

# EXPLANATION OF SIGNIFICANT DIFFERENCES (ESD)

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BFI Rockingham Landfill Superfund Site  
Rockingham, Vermont

EPA ID: VTD980520092

September 29, 2014

**DECLARATION FOR THE  
EXPLANATION OF SIGNIFICANT DIFFERENCES  
BFI ROCKINGHAM LANDFILL SUPERFUND SITE  
ROCKINGHAM, VERMONT  
September 2014**

**Site Name and Location**

BFI Rockingham Landfill Superfund Site, Rockingham, Vermont.

**Lead Agency**

United States Environmental Protection Agency

**Support Agency**

Vermont Department of Environmental Conservation

**Statement of Purpose**

This decision document sets forth the basis for the determination to issue the attached Explanation of Significant Differences (ESD) for the BFI Rockingham Landfill Superfund Site (Site). The U.S. Environmental Protection Agency (EPA) developed this decision document after consulting with the Vermont Department of Environmental Conservation (VT DEC), and VT DEC's letter of concurrence is provided as Attachment 1 to this ESD. EPA also provided a fifteen day public comment period, during which one comment was received. The comment is addressed in a Responsiveness Summary incorporated into the ESD.

**Statutory Basis for Issuance of the ESD**

Pursuant to Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9617(c), and the National Contingency Plan (NCP), 40 C.F.R. § 300.435(c)(2)(i), if EPA determines that the remedial action being undertaken at a site differs significantly from the Record of Decision (ROD) for that site, EPA shall publish an explanation of the significant differences and the reasons such changes are being made. According to 40 C.F.R. § 300.435(c)(2)(i), and EPA guidance (Office of Solid Waste and Emergency Response (OSWER) Directive 9200.1-23-P, July 1999), an Explanation of Significant Differences, rather than a ROD amendment, is appropriate where the adjustments being made to the ROD are significant but do not fundamentally alter the remedy with respect to scope, performance or cost. EPA has determined that the adjustments to the 1994 ROD provided in this ESD are significant but do not fundamentally alter the overall remedy for the Site with respect to scope, performance, or cost. Therefore, this ESD is being properly issued.

The supporting documentation for this ESD and the Administrative Record are available for public review at the following locations and times:

**U.S. Environmental Protection Agency  
Records & Information Center**  
5 Post Office Square, Suite 100  
Boston, MA 02109  
617-918-1440

Monday-Friday: 9:00 am - 5:00 pm  
Saturday and Sunday: Closed

**Rockingham Free Public Library**  
65 Westminster Street  
Bellows Falls, VT 05101  
Phone: 802.463.4270  
Email: rockref@sover.net

Monday – Wednesday: 10:00 - 7:00  
Thursday & Friday: 10:00 - 5:30  
Saturday: 10:00 - 2:00

## **Background**

The BFI Rockingham Landfill Superfund Site (Site) includes a former 17-acre solid waste landfill that is located on a terrace approximately 500 feet from and 200 feet higher in elevation than the Connecticut River, as shown on the Site Plan included as Attachment 2. The Site includes the landfill area and the downgradient rural residential area impacted by the Site. From 1968 until 1991, the landfill received residential, commercial and industrial solid and liquid waste. Approximately 1.2 million cubic yards of solid waste were disposed in the landfill during its operation. The Site was included on the EPA National Priorities List (NPL) in October 1989.

EPA signed an Action Memorandum on September 13, 1993 to initiate a Non-Time Critical Removal Action (NTCRA) to install a multi-layer landfill cap, expand the active landfill gas collection and treatment system, and implement institutional controls on Browning-Ferris Industries, Inc. (BFI) owned property to restrict use of the landfill area and prevent use of the groundwater. Disposal Specialist, Inc. (DSI) and Browning-Ferris Industries of Vermont, Inc. (BFI-VT), the two Potentially Responsible Parties (PRPs) at the Site, entered into an Administrative Order on Consent (AOC) with EPA in September 1993 to perform the NTCRA. The landfill cap and landfill gas collection and treatment system design was completed in June 1994. Construction under the NTCRA was initiated in April 1994 and completed in July 1995.

On September 21, 1994, EPA issued the Record of Decision (ROD) for the Site describing remedial actions to be implemented and the basis for the selected remedy. The selected remedy identified in the ROD called for long-term monitored natural attenuation of surface water and groundwater; maintenance of the multi-layer cap and landfill gas extraction system; and the continued operation and maintenance of the off-site potable water supply line, lined ash monofill cell leachate collection system, and the Route 5 Seepage Control and Stabilization System (Route 5 System). The ROD also required maintenance of institutional controls and assurance of a water supply to residents impacted by contaminated groundwater from the Site. The ROD established Interim Groundwater Cleanup Levels (IGCLs) for bedrock groundwater based on

ARARs and the cumulative carcinogenic and non-carcinogenic risks posed to individuals drinking bedrock groundwater. The ROD anticipated that IGCLs would be achieved 15 years after completion of the NTCRA.

Long-term monitoring activities have shown improvements in groundwater and surface water quality following the construction activities of the NTCRA. However, review of sample results over time has indicated that IGCLs will not be met for bedrock groundwater at some bedrock compliance wells within the 15-year restoration estimate contained in the ROD (i.e., by 2010). In the spring of 2009, EPA and BFI-VT entered into discussions regarding the need to conduct additional investigations to further evaluate the status of the natural attenuation component of the Site remedy.

On October 18, 2011, EPA sent a letter to BFI-VT requesting an Additional Investigation Plan (Plan) and on February 16, 2012 EPA approved with conditions the January 12, 2012 Plan submitted by BFI-VT. BFI-VT has been performing the actions required under the Plan, the results of which provide support for this ESD.

### **Overview of the ESD**

This ESD is necessary because the 15 year timeframe predicted in the 1994 ROD to meet the IGCLs and complete the bedrock groundwater cleanup at the Site has not been achieved. The 1994 ROD predicted the natural attenuation remedy would result in the attainment of the IGCLs established for bedrock groundwater by 2010, or 15 years following completion of the NTCRA which was completed in July 1995 with the construction of the landfill cap. However, the timeframe predicted for bedrock groundwater to meet cleanup criteria was underestimated due to the following mechanisms which continue to affect groundwater quality in the vicinity of the Site: 1) continued dissipation of the groundwater mound within and beneath the landfill; 2) residual infiltration through the multilayer cap and areas adjacent to the landfill; 3) bedrock groundwater seepage into waste adjacent to the western portion of the landfill and subsequent recharge to bedrock downslope of the point of influx; and 4) limited hydraulic interconnectivity of bedrock fractures, resulting in slower than anticipated flushing rates.

This ESD establishes a new estimated timeframe for groundwater restoration. Based on available data, EPA has determined that it may take an additional 40 to 60 years to achieve IGCLs in groundwater (i.e. between 2055 and 2075). The new timeframe is due to the revised IGCL for arsenic established in this ESD and the current understanding of the hydrogeological and geochemical conditions at the Site discussed in the 2012 Conceptual Site Model (CSM) Update.

This ESD also revises the lead IGCL, another chemical of concern at the Site. Both the arsenic and lead IGCLs have been revised based on changes in the federal and state standards for these chemicals. The revised IGCLs ensure that the Site remedy is protective of human health and the environment.

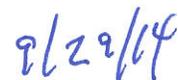
The 1994 ROD identified a total estimated present value cost of 2.9 million dollars (4.62 million in 2014 dollars) to implement the remedy for 30 years to 2025. An updated present value analysis to continue implementing the current remedy, including operation and maintenance of the water line, for an additional 40 years (2025 to 2065), assuming \$200,000 in annual

expenditures and a 7% discount rate, results in a present value increase of approximately \$1,756,000. This amount represents an approximately 38% increase in the total estimated present value identified in the 1994 ROD and adjusted to 2014 dollars: \$6.38 million verse \$4.62 million.

This ESD also documents the inclusion of an additional institutional control, groundwater reclassification by the State of Vermont, to prevent groundwater use at the Site and the addition of the Vermont Water Supply Rule, Chapter 21 of the Vermont Environmental Protection Rules, as a Relevant and Appropriate Action-Specific ARAR, establishing compliance standards for the operation and maintenance of the water line component of the remedy.



