
E	3U	5U	3U	4U	3U	2U	3U	34	3U	3U	N/A	2100U	2U	N/A	2900U	2U	N/A	5U	2U	2U	3U
X	3U	5U	3U	4U	3U	2U	3U	230	3U	3U	N/A	2,700	2U	N/A	2900U	2U	N/A	5U	2U	2U	11
1,3,5 TMB	3U	3U	3U	4U	3U	2U	3U	49	3U	3U	N/A	2100U	2U	N/A	2900U	2U	N/A	5U	2U	2U	3U
1,2,4 TMB	3U	3U	3U	4U	3U	2U	3U	140	3U	3U	2U	2100U	2U	7	2900U	2U	17	5U	2U	2U	3U
NAP	15U	16U	17U	19U	16U	12U	17U	200	14U	16U	N/A	1,700 J	12U	N/A	15000U	12U	N/A	23U	12U	12U	15U
1,1,1 TCA	2U	24	2U	2U	2U	1U	2U	7U	1U	2U	53	3,400	1U	3	9,600	3	3U	2U	2	33	530
TCE	2U	8	2U	2U	3	1U	2U	7U	1U	2U	5	2100U	1U	3	2,300	1	3U	2U	2	8	57
PCE	2U	42	2U	2U	2U	4U	2U	7U	1U	2U	16	150,000	1U	8U	1,400,000	17	8U	2U	19	86	3,000
1,1-DCE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3	N/A	N/A	2U	N/A	N/A	2U	N/A	N/A	N/A	N/A
1,1-DCA	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	18	N/A	N/A	5	N/A	N/A	3U	N/A	N/A	N/A	N/A
T1,2-DCE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	18	N/A	N/A	2U	N/A	N/A	12	N/A	N/A	N/A	N/A
C1,2-DCE	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	259*	N/A	N/A	128*	N/A	N/A	359*	N/A	N/A	N/A	N/A
MDCB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	65	N/A	N/A	3	N/A	N/A	4	N/A	N/A	N/A	N/A
PDCB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	230*	N/A	N/A	7	N/A	N/A	4	N/A	N/A	N/A	N/A
1,2,4-TCB	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	78	N/A	N/A	6U	N/A	N/A	6U	N/A	N/A	N/A	N/A
PIST	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2U	N/A	N/A	2U	N/A	N/A	14	N/A	N/A	N/A	N/A
A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	20	N/A	N/A	63*	N/A	N/A	166*	N/A	N/A	N/A	N/A
MEK	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15	N/A	N/A	5	N/A	N/A	30	N/A	N/A	N/A	N/A

TPH--Total Petroleum Hydrocarbon(relative to gasoline)
B--Benzene
T--Toluene
E--Ethyl Benzene
X--Xylene
TMB--Trimethyl Benzene
NAP--Naphthalene
TCA--Trichloroethane
TCE--Trichloroethylene
PCE--Tertrachloroethylene
U--Below the quantitation level of the listed value
J--An approximated value

*-- Concentration is approximate, the result exceeds the calibration range

A-- Acetone
MEK--Methyl Ethyl Ketone
DCE--Dichloroethylene
DCA--Dichloroethane
T--Toluene
TCA--Trichloroethane
TCE--Trichloroethylene
PCE--Tertrachloroethylene
MDCB(1,3)--M-Dichlorobenzene
PDCB--(1,4)P-Dichlorobenzene
TCB--Trichlorobenzene
PIST--P-Isopropyltoluene
TMB--Trimethylbenzene

DAF- Dilution-Attenuation Factor

Table 1, Continued

TPH--Total Petroleum Hydrocarbon(relative to gasoline)
B--Benzene
T--Toluene
E--Ethyl Benzene
X--Xylene
TMB--Trimethyl Benzene
NAP--Naphthalene
TCA--Trichloroethane
TCE--Trichloroethylene
PCE--Tertrachloroethylene
U--Below the quantitation level of the listed value
J--An approximated value