James T. Owens, III, Director  
Office of Site Remediation and Restoration  
U.S. Environmental Protection Agency – Region 1



Date

**EXPLANATION OF SIGNIFICANT DIFFERENCES  
BFI ROCKINGHAM LANDFILL SUPERFUND SITE  
ROCKINGHAM, VERMONT  
September 2014**

**TABLE OF CONTENTS**

I.	INTRODUCTION .....	1
II.	SUMMARY OF SITE HISTORY, CONTAMINATION AND SELECTED REMEDY..	3
A.	Site History .....	3
B.	Groundwater Conditions .....	6
C.	Summary of Remedial Action Objectives .....	7
D.	Components of the Selected Remedy .....	9
E.	Status of Remedy .....	9
III.	BASIS FOR THIS ESD .....	10
A.	Institutional Controls for Groundwater Use .....	11
B.	Modification of Interim Groundwater Cleanup Levels (IGCLs).....	14
C.	Establish a Revised Time-Frame for Restoration of Bedrock Groundwater .....	14
D.	Increased Cost of the Remedial Action .....	16
IV.	DESCRIPTION OF SIGNIFICANT DIFFERENCES .....	16
A.	Institutional Controls for Groundwater Use Restrictions .....	16
B.	Modification of Interim Groundwater Cleanup Levels (IGCLs).....	17
C.	Adding State Water Supply Rules as a new ARAR for the Remedy .....	17
D.	Establish a Revised Time-frame for Restoration of Bedrock Groundwater .....	17
E.	Increased Cost of the Remedial Action .....	19
V.	SUPPORT AGENCY COMMENTS.....	19
VI.	STATUTORY DETERMINATION.....	20
VII.	PUBLIC PARTICIPATION .....	20

**ATTACHMENTS**

Attachment 1:	VT DEC Letter of Concurrence
Attachment 2:	Site Plan and Groundwater Reclassification Area
Attachment 3:	Summary of Interim Groundwater Cleanup Standard (IGCL) Exceedances
Attachment 4:	Extent of Contaminants of Concern in Overburden Groundwater
Attachment 5:	Cleanup Level Exceedances in Bedrock Groundwater
Attachment 6:	Responsiveness Summary

**EXPLANATION OF SIGNIFICANT DIFFERENCES  
BFI ROCKINGHAM LANDFILL SUPERFUND SITE  
ROCKINGHAM, VERMONT**

**I. INTRODUCTION**

- A. Site Name and Location:** BFI Rockingham Landfill Superfund Site in the Town of Rockingham, Windham County, Vermont
- B. Lead Agency:** United States Environmental Protection Agency (EPA)
- C. Support Agency:** Vermont Department of Environmental Conservation (VT DEC)
- D. Legal Authority:**

Pursuant to Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. § 9617(c), and the National Contingency Plan (NCP) at 40 C.F.R. § 300.435(c)(2)(i), if EPA determines that the remedial action being undertaken at a site differs significantly from the Record of Decision (ROD) for that site, EPA shall publish an explanation of the significant differences and the reasons such changes are being made. According to 40 C.F.R. § 300.435(c)(2)(i), and EPA guidance (Office of Solid Waste and Emergency Response (OSWER) Directive 9200.1-23-P, July 1999), an Explanation of Significant Differences, rather than a ROD amendment, is appropriate where the adjustments being made to the ROD are significant but do not fundamentally alter the remedy with respect to scope, performance or cost. EPA has determined that the adjustments to the 1994 ROD provided in this ESD are significant but do not fundamentally alter the overall remedy for the Site with respect to scope, performance, or cost. Therefore, this ESD is properly issued.

In accordance with Section 300.825(b) of the NCP, EPA voluntarily allowed a 15-day public comment period prior to the finalization and signing of this ESD. The comment period was designed to allow consideration of any possible concerns raised by the public or other interested parties. A draft of this ESD was issued publically on September 11, 2014. The formal public comment period for this draft ESD was held from September 11 to September 25, 2014. EPA accepted written and emailed comments on this document and all comments received by September 25, 2014. One comment was received which was addressed in a Responsiveness Summary that has been incorporated into the ESD and is included in the final administrative record.

**E. Summary of Circumstances Necessitating this ESD:**

This Explanation of Significant Differences (ESD) is being issued for the BFI Rockingham Landfill Site (Site) to address differences between the remedial action undertaken and the remedy that was set forth in the Record of Decision (ROD) for the Site, dated September 21, 1994.

This ESD documents the following changes to the ROD:

- Inclusion of an additional Institutional Control measure (groundwater reclassification) to restrict groundwater use at the Site;
- Revision of two Interim Groundwater Cleanup Levels (IGCLs);
- The addition of the Vermont Water Supply Rule as a Relevant and Appropriate Action-Specific ARAR, establishing compliance standards for the operation and maintenance of the water line component of the remedy;
- Revision of the time frame for restoration of bedrock groundwater; and
- Increased cost of the remedial action.

The basis for these changes is summarized below.

The 1994 ROD estimated that the groundwater restoration component of the remedy would be achieved by 2010. However, by the spring of 2009, long-term monitoring results indicated that the Interim Groundwater Cleanup Levels (IGCLs) would not be achieved in the 15-year time frame specified in the ROD (by 2010) at some bedrock wells. EPA and BFI-VT entered into discussions regarding the need to conduct additional investigations to further evaluate the status of the natural attenuation component of the Site remedy. At EPA's request, BFI undertook additional investigations at the Site. The results of those investigations have shown the bedrock groundwater at the Site will likely meet the IGCLs in an additional 40 to 60 years.

Due to the increased time for groundwater restoration, an additional institutional control has been added to further restrict groundwater use at the Site. EPA and VT DEC agreed that the groundwater within the impacted groundwater area should be reclassified from Class III to Class IV. Under Vermont standards, Class III groundwater is suitable as a source of water for individual domestic water supply, irrigation, agricultural use and general industrial and commercial use. Class IV groundwater is not suitable as a source of potable water, but may be suitable for some agricultural, industrial and commercial uses. This state reclassification was finalized in 2009 and amended in 2013 to expand the reclassification area.

The Vermont Water Supply Rule, Chapter 21 of the Vermont Environmental Protection Rules, has been added as a Relevant and Appropriate Action-Specific ARAR, establishing compliance standards for the operation and maintenance of the water line component of the remedy. The substantive requirements of these standards have already been incorporated into the Operation and Maintenance Plan for the water line, but had not been identified as an ARAR in the ROD.

Revisions to the Interim Groundwater Cleanup Levels for arsenic and lead ensures the remedy remains protective of human health and the environment based on changes to the federal and state standards for these constituents.

The increase in time to complete the remedy also will increase the present value estimate of the remedy by approximately \$1,756,000 (assuming \$200,000 in annual expenditures and a 7% discount rate). This amount represents an approximately 38% increase in the total estimated

present value identified in the 1994 ROD and adjusted to 2014 dollars: \$6.38 million verse \$4.62 million.

#### **F. Availability of Documents:**

The supporting documentation for this ESD and the Administrative Record are available to the public at the following locations and may be reviewed at the times listed:

U.S. Environmental Protection Agency Records Center  
5 Post Office Square, Suite 100 (OSRR 02-3)  
Boston, MA 02109-3912  
Telephone: (617) 918-1440  
E-mail: R1.Records-OSRR@epa.gov

Open Monday through Friday from 9 am to 5 pm, excluding federal holidays.

Rockingham Free Public Library  
65 Westminster Street  
Bellows Falls, VT 05101  
Phone: (802) 463-4270  
Email: rockref@sover.net

Monday, Tuesday & Wednesday: 10 am to 7 pm  
Thursday & Friday: 10:00 am to 5:30 pm  
Saturday: 10 am to 2 pm

A public notice announcing the availability of the draft ESD was printed in the *Brattleboro Reformer* on September 13, 2014.

## **II. SUMMARY OF SITE HISTORY, CONTAMINATION AND SELECTED REMEDY**

### **A. Site History**

The BFI Rockingham Landfill Superfund Site (the “Site”), also known as the Disposal Specialist, Inc. (DSI) Landfill, is located along U.S. Route 5, locally known as Missing Link Road, in the Town of Rockingham, Windham County, Vermont (Attachment 2). The 17-acre solid waste landfill is located on a terrace approximately 500 feet from and 200 feet higher in elevation than the Connecticut River. The Site includes the landfill area and the surrounding rural residential areas impacted by the Site.

Landfill operations at the Site first started in 1968 (under the ownership of Harry K. Shepard, Inc.) following the removal of significant quantities of borrow material (fill) from the property for the construction of Interstate 91. In 1969, Harry K. Shepard, Inc. deeded the landfill to Disposal Specialist, Inc., and Harry K. Shepard, Inc. was continued as a solid waste and industrial waste hauling company. The DSI landfill and Harry K. Shepard, Inc. were acquired by Browning-Ferris Industries, Inc. (BFI) in 1973, and Harry K. Shepard, Inc. subsequently changed

its name to Browning-Ferris Industries of Vermont, Inc. (BFI-VT).

From 1968 until 1991, the landfill received residential, commercial and industrial solid and liquid waste. Approximately 1.2 million cubic yards of solid waste were disposed in the landfill during its operation. The majority of wastes were placed in unlined landfill cells, with the exception of municipal incinerator ash placed in a lined monofill cell located in the southeastern section of the landfill from 1986 to 1989. The monofill cell was capped in 1989. Wastes continued to be disposed in the unlined landfill cells until landfilling activities at the Site ceased in November 1991.

Neighbors began reporting potential groundwater quality impacts in 1977. In 1979, the VTDEC collected and analyzed drinking water samples from six bedrock water supply wells located in the vicinity of the landfill. Metals and volatile organic compounds (VOCs) consistent with impacts attributable to the DSI landfill were reported in some of the bedrock water supply wells sampled, and the State of Vermont required DSI to provide residences located east and hydraulically downgradient of the landfill with bottled water for potable use. In 1980, a new water supply well was installed on DSI property and a distribution system was constructed to serve residents previously supplied with bottled water. DSI entered into agreements with off-site residents to continue supplying water until EPA and VT DEC determine that the water beneath the residences is acceptable for use as a water supply. These agreements are still in effect.

A series of Assurance of Discontinuance Agreements between DSI and VT DEC required DSI to demonstrate that the landfill would not further degrade groundwater or surface water quality in the vicinity of the landfill. Consequently, beginning in 1979 a series of hydrogeological investigations were performed to investigate groundwater flow and water quality conditions at the landfill. In October 1989, the Site was included on the EPA National Priorities List (NPL).

During the spring of 1992, DSI and BFI-VT, the two Potentially Responsible Parties (PRPs) entered into negotiations with EPA to conduct a Remedial Investigation and Feasibility Study (RI/FS) in accordance with NCP requirements. EPA issued an Administrative Order on Consent (AOC), EPA Docket No. I-92-1053, for RI/FS activities which became effective on August 8, 1992. Pursuant to the RI/FS AOC, a shallow overburden groundwater collection trench (the Route 5 Seepage Control and Stabilization System, the "Route 5 System") was constructed in the fall and winter of 1992 to: 1) collect seepage discharging within the stormwater drainage ditch to the east of the landfill and immediately adjacent to Route 5; 2) reduce seepage below Route 5; and 3) to reduce soil pore water pressure in a localized area along Route 5.

In May 1993, EPA issued an Engineering Evaluation/Cost Analysis Approval Memorandum for the Site that concluded a non-time critical removal action (NTRCA) was necessary and appropriate to control the source of contamination at the Site. The PRPs prepared an engineering evaluation/cost analysis under the existing RI/FS Order to evaluate various response alternatives for the Site. EPA signed an Action Memorandum on September 13, 1993 to initiate a NTCRA to install a multi-layer landfill cap, expand the active landfill gas collection and treatment system, and implement institutional controls on BFI owned property to restrict use of the landfill area and prevent use of the groundwater. DSI and BFI-VT entered into an AOC with EPA in September 1993 to perform the NTCRA. The landfill cap and landfill gas collection and

treatment system design was completed in June 1994. Construction of the NTCRA was initiated in April 1994 and completed in July 1995.

On September 21, 1994, EPA issued the Record of Decision for the Site describing remedial actions to be implemented and the basis for the selected remedy. No further construction activities were required under the ROD. The selected remedy identified in the ROD called for long-term monitored natural attenuation of surface water and groundwater; maintenance of the multi-layer cap and landfill gas extraction system; and the continued operation and maintenance of the off-site potable water supply line, lined ash monofill cell leachate collection system, and the Route 5 System. The ROD also required maintenance of institutional controls and assurance of a water supply to residents impacted by contaminated groundwater from the Site. The ROD established IGCLs for bedrock groundwater that were based on ARARs and the cumulative carcinogenic and non-carcinogenic risks posed to individuals drinking bedrock groundwater. At the time of the ROD, it was anticipated that IGCLs would be achieved 15 years after completion of the NTCRA. Due to the limited extent and low yield, overburden groundwater was not considered to be a potential drinking water source or a current or future human exposure pathway; therefore, IGCLs were not established for overburden groundwater.

DSI and BFI-VT entered into a consent decree (Civil Action #2:96-CV-309) with EPA in 1996 to perform the remedial actions required under the ROD. The consent decree also required the Settling Defendants (DSI and BFI-VT) to maintain, free of charge to the three residences adjacent to the landfill, a drinking water supply system thirty years after full and final closure of the entire BFI Rockingham solid waste facility or until five years past the EPA approval of the Groundwater Completion Report, whichever is longer.

Pursuant to the consent decree, a long-term monitoring plan (LTMP) to monitor surface water and groundwater was prepared and submitted to the EPA as part of the Site remedy and subsequently revised in April 1997. By the fall 2008, long-term monitoring results documented that the IGCLs had been met at many Site monitoring wells. However, review of sample results at that time also indicated benzene, total xylenes, tetrachloroethene, methylene chloride, 2-butanone, vinyl chloride, arsenic, manganese and chromium IGCLs may not be met for bedrock groundwater at some bedrock compliance wells located hydraulically downgradient of the landfill within the 15-year restoration estimate contained in the ROD.

In the spring of 2009, following receipt of the fall 2008 Semi-Annual Long-Term Monitoring Report results, EPA and BFI-VT entered into discussions regarding the need to conduct additional investigations to further evaluate the status of the natural attenuation component of the Site remedy. EPA determined that IGCLs would not likely be achieved in the 15-year time frame specified in the ROD (i.e., by 2010) at some bedrock wells. BFI-VT noted that meeting arsenic and manganese IGCLs may be difficult due in part to the naturally occurring presence of these metals in bedrock and the relatively slow rate of groundwater flow through bedrock and bedrock fractures.

Pursuant to the 1996 consent decree, an Additional Investigation Plan is required when the cleanup levels in the ROD may not be achieved by the estimated timeframe. On October 18, 2011, EPA sent a letter to BFI-VT requesting an Additional Investigation Plan (Plan). The Plan

was submitted to EPA on January 12, 2012. A Technical Impracticability (TI) waiver was also considered for the Site; however, EPA determined that a TI waiver was not necessary because the cleanup levels could be achieved in a reasonable timeframe beyond the 15-year estimate in the ROD. On February 16, 2012, EPA approved, with conditions, the actions identified in the Additional Investigation Plan which are summarized below:

- Update the Conceptual Site Model (CSM) to assess water quality trends, changes in Site conditions and the potential for the Site to meet cleanup goals in the future.
- Evaluate the potential vapor intrusion pathways related to structures located downgradient of the landfill.
- Draft a Grant of Environmental Restriction to prevent groundwater use for downgradient residential properties and identify the proposed long-term funding mechanism for water supply well and water supply line maintenance and monitoring.
- Confirm that the water supply system installed to serve off-site residences substantially meets existing codes for public water lines.
- Expand the 2009 State of Vermont Groundwater Reclassification Zone boundary to include two additional properties to the north of the existing boundary.
- Review the existing groundwater quality monitoring program and establish an updated monitoring program until cleanup criteria are met.

Many of the actions listed above have been completed and several are on-going. Progress and results on the Additional Investigation Plan actions form the basis for issuance of this ESD and are discussed in Section III.

## **B. Groundwater Conditions**

Remedial investigations discussed in the 1994 ROD documented the presence of contamination resulting from solid and liquid waste disposal activities at the Site in sediment, groundwater, and surface water. A Human Health Risk Assessment and Ecological Risk Assessment were performed to estimate the probability and magnitude of potential human health and environmental effects from exposure to constituents associated with the Site. Twenty-three constituents of concern, including volatile organic compounds, semi-volatile organic compounds and metals, were evaluated in the risk assessment based on hazards presented by toxicity, concentration, frequency of detection, mobility and persistence in the environment.