*-- Concentration is approximate, the result exceeds the calibration range

A-- Acetone
MEK--Methyl Ethyl Ketone
DCE--Dichloroethylene
DCA--Dichloroethane
T--Toluene
TCA--Trichloroethane
TCE--Trichloroethylene
PCE--Tertrachloroethylene
MDCB(1,3)--M-Dichlorobenze
PDCB--(1,4)P-Dichlorobenzene
TCB--Trichlorobenzene
PIST--P-Isopropyltoluene
TMB--Trimethylbenzene

DAF- Dilution-Attenuation Factor

Table 2
Generic SSLs
for the Contaminants of Concern(ug/kg, ppb)

Contaminant List	Ingestion Pathway	Inhalation Pathway	Groundw ater Pathway (DAF=1)	Groundwater Pathway (DAF=20)
Benzene	22000	800	2	30
Toluene	16000000	650000	600	12000
Ethyl Benzene	7800000	400000	700	13000
Xylene	1.60E+08	410000	9000	190000
1,3,5 Trimethylbenzene	NIA	NIA	NIA	NIA
1,2,4 Trimethylbenzene	NIA	NIA	NIA	NIA
Naphthalene	3100000	NIA	4000	84000
1,1,1 Trichloroethane	NIA	1200000	10	2000
Trichloroethene	58000	5000	3	60
Tetrachloroethene	12000	11000	3	60
1,1-Dichloroehtene	1000	70	3	60
1,1-Dichloroethane	7800000	1300000	1000	23000
Trans1,2-Dichloroethene	1600000	3100000	30	700
Cis1,2-Dichloroethene	780000	1200000	200	400
1,3-Dichlorobenzene	NIA	NIA	NIA	NIA
1,4-Dichlorobenzene	27000	NIA	100	2000
1,2,4-Trichlorobenzene	NIA	NIA	NIA	NIA
P-Isoproyltoluene	NIA	NIA	NIA	NIA
Acetone	7800000	1.00E+08	800	16000
Methyl Ethyl Ketone	NIA	NIA	NIA	NIA

NIA-No Information Available
DAF- Dilution-Attenuation Factor

Table 3
Generic SSL Exceedances for
Ingestion Pathway
(ug/kg, ppb)

Location		GP-107	GP-113
Depth		4-6'	4-6'
Headspace		263	1564
TPH		10,000J	46,000J
Benzene	22000	2100U	2900U
Toluene	16000000	2100U	2900U
Ethyl Benzene	7800000	2100U	2900U
Xylene	1.60E+08	2,700	2900U
1,3,5 Trimethylbenzene		2100U	2900U
1,2,4 Trimethylbenzene		2100U	2900U
Naphthalene	3100000	1,700 J	15000U
1,1,1 Trichloroethane		3,400	9,600
Trichloroethene	58000	2100U	2,300
Tetrachloroethene	12000	150,000	1,400,000
1,1-Dichloroehtene	1000	N/A	N/A
1,1-Dichloroethane	7800000	N/A	N/A
Trans1,2-Dichloroethene	1600000	N/A	N/A
Cis1,2-Dichloroethene	780000	N/A	N/A
1,3-Dichlorobenzene		N/A	N/A
1,4-Dichlorobenzene	27000	N/A	N/A
1,2,4-Trichlorobenzene		N/A	N/A
P-Isoproyltoluene		N/A	N/A
Acetone	7800000	N/A	N/A
Methyl Ethyl Ketone		N/A	N/A

N/A - Not Analyzed for this analyte

Table 4
Generic SSL Exceedances for
Inhalation Pathway
(ug/kg, ppb)