The Human Health Risk Assessment evaluated potential human health effects associated with exposure to the constituents of concern through the development of several hypothetical exposure pathways. These pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses and location of the Site.

Findings of the Human Health Risk Assessment are summarized below:

- Groundwater is present in overburden and bedrock aquifers; however, due to the limited yield and extent of overburden materials, overburden groundwater was not considered a current or future exposure pathway.
- Constituents exceeding Federal Primary Drinking Water Maximum Contaminant Level (MCL) or Maximum Contaminant Level Goal (MCLG) in bedrock groundwater included: antimony, arsenic, barium, benzene, bis (2-ethyl hexyl) phthalate, chromium, nickel, pentachlorophenol, tetrachloroethene, trichloroethene, and vinyl chloride.
- Constituents exceeding State of Vermont groundwater standards included 2-butanone, lead, and total xylenes.
- Unacceptable carcinogenic and non-carcinogenic risk were calculated for ingestion of bedrock groundwater; however, this is a future use scenario since no individuals are currently ingesting groundwater;
- Carcinogenic risk resulted primarily from arsenic and vinyl chloride;
- Non-carcinogenic risk resulted primarily from arsenic and manganese; and
- IGCLs were developed based on the cumulative risk posed by these constituents.

The Ecological Risk Assessment evaluated potential ecological effects associated with the release of hazardous substances to the environment. The Connecticut River surface water and sediments were identified as the most significant ecological habitat at or near the Site, and the assessment concluded that localized areas of the River were impacted by metals in leachate seeps. However, the Ecological Risk Assessment was prepared using data collected prior to the installation of the Route 5 System which eliminated two of the three seeps impacting the Connecticut River. As discussed in the 1994 ROD, data collected after the installation of the Route 5 System demonstrated impacts to the Connecticut River were significantly reduced and that continued operation and maintenance of the Route 5 System would eliminate the ecological risks posed to the Connecticut River by leachate seeps.

### **C. Summary of Remedial Action Objectives**

The 1994 ROD identifies the following remedial action objectives developed to mitigate existing and future potential threats to public health and the environment:

#### Landfill (Source Area) Remedial Action Objectives:

- Prevent, to the extent practicable, the potential for water to contact or infiltrate through the debris mass;
- Prevent, to the extent practicable, the generation of landfill seeps and the migration of landfill impacted surface water into the Connecticut River;

- Control landfill gas emissions so methane gas does not present an explosion hazard; prevent, to the extent practicable, the inhalation of landfill gas containing hazardous substance, pollutants, or contaminants; and meet state and federal air standards;
- Prevent, to the extent practicable, the migration of contaminated groundwater/leachate beyond the points of compliance by controlling the source of the contamination;
- Minimize the potential for slope failure of the debris mass associated with the multi-layer landfill cap or any further action; and
- Prevent, to the extent practicable, direct contact with and ingestion of soils/debris within the landfill and beneath the landfill.

Groundwater Remedial Action Objectives:

- Prevent, to the extent practicable, the ingestion of landfill-impacted bedrock groundwater exceeding EPA Safe Drinking Water Act Maximum Contaminant Levels (MCLs), Vermont Primary Groundwater Quality Standards, or in their absence, the more stringent of an excess cancer risk of  $1 \times 10^{-6}$  for each compound or a hazard quotient of 1 for each non-carcinogenic compound, by any individual who may use the bedrock groundwater within the area of landfill-impacted groundwater or within an area that could become impacted as a result of pumping activities; and
- Restore the bedrock groundwater at the edge of the Waste Management Unit to: MCLs, Vermont Primary Groundwater Quality Standards, or in their absence, the more stringent of an excess cancer risk of  $1 \times 10^{-6}$  for each compound or hazard quotient of 1 for each non-carcinogenic compound.

Surface Water (Ecological) Remedial Action Objectives:

- Protect off-site surface water by preventing the occurrence of landfill impacted seeps;
- Meet federal and state applicable or relevant and appropriate requirements (ARARs) for any surface water discharge to the Connecticut River; and
- Provide long term monitoring of the surface water and sediments of the section of the Connecticut River adjacent to the landfill to assure that no landfill related impacts occur in the future.

## **D. Components of the Selected Remedy**

The 1994 ROD described the following major components of the remedy:

- Continued maintenance of the multi-layer cap;
- Continued operation and maintenance of the existing (lined ash-monofill cell) leachate collection system and groundwater collection trench (Route 5 System). The collected leachate and groundwater will be shipped to an off-site facility for treatment and disposal;
- Continued operation and maintenance of the landfill gas collection and treatment system;
- Maintenance of institutional controls: to prevent future use of the landfill that would damage the multi-layer cap; to prevent ground water use throughout the area of Site-related contamination; and to assure a water supply to residents with Site-related contaminated groundwater beneath their residences;
- Continued long-term monitoring of the seeps, groundwater, collected groundwater and leachate, Connecticut River surface water and sediments, and storm water run-off, to confirm the nature and extent of contamination and confirm the restoration of the ground water; and
- A review of Site conditions every five years.

## **E. Status of Remedy**

Long-term monitoring activities conducted at the Site since the RI/FS (1992) have shown improvements in groundwater and surface water quality. However, cleanup goals for bedrock groundwater at some monitoring points have not been met within the timeframe predicted in the 1994 ROD. The status of water quality restoration goals based on long-term monitoring activities conducted through June 2014, are as follows:

- Since installation of the landfill cap, there have been no significant new overburden groundwater seeps observed on or adjacent to the landfill. Seep SW-6, which is located downgradient (east) of Route 5 (see Attachment 2), continues to be the only actively flowing seep within the hydraulic influence of the landfill. Overall, the discharge rate of Seep SW-6 has decreased with time, but continues to fluctuate seasonally and in response to significant precipitation events. Consistent with the groundwater restoration component of the selected Site remedy, decreasing trends in a majority of the constituents of concern at Seep SW-6 are indicative of a reduction of contaminant loading to shallow overburden groundwater.
- Analytical results for four surface water sampling locations in the Connecticut River have shown no measureable adverse effects to the Connecticut River.
- Semi-volatile organic compounds (SVOCs), VOCs, and metals in shallow overburden

groundwater collected by the Route 5 Slope Stabilization and Seepage Control System have decreased in concentration since remedy implementation in 1994-1995. Shallow overburden groundwater quality on the Site has improved considerably since the implementation of the groundwater restoration component of the selected Site remedy. However, some VOCs and metals at selected deeper overburden monitoring wells continue to exceed IGCLs established for bedrock groundwater. Attachment 3 summarizes IGCL exceedances at bedrock and overburden monitoring wells during the June 2014 Five Year Review semi-annual sampling event. The areal extent of contaminants of concern in overburden groundwater during the June 2014 sampling event is shown on Attachment 4. Attachment 5 shows the areas with IGCL exceedances in bedrock groundwater during the June 2014 event.

- Deeper overburden groundwater quality initially remained relatively stable following implementation of the Site remedy; however, VOC concentrations are increasing in some of the deeper overburden wells. Based on the hydrogeological conceptual site model it appears likely that the increasing trends are due to the slow downward migration of impacted groundwater through the varved lacustrine clayey silt overburden deposits downgradient of the landfill. Observed improvements in shallow overburden groundwater quality indicate that a similar improvement in water quality is considered likely in deeper overburden; however, improvements are expected to take longer due to the slow movement of groundwater in the deeper overburden.
- Bedrock groundwater quality has improved substantially since implementation of the remedy; however, manganese, arsenic, tetrachloroethene and benzene continue to be reported for the most recent (June 2014) sampling event (Attachment 3) at concentrations at or exceeding the IGCLs established in the ROD at selected bedrock compliance wells located proximal to and/or downgradient of the landfill (Attachment 5) and within the area of contamination defined by the ROD.
- Institutional controls in the form of land use restrictions have been implemented for the landfill and adjacent properties to protect the remedy components. The primary institutional control for the properties downgradient of the landfill is the water line agreement, which assures the residents will be provided drinking water until the groundwater is restored. In addition, the Vermont Agency of Natural Resources has reclassified groundwater within an area surrounding and downgradient of the Site to prevent the development of any water supply.
- Three five year reviews have been completed for the Site and the 2009 review determined the remedy to be protective of human health and the environment in both the short and long-terms. The next five year review will be completed in 2014.