Location		GP-107	GP-113
Depth		4-6'	4-6'
Headspace		263	1564
TPH		10,000J	46,000J
	800	2100U	2900U
	650000	2100U	2900U
Ethyl Benzene	400000	2100U	2900U
Xylene	410000	2,700	2900U
1,3,5 Trimethylbenzene		2100U	2900U
1,2,4 Trimethylbenzene		2100U	2900U
Naphthalene		1,700 J	15000U
1,1,1 Trichloroethane	1200000	3,400	9,600
Trichloroethene	5000	2100U	2,300
Tetrachloroethene	11000	150,000	1,400,000
1,1-Dichloroehtene	70	N/A	N/A
1,1-Dichloroethane	1300000	N/A	N/A
Trans1,2-Dichloroethene	3100000	N/A	N/A
Cis1,2-Dichloroethene	1200000	N/A	N/A
1,3-Dichlorobenzene		N/A	N/A
1,4-Dichlorobenzene		N/A	N/A
1,2,4-Trichlorobenzene		N/A	N/A
P-Isoproyltoluene		N/A	N/A
Acetone	1.00E+08	N/A	N/A
Methyl Ethyl Ketone		N/A	N/A

N/A - Not Analyzed for this analyte

Table 5
Generic SSL Exceedances for
Groundwater Pathway with a DAF = 1
(ug/kg, ppb)

Location	1 DAF	GP-101	GP-102	GP-102	GP-102	GP-103	GP-105	GP-105	GP-105	GP-105	GP-106	GP-107	GP-113	GP-113	GP-115	GP-116	GP-116	GP-117	GP-119	GP-124
Depth		2-4'	0-2'	2-4'	4-6'	4-6'	0-2'	2-4'	4-6'	6-8'	2-4'	4-6'	2-4'	4-6'	2-4'	2-4'	4-6'	4-6'	4-6'	4-6'
Headspace		3	0	0	0	2	3	3	3	3	6	263	6	1564	N/S	15	122	6	4	N/S
TPH								4,800J			N/A	10,000J	N/A	46,000J		N/A				
B	2	5U	3U	4U	3U	2U	3U	28	3U	3U	N/A	2100U	N/A	2900U	2U	N/A	5U	2U	2U	3U
T	600	5U	3U	4U	3U	2U	3U	36	3U	3U	3U	2100U	3U	2900U	2U	36	5U	2U	2U	20
E	700	5U	3U	4U	3U	2U	3U	34	3U	3U	N/A	2100U	N/A	2900U	2U	N/A	5U	2U	2U	3U
X	9000	5U	3U	4U	3U	2U	3U	230	3U	3U	N/A	2,700	N/A	2900U	2U	N/A	5U	2U	2U	11
1,3,5 TMB		3U	3U	4U	3U	2U	3U	49	3U	3U	N/A	2100U	N/A	2900U	2U	N/A	5U	2U	2U	3U
1,2,4 TMB		3U	3U	4U	3U	2U	3U	140	3U	3U	2U	2100U	7	2900U	2U	17	5U	2U	2U	3U
NAP	4000	16U	17U	19U	16U	12U	17U	200	14U	16U	N/A	1,700 J	N/A	15000U	12U	N/A	23U	12U	12U	15U
1,1,1 TCA	10	24	2U	2U	2U	1U	2U	7U	1U	2U	53	3,400	3	9,600	3	3U	2U	2	33	530
TCE	3	8	2U	2U	3	1U	2U	7U	1U	2U	5	2100U	3	2,300	1	3U	2U	2	8	57
PCE	3	42	2U	2U	2U	4U	2U	7U	1U	2U	16	150,000	8U	1,400,000	17	8U	2U	19	86	3,000
1,1-DCE	3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3	N/A	2U	N/A	N/A	2U	N/A	N/A	N/A	N/A
1,1-DCA	1000	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	18	N/A	5	N/A	N/A	3U	N/A	N/A	N/A	N/A
T1,2-DCE	30	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	18	N/A	2U	N/A	N/A	12	N/A	N/A	N/A	N/A
C1,2-DCE	200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	259*	N/A	128*	N/A	N/A	359*	N/A	N/A	N/A	N/A
MDCB		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	65	N/A	3	N/A	N/A	4	N/A	N/A	N/A	N/A
PDCB	100	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	230*	N/A	7	N/A	N/A	4	N/A	N/A	N/A	N/A
1,2,4-TCB		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	78	N/A	6U	N/A	N/A	6U	N/A	N/A	N/A	N/A
PIST		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2U	N/A	2U	N/A	N/A	14	N/A	N/A	N/A	N/A
A	800	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	20	N/A	63*	N/A	N/A	166*	N/A	N/A	N/A	N/A
MEK		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	15	N/A	5	N/A	N/A	30	N/A	N/A	N/A	N/A

TPH--Total Petroleum Hydrocarbon(relative to gasoline)
B--Benzene
T--Toluene
E--Ethyl Benzene
X--Xylene
TMB--Trimethyl Benzene
NAP--Naphthalene
TCA--Trichloroethane
TCE--Trichloroethylene
PCE--Tertrachloroethylene
U--Below the quantitation level of the listed value
J--An approximated value

*-- Concentration is approximate, the result exceeds the calibration range
A-- Acetone
MEK--Methyl Ethyl Ketone
DCE--Dichloroethylene
DCA--Dichloroethane
T--Toluene
TCA--Trichloroethane
TCE--Trichloroethylene
PCE--Tertrachloroethylene
MDCB(1,3)--M-Dichlorobenzene
PDCB--(1,4)P-Dichlorobenzene
TCB--Trichlorobenzene
PIST--P-Isopropyltoluene
TMB--Trimethylbenzene

DAF- Dilution-Attenuation Factor

Table 5 Continued
Generic SSL Exceedances for
Groundwater Pathway with a DAF = 1
(ug/kg, ppb)

TPH--Total Petroleum Hydrocarbon(relative to gasoline)
B--Benzene
T--Toluene
E--Ethyl Benzene
X--Xylene
TMB--Trimethyl Benzene
NAP--Naphthalene
TCA--Trichloroethane
TCE--Trichloroethylene
PCE--Tertrachloroethylene
U--Below the quantitation level of the listed value
J--An approximated value

*-- Concentration is approximate, the result exceeds the calibration range
A-- Acetone
MEK--Methyl Ethyl Ketone
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T--Toluene
TCA--Trichloroethane
TCE--Trichloroethylene
PCE--Tertrachloroethylene
MDCB(1,3)--M-Dichlorobenzene
PDCB--(1,4)P-Dichlorobenzene
TCB--Trichlorobenzene
PIST--P-Isopropyltoluene
TMB--Trimethylbenzene

DAF- Dilution-Attenuation Factor

Table 6
Generic SSL Exceedances for
Groundwater Pathway with a DAF = 20
(ug/kg, ppb)

Location	20 DAF	GP-107	GP-113	GP-119	GP-124
Depth		4-6'	4-6'	4-6'	4-6'
Headspace		263	1564	4	N/S
TPH		10,000J	46,000J		
Benzene	30	2100U	2900U	2U	3U
Toluene	12000	2100U	2900U	2U	20
Ethyl Benzene	13000	2100U	2900U	2U	3U
Xylene	190000	2,700	2900U	2U	11
1,3,5 Trimethylbenzene		2100U	2900U	2U	3U
1,2,4 Trimethylbenzene		2100U	2900U	2U	3U
Naphthalene	84000	1,700 J	15000U	12U	15U
1,1,1 Trichloroethane	2000	3,400	9,600	33	530
Trichloroethene	60	2100U	2,300	8	57
Tetrachloroethene	60	150,000	1,400,000	86	3,000
1,1-Dichloroehtene	60	N/A	N/A	N/A	N/A
1,1-Dichloroethane	23000	N/A	N/A	N/A	N/A
Trans1,2-Dichloroethene	700	N/A	N/A	N/A	N/A
Cis1,2-Dichloroethene	400	N/A	N/A	N/A	N/A
1,3-Dichlorobenzene		N/A	N/A	N/A	N/A
1,4-Dichlorobenzene	2000	N/A	N/A	N/A	N/A
1,2,4-Trichlorobenzene		N/A	N/A	N/A	N/A
P-Isoproyltoluene		N/A	N/A	N/A	N/A
Acetone	16000	N/A	N/A	N/A	N/A
Methyl Ethyl Ketone		N/A	N/A	N/A	N/A

U--Below the quantitation level of the listed value

J--An approximated value

N/A - Not Analyzed for this analyte