### **III. BASIS FOR THIS ESD**

This ESD documents the following changes to the 1994 ROD:

- Inclusion of an additional Institutional Control measure (groundwater reclassification) to restrict groundwater use at the Site;
- Revision of two Interim Groundwater Cleanup Levels (IGCLs);
- The addition of the Vermont Water Supply Rule as a Relevant and Appropriate Action-Specific ARAR, establishing compliance standards for the operation and maintenance of the water line component of the remedy;
- Revision of the time-frame for restoration of bedrock groundwater; and
- Increased cost of the remedial action.

#### **A. Institutional Controls for Groundwater Use**

Groundwater extraction within the area of impacted groundwater at and hydraulically downgradient of the DSI landfill has not been occurring since 1979, when the VT DEC required DSI to provide potable water to affected property owners. In 1980, DSI installed a well and a water line to provide potable water to affected property owners. A second water supply well was installed and connected to the water line in the mid-1990s. The initial 1983 Water Agreement between BFI and three residences located on Riverfront Drive located east of the landfill and Route 5, required DSI to provide drinking water until 20 years after the landfill was closed. In 1996, as part of institutional controls developed for the Site during completion of the ROD and consent decree, the 1983 Water Agreement between BFI and three properties owners was amended to include a requirement to provide water for 30 years after closure of the landfill or 5 years after EPA determines the groundwater cleanup is complete, whichever is longer. The Amended Water Agreement was recorded on these three property deeds in 1996. In 2013, the water supply line was extended to a fourth residence, who was formerly served by a spring located on BFI property, and a Water Supply Agreement was recorded on this property deed in 2014 which requires BFI to provide potable water for 5 years after EPA determines the groundwater cleanup is complete.

The State of Vermont Groundwater Protection statute, 10 V.S.A. Section 1392 states that all groundwater of the State of Vermont is classified as Class III water unless otherwise reclassified. Class III groundwater is suitable as a source of water for individual domestic water supply, irrigation, agricultural use and general industrial and commercial use.

In response to a Groundwater Reclassification Petition prepared by BFI-VT in 2008 on behalf of the State of Vermont Agency of Natural Resources (VT ANR), VT ANR reclassified groundwater within the impacted groundwater area from Class III to Class IV on March 10, 2009. This reclassification provides an additional layer of protection to prevent groundwater extraction at the Site. Class IV groundwater is not suitable as a source of potable water, but may be suitable for some agricultural, industrial and commercial uses. The Class IV Groundwater Zone includes areas where one or more constituents of concern in bedrock groundwater are known to exceed, or have the potential to exceed, Vermont Groundwater Quality Enforcement Standards (VT GESs).

The reclassification area included the landfill property and parcels hydraulically downgradient of the landfill including parcels owned by BFI-VT and two residential properties located on Riverfront Drive along the Connecticut River. A Buffer Zone was also established around the Class IV Zone to prevent potential groundwater extraction activities that may be affected by Class IV groundwater. The Buffer Zone encompassed one additional residential property on Riverfront Drive and one commercial property (rod and gun club) on Route 5. The Groundwater Zone and Buffer Zone are collectively referred to as the Class IV Groundwater Reclassification Area, in which groundwater use is restricted from potable use.

Based on subsequent review of monitoring well and property line locations (survey completed in November 2012), it was determined that a revision to the boundary of the Class IV Reclassification Area was required because the 2009 reclassification area was delineated based upon inaccurate coordinates for bedrock monitoring well couplet (MW-J37, MW-J38) at which bedrock groundwater quality exceeded the VT GES for manganese and iron. On November 21, 2012, BFI-VT provided VT ANR and EPA with a report providing the technical basis and revised well coordinates in support of a revised Class IV Groundwater Zone and Buffer Zone.

On November 4, 2013, VT ANR finalized an amendment to the groundwater reclassification order. The Class IV Groundwater Zone and Buffer Zone was extended northward to include two additional parcels located downgradient of the landfill. The properties located within the Class IV Groundwater Zone and Buffer Zone are shown on the Site Plan presented in Attachment 2 and are listed in the table below.

#### Properties in Class IV Groundwater Reclassification Area

<b>Rockingham Tax Assessment Map Parcel ID</b>	<b>Owner / Current Use</b>	<b>History/Status of Class IV Groundwater Reclassification Area</b>
Parcel 4-505-894	Owned by PRPs / Landfill property	In 2009 Class IV Groundwater Zone
Parcel 4-505-890	Owned by PRPs / abuts landfill property, former facility manager residence	In 2009 Class IV Groundwater Zone
Parcel 4-107-032	Owned by PRPs / former residential properties, currently not developed	In 2009 Class IV Groundwater Zone
Parcel 4-107-014*	Privately owned / residence	In 2009 Class IV Groundwater Zone
Parcel 4-505-897	Privately owned / rod and gun club	In 2009 Class IV Groundwater Zone Buffer (undeveloped portion of property only)
Parcel 4-107-012*	Privately owned / residence	In 2009 Class IV Groundwater Zone Buffer, now in 2012 Class IV Groundwater Zone
Parcel 4-107-010*	Privately owned / residence	In 2012 Class IV Groundwater Zone
Parcel 4-107-006*	Privately owned / residence	In 2012 Class IV Groundwater Buffer Zone

\* BFI-VT currently provides potable water to these properties.

BFI-VT has provided potable water to Parcels 4-107-014, 4-107-012 and 40-107-010 via a supply line since 1980. In addition, Parcel 4-107-006 had been served by a spring on BFI-owned property located north and hydraulically cross gradient of the impacted groundwater area until 2013 (further discussion provided below).

In 2012, as part of the EPA-approved January 12, 2012 Additional Investigation Plan, BFI-VT undertook a systematic review of the water supply system used to provide potable water to off-site residences. Maintenance activities including water main flushing and disinfection were completed and a number of improvements to the water system were installed in 2012 and 2013. System improvements included: 1) installation of particulate filters at one of the source wells and at each residential property being served; 2) installation of an iron and arsenic treatment system on the Primary and Backup wells, respectively; 3) installation of new pressure tanks; and 4) reconfiguration of the plumbing system to improve serviceability and sample collection.

Also required under the Additional Investigation Plan was confirmation that the water supply system substantially meets existing codes for public water lines. Water supply in the State of Vermont is regulated in accordance with Chapter 21, Water Supply Rule of the VTDEC Environmental Protection Rules (VT EPR).<sup>1</sup> Based on this rule, the water system serving the off-site residence is classified as a Non-Public Water System not requiring a State permit due to the limited number of users and system connections. To substantially meet current state and federal requirements for a public, multi-user water supply system BFI-VT submitted an Operation and Maintenance Manual (O&M Manual) for the water supply system to EPA and VT DEC on June 7, 2013. The submission included a cover letter summarizing water system maintenance and improvement activities completed in 2012 and 2013. The O&M Manual formalized the operation and maintenance activities to be completed.

In 2013, at the request of the property owner, BFI-VT extended the water supply line to Parcel 4-107-006 which had previously obtained water from a spring located on BFI-VT property and within the Groundwater Reclassification Buffer Zone. A Water Supply Agreement was executed with the property owner on October 13, 2013 and recorded on the deed to the property. The Water Supply Agreements establish binding provisions to supply potable water to the landowners and operate and maintain the water supply system until EPA and VT DEC determine that groundwater restoration has been completed.

The current Institutional Controls (groundwater reclassification, Water Supply Agreements, and deed restrictions on BFI owned property) established to restrict the use of bedrock groundwater at properties located downgradient of the landfill area (see Attachment 2) and within the Site-related impacted groundwater area are protective of human health.

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<sup>1</sup> Through this ESD, the Water Supply Rule, Chapter 21 of the VT EPR, is added as a Relevant and Appropriate Action-Specific ARAR, establishing compliance standards for the operation and maintenance of the water line component of the remedy, as discussed in this paragraph.

## **B. Modification of Interim Groundwater Cleanup Levels (IGCLs)**

After the 1994 ROD was issued, the Federal Safe Drinking Water Act and State of Vermont standards for groundwater and drinking water quality have been revised for arsenic and lead, two of the constituents of concern for which IGCLs were established. The IGCLs established in the ROD may not result in a remedy that is protective of human health. Therefore, this ESD updates the IGCLs based on the revised federal and state standards for arsenic and lead.

The IGCL for arsenic established in the ROD was based on the federal Safe Drinking Water Act (SDWA) MCL effective at the time. In 1996, the Safe Drinking Water Act was amended and required EPA to review drinking water standards for arsenic and propose a new MCL. The MCL for arsenic in drinking water was changed from 50 ug/L to 10 ug/L.

The IGCL for lead established in the ROD was based on the State of Vermont Groundwater Protection Rule and Strategy and Groundwater Quality Standards effective at that time. After the 1994 ROD was issued, this State standard was decreased from 20 to 15 ug/L to be consistent with the SDWA Action Level.

Revisions to the Interim Groundwater Cleanup Levels for arsenic and lead ensures the remedy remains protective of human health and the environment.

## **C. Establish a Revised Time-Frame for Restoration of Bedrock Groundwater**

The ROD identified natural attenuation as the long-term remedy for the restoration of groundwater and surface water quality following the completion of the NTCRA source control measures in July 1995. The NTCRA included the construction of a multi-layer landfill cover system, a landfill gas extraction system, the Route 5 Seepage Control and Slope Stability System, and a leachate collection system. The ROD predicted Interim Groundwater Cleanup Levels (IGCLs, “cleanup goals”) would be met 15 years following completion of the NTCRA (i.e., by 2010), based in part on the hydrogeological and geochemical conditions at the Site presented in the hydrogeological Conceptual Site Model (CSM) developed during RI/FS activities. However, recent groundwater and surface water quality monitoring data have shown that cleanup criteria at some bedrock groundwater quality monitoring compliance wells were not met within the 15 year time frame specified in the ROD. A modified groundwater sampling program was implemented in 2009 and 2010 to support a hydrogeological CSM Update for the Site and to further evaluate the processes controlling bedrock groundwater restoration.

The CSM Update completed in August 2012 as part of the Additional Investigation Plan tasks concluded that the hydrogeological and geochemical conditions in the overburden and bedrock aquifers and the response to the Site remedy are generally consistent with the CSM developed during RI/FS activities. However, the time frame predicted for bedrock groundwater to meet cleanup criteria was underestimated due to the following mechanisms which continue to affect ground water quality in the vicinity and downgradient of the landfill area:

- **Continued dissipation of the groundwater mound within and beneath the landfill.** Groundwater quality data suggest that some discharge is likely continuing, although data also suggest an improvement in water quality over time that is consistent with a decline

of a perched mound within the landfill and subsequent reduction in discharge of water from the landfill waste mass.

- **Residual infiltration through the multilayer cap and areas adjacent to the landfill.** The purpose of the multilayer cap was to reduce direct infiltration of precipitation into the waste to the extent feasible. A large reduction in leachate generation has been observed indicating that the landfill cap is performing as anticipated. However, consistent with performance modeling of the landfill cap during design, minor infiltration is likely continuing through the cap and in areas proximal to the landfill waste boundary that might interact with the landfill.
- **Continuing bedrock groundwater seepage into waste adjacent to the southwestern portion of the landfill and subsequent recharge to bedrock downslope of the point of influx.** For this to occur, shallow ground water (or water moving through near surface unsaturated bedrock) would discharge (or drain) toward the southwestern portion of the landfill then subsequently recharge or infiltrate underlying bedrock. This water could either interact directly with waste in proximity to discharging water or interact with water already present within the waste mass. Persistent groundwater quality impacts observed at well MW-G25 support this mechanism.
- **Limited hydraulic interconnectivity of bedrock fractures resulting slower than anticipated flushing rates.** Under pre-cap conditions, water interacting with the landfill was discharging to complexly-fractured bedrock beneath and downgradient of the landfill. Bedrock aquifer systems contain fractures with a wide range of transmissivities, including small aperture, low conductivity and “dead-end” fractures where flow may only occur in response to local hydrogeologic conditions such as during high recharge or high water table periods. It is likely that under post-cap conditions, the rate of recharge to many of these fractures was significantly reduced, but not eliminated, resulting in less flushing of these fractures and more persistent reducing conditions compared to more transmissive fractures.

Based on the current understanding of the hydrogeological and geochemical conditions in the bedrock aquifer at the Site, estimating the time-frame for restoration of bedrock groundwater quality contains a large degree of uncertainty due to: 1) the random distribution, limited (and variable) interconnectivity and wide range of permeability (low flushing rates) of bedrock fractures; 2) highly variable and unknown distribution of naturally occurring arsenic and manganese bearing fracture fillings present in Site bedrock; 3) the persistence of reducing conditions downgradient of the landfill which leads to the mobilization of naturally occurring arsenic and manganese; and 4) the known existence of arsenic concentrations in bedrock water supply wells located beyond the boundaries of the impacted groundwater area above applicable State and Federal standards.

Given these uncertainties and variables, it is difficult to more precisely predict a restoration timeframe for all bedrock compliance wells at the Site. However, in the first 15 years following implementation of the NTCRA, VOC and SVOCs concentration in bedrock groundwater have decreased in concentrations such that they have met or are expected to meet the IGCLs within

the next 10 years (i.e., by 2025) and are no longer considered to be a driving factor for predicting the timeframe for the restoration of bedrock groundwater quality at the Site. Arsenic and manganese are the principle constituents of concern in bedrock groundwater requiring an extended time frame to meet the goals for restoration of bedrock groundwater. Because available information suggests that the original remedy remains viable, contaminant plumes are stable or shrinking, institutional controls have removed potential pumping influences and groundwater use, a more detailed evaluation of additional or alternative remedial actions for the Site has not occurred.

Refer to Section IV (C) for further information regarding an estimated timeframe for restoration of bedrock groundwater.

#### **D. Increased Cost of the Remedial Action**

The increase in time to complete the current remedy is expected to increase the present value estimated cost of the remedy from the \$4.62 million to \$6.38 million.

### **IV. DESCRIPTION OF SIGNIFICANT DIFFERENCES**

#### **A. Institutional Controls for Groundwater Use Restrictions**

When the 1994 ROD was issued, deed restrictions on BFI-VT owned property and a Water Services Agreement with downgradient property owners were the Institutional Controls implemented. The goal of these measures was to maintain long-term protectiveness of human health by preventing the use of bedrock groundwater at residences within or adjacent to the Site-related impacted groundwater area. Institutional Controls were supported by the CSM which predicted that compliance with State and Federal Groundwater Quality Standards (ARARs) would be attained within 15 years following implementation of the Site Remedy (Cover System, Gas Extraction System, Seepage Control System).

When it was determined that groundwater quality standards would not be achieved at all bedrock compliance wells with the 15 year time frame specified in the 1994 ROD, EPA and VT DEC agreed that the groundwater within the impacted groundwater area should be reclassified from Class III to Class IV to fully comply with the VTDEC's *Environmental Protection Rules Chapter 12 Groundwater Protection Rule and Strategy*. On March 10, 2009, the VT ANR reclassified groundwater within the impacted groundwater area from Class III to Class IV to strengthen the existing Institutional Controls for groundwater use at the Site. Subsequently, an amendment to the groundwater reclassification order was proposed in 2013 because the original reclassification zone was delineated based upon an inaccurate set of coordinates for one monitoring well near the north boundary of the Reclassification Zone. On November 4, 2013, VT ANR finalized an amendment to the groundwater reclassification order.

At the time of this ESD, all properties located to the east (between the landfill and the Connecticut River) and hydraulically downgradient of the landfill area are either undeveloped properties owned by BFI-VT or are residential properties at which BFI-VT has executed Water Supply Agreements. In addition, VTANR has reclassified groundwater underlying the landfill

area, and the properties located east and hydraulically downgradient of the landfill, as shown on Attachment 2, as Class IV groundwater which designates groundwater as “not suitable as a source of potable water.”

Institutional Controls (groundwater reclassification, Water Service Agreements recorded on residential property deeds, and deed restrictions on BFI owned property) established to restrict the use of bedrock groundwater at properties located within the Site-related impacted groundwater area are protective of human health. The 1994 ROD allows for the establishment of additional Institutional Controls if EPA determines they are necessary to protect human health or the environment.

## **B. Modification of Interim Groundwater Cleanup Levels (IGCLs)**

This ESD updates two IGCLs established in the 1994 ROD to ensure the protectiveness of the Site remedy.

- Arsenic: The IGCL for arsenic established in the ROD was 50ug/L and was based on the federal Safe Drinking Water Act (SDWA) MCL effective at the time. After the 1994 ROD was issued, the SDWA MCL for arsenic was decreased from 50 micrograms per liter (ug/L) to 10 ug/L. The revised IGCL for arsenic at the Site will be 10ug/L. The revised standard is also consistent with State of Vermont standard.
- Lead: The IGCL for lead established in the ROD was 20 ug/L and was based on the State of Vermont Groundwater Protection Rule and Strategy and Groundwater Quality Standards effective at that time. After the 1994 ROD was issued, this State standard was decreased from 20 to 15 ug/L to be consistent with the SDWA Action Level. The revised IGCL for lead at the Site will be 15ug/L.

## **C. Adding State Water Supply Rules as a new ARAR for the Remedy**

Through this ESD, the Water Supply Rule, Chapter 21 of the Vermont Environmental Protection Rules, has been added as a Relevant and Appropriate Action-Specific ARAR, establishing compliance standards for the operation and maintenance of the water line component of the remedy. The substantive requirements of these standards have already been incorporated into the Operation and Maintenance Plan for the water line, but had not been identified as an ARAR in the ROD.

## **D. Establish a Revised Time-frame for Restoration of Bedrock Groundwater**

The 1994 ROD predicted the natural attenuation remedy would result in attainment of the IGCLs established for bedrock groundwater by 2010, or 15 years following completion of the NTCRA which was completed in July 1995 with the completion of the landfill cap. However, the time frame predicted for bedrock groundwater to meet cleanup criteria was underestimated due to the following mechanisms which continue to affect ground water quality in the vicinity of the landfill area: 1) continued dissipation of the groundwater mound within and beneath the landfill; 2) residual infiltration through the multilayer cap and areas adjacent to the landfill; 3) bedrock groundwater seepage into waste adjacent to the western portion of the landfill and subsequent

recharge to bedrock downslope of the point of influx; and 4) limited hydraulic interconnectivity of bedrock fractures resulting slower than anticipated flushing rates.

The time-frame to meet the revised Interim Groundwater Cleanup Levels established in this ESD for bedrock groundwater is being extended to more than 15-years after the NTCRA due to: 1) the revised Interim Groundwater Cleanup Level for arsenic established in this ESD, and 2) the current understanding of the hydrogeological and geochemical conditions at the Site discussed in the CSM Update.

Based on the current understanding of the hydrogeological and geochemical conditions in the bedrock aquifer at the Site, estimating the time-frame for restoration of bedrock groundwater quality contains a large degree of uncertainty due to: 1) the random distribution, limited (and variable) interconnectivity and wide range of permeability (low flushing rates) of bedrock fractures; 2) highly variable and unknown distribution of naturally occurring arsenic and manganese bearing fracture fillings present in site bedrock; 3) the persistence of reducing conditions downgradient of the landfill which leads to the mobilization of naturally occurring arsenic and manganese; and 4) the known existence of arsenic concentrations in bedrock water supply wells located beyond the boundaries of the impacted groundwater area above Groundwater Cleanup Levels.

Given these uncertainties and variables, it is difficult to predict a restoration timeframe for all bedrock compliance wells at the Site. However, in the first 15 years following implementation of the NTCRA, VOC and SVOC concentrations in bedrock groundwater have decreased in concentrations such that they have met or are expected to meet IGLCs established in the ROD within the next 10 years (i.e., by 2025) and are no longer considered to be a driving factor for predicting the timeframe for the restoration of bedrock groundwater quality at the Site. Arsenic and manganese are the principle constituents of concern in bedrock groundwater requiring an extended time frame to meet the goals for restoration of bedrock groundwater.

The CSM Update compiled arsenic and manganese concentrations reported in groundwater samples collected from 14 open-borehole bedrock wells monitored as part of the LTMP, including thirteen current or former open-borehole bedrock water supply wells and one open-borehole well (Interceptor) located upgradient of the Site. The Interceptor well is located to the west and hydraulically upgradient of the DSI landfill, while the remaining wells are located hydraulically cross-gradient to the south, east and southeast of the DSI landfill. Dissolved and total (and commonly both) arsenic, iron and manganese concentrations were compiled for one or more grab samples periodically collected from October 31, 1983 to September 27, 2011 as part of remedial investigations or the LTMP. A summary of arsenic and manganese concentrations reported for background groundwater quality locations in the vicinity of the landfill is provided in the table below.

	<b>Minimum</b>	<b>Maximum</b>	<b>Median</b>	<b>Average</b>
Arsenic	0.51 ug/L	65.6 ug/L	8.2 ug/L	11.5 ug/L
Manganese	0.47 ug/L	2,300 ug/L	20 ug/L	143.7 ug/L

Data from background wells indicates that appreciable concentrations of arsenic and manganese may be naturally present in the bedrock groundwater at and around the Site. This result is consistent with many other studies which indicate that it is very common for groundwater in the northeastern United States to contain appreciable concentrations of naturally-occurring arsenic and manganese, and that local/regional variation in concentrations of these metals appears to be largely controlled by the redox state of groundwater and aquifer matrix mineralogy. It is, however, difficult to accurately establish what background concentrations are in the area of the Site due to the absence of groundwater monitoring data for the period prior to the placement of waste at the Site.

Based on the available data, EPA has determined that it may take an additional 40 to 60 years to complete the groundwater cleanup (i.e., between 2055 and 2075). The technical basis for this estimate is presented in the July 2014 Draft Investigation Report. Maintenance of the components of the Site remedy and long-term monitoring of groundwater quality for constituents of concern will continue after IGCLs are achieved in accordance with the ROD and consent decree. The extended timeframe for the achievement of IGCLs is reasonable considering Site conditions. Clean, potable water is and will continue to be provided to all downgradient residents via a drinking water system established and maintained by the responsible parties. Furthermore, land use restrictions and the recent groundwater reclassification prevent the use of groundwater in the area of the Site, and the Connecticut River provides a boundary that limits plume expansion.

#### Change in Expected Outcomes

With the exception of an increased time frame for the restoration of Site groundwater quality, there is no change in the expected outcome for the selected remedy. The additional Institutional Control measure (groundwater reclassification) completed since execution of the ROD has resulted in increased protectiveness of human health.

#### **E. Increased Cost of the Remedial Action**

The 1994 ROD identified a total estimated present value cost of 2.9 million dollars (4.62 million in 2014 dollars) to implement the remedy for 30 years to 2025. An updated present value analysis to continue implementing the current remedy for an additional 40 years (2025 to 2065), assuming \$200,000 in annual expenditures and a 7% discount rate, results in a present value increase of approximately \$1,756,000. This amount represents an approximately 38% increase in the total estimated present value identified in the 1994 ROD and adjusted to 2014 dollars: \$6.38 million versus \$4.62 million.

### **V. SUPPORT AGENCY COMMENTS**

The State of Vermont concurs with and is supportive of this ESD. VT DEC's letter of concurrence is provided as Attachment 1 to this ESD.

## VI. STATUTORY DETERMINATION

In accordance with Section 121 of CERCLA, EPA, in consultation with VTDEC, has determined that the modified remedy remains protective of human health and the environment, complies with all Federal and State requirements that are applicable or relevant and appropriate to this remedial action, meets the remedial action objectives specified in the ROD, and is cost-effective. The changes made in this ESD do not fundamentally alter the overall remedy for the Site with respect to scope, performance, or cost. Therefore, this ESD is being properly issued.

## VII. PUBLIC PARTICIPATION

In accordance with Section 300.825(b) of the NCP, EPA voluntarily allowed a 15-day public comment period prior to the finalization and signing of this ESD. The comment period was designed to allow consideration of any possible concerns raised by the public or other interested parties. A draft of this ESD was issued publically on September 11, 2014 and EPA accepted public comments on this document from September 11 to September 25, 2014. A public notice announcing the availability of the draft ESD was printed in the *Brattleboro Reformer* on September 13, 2014. The public was invited to provide comment by September 25, 2014 to:

Kevin S. Heine, PG  
Remedial Project Manager  
U.S. EPA Region 1  
5 Post Office Square, Suite 100 (OSRR 07-1)  
Boston, MA 02109-3912  
Email: [heine.kevin@epa.gov](mailto:heine.kevin@epa.gov)  
Fax: 617 918-0321

One public comment was received by the September 25, 2014 deadline and has been addressed in the Responsiveness Summary included as Attachment 6 of this ESD.

In accordance with Section 117(d) of CERCLA and Section 300.825(a) of the NCP, this ESD and the Administrative Record are available for public review at the locations and times listed in Section I.F above as well as on the internet at <http://www.epa.gov/region1/superfund/sites/bfi>. Adobe Reader is required to review the documents.

## **ATTACHMENTS**

**1 – VTDEC’s Letter of Concurrence**

**2 – Site Plan and Groundwater Reclassification Area**

**3 – Summary of Interim Groundwater Cleanup Standard (IGCLs)**

**4 – Extent of Contaminants of Concern in Overburden Groundwater**

**5 – Cleanup Level Exceedances in Bedrock Groundwater**

**6 – Responsiveness Summary**

**Vermont Department of Environmental Conservation**

Commissioner's Office

One National Life Drive, Main 2 [phone] 802-828-1556

Montpelier, VT 05620-3520 [fax] 802-828-1541

*Agency of Natural Resources*

September 26, 2014

James T. Owens, Director  
Office of Remediation and Restoration  
US EPA Region I  
5 Post Office Sq. Suite 100 (07-5)  
Boston, MA 02109-3912

Subject: September 2014 Explanation of Significant Differences for the BFI Sanitary Landfill NPL Site.  
Rockingham, VT. VT DEC WM&PD Site #77 0070

Dear Mr. Owens:

We concur with the September 28, 2014 Explanation of Significant Differences (ESD) proposed by the US EPA to modify the remedy for the BFI Sanitary Landfill (BFI) site from what was included in the 1994 Record of Decision (ROD).

The remedial alternatives selected for the BFI site included long term groundwater monitoring of natural attenuation. This activity was predicted to allow the groundwater at the site to meet Interim Groundwater Cleanup Levels (IGCLs) 15 years after construction of the Non-Time Critical Removal Action Landfill CAP. Not all of the site specific IGCLs for bedrock groundwater were met within the 15 year time period. BFI and EPA now predict it will take another 40-60 years of natural attenuation for arsenic, manganese, benzene, and other compounds in the bedrock groundwater to meet the IGCLs. The US EPA and VT groundwater protection standards for Arsenic and Lead have also been lowered since the 1994 ROD.

The proposed ESD therefore includes three modifications to the remedy required by the 1994 ROD: expansion of institutional controls to include the reclassification of groundwater from the Vermont Class III class to the Vermont Class IV groundwater classification (completed in 2009 and revised in 2013); modification of the IGCL's for Arsenic and Manganese; and expansion of the time frame for bedrock groundwater to meet all IGCL's from the original 15 years to another 40-60 years.

Please do not hesitate to contact me or Michael B. Smith if you need additional information or clarification on our response to the ESD.

Sincerely,

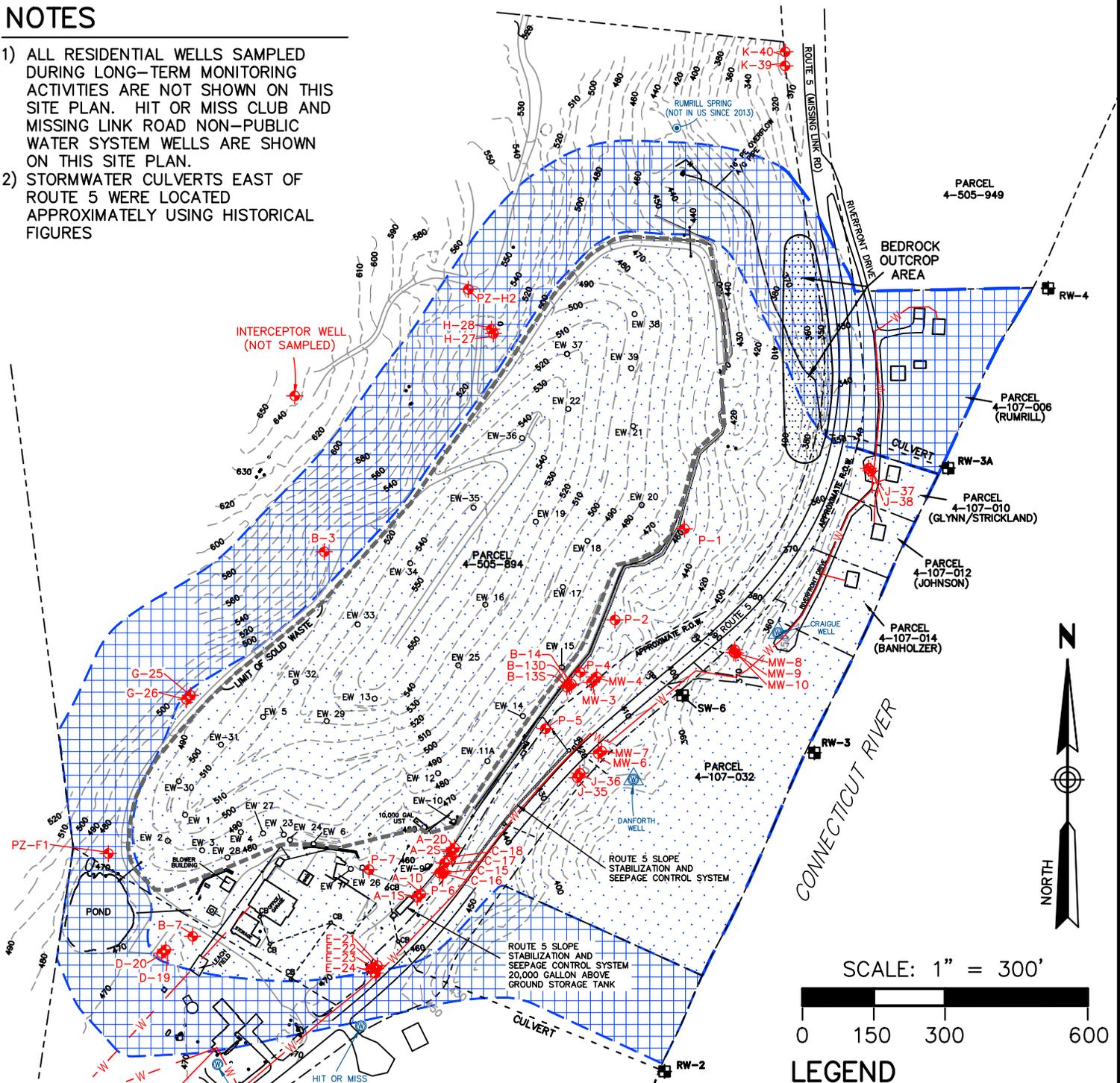


David K. Mears  
Commissioner

cc: Kevin Heine, US EPA  
Michael B. Smith, VT DEC

# NOTES

- 1) ALL RESIDENTIAL WELLS SAMPLED DURING LONG-TERM MONITORING ACTIVITIES ARE NOT SHOWN ON THIS SITE PLAN. HIT OR MISS CLUB AND MISSING LINK ROAD NON-PUBLIC WATER SYSTEM WELLS ARE SHOWN ON THIS SITE PLAN.
- 2) STORMWATER CULVERTS EAST OF ROUTE 5 WERE LOCATED APPROXIMATELY USING HISTORICAL FIGURES



## LEGEND

- CLASS IV GROUNDWATER RECLASSIFICATION ZONE
- CLASS IV GROUNDWATER RECLASSIFICATION BUFFER
- MW-6 MONITORING WELL
- EW 11A GAS EXTRACTION WELL
- RW-4 CT RIVER OR SEEP SAMPLING LOCATION
- FORMER WATER SUPPLY WELL (NOT IN USE)
- WATER SUPPLY WELL (IN USE, UNLESS NOTED)

- PROPERTY BOUNDARY
- LANDFILL SOLID WASTE BOUNDARY
- EXISTING CONTOUR (10 FT INTERVAL)
- MISSING LINK ROAD WATER SUPPLY LINE

## ATTACHMENT 2 – SITE PLAN

BFI ROCKINGHAM SANITARY LANDFILL SUPERFUND SITE  
DISPOSAL SPECIALIST, INC. LANDFILL  
MISSING LINK ROAD (ROUTE 5) – ROCKINGHAM, VERMONT



Tel.: (207) 795-6009  
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www.ces-maine.com  
640 MAIN STREET  
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ATTACHMENT 3  
 BFI-Rockingham Sanitary Landfill Superfund Site  
 Summary of Interim Groundwater Cleanup Standard (IGCLs) Exceedances  
 June 2014 Five Year Review Semi-Annual Sampling Event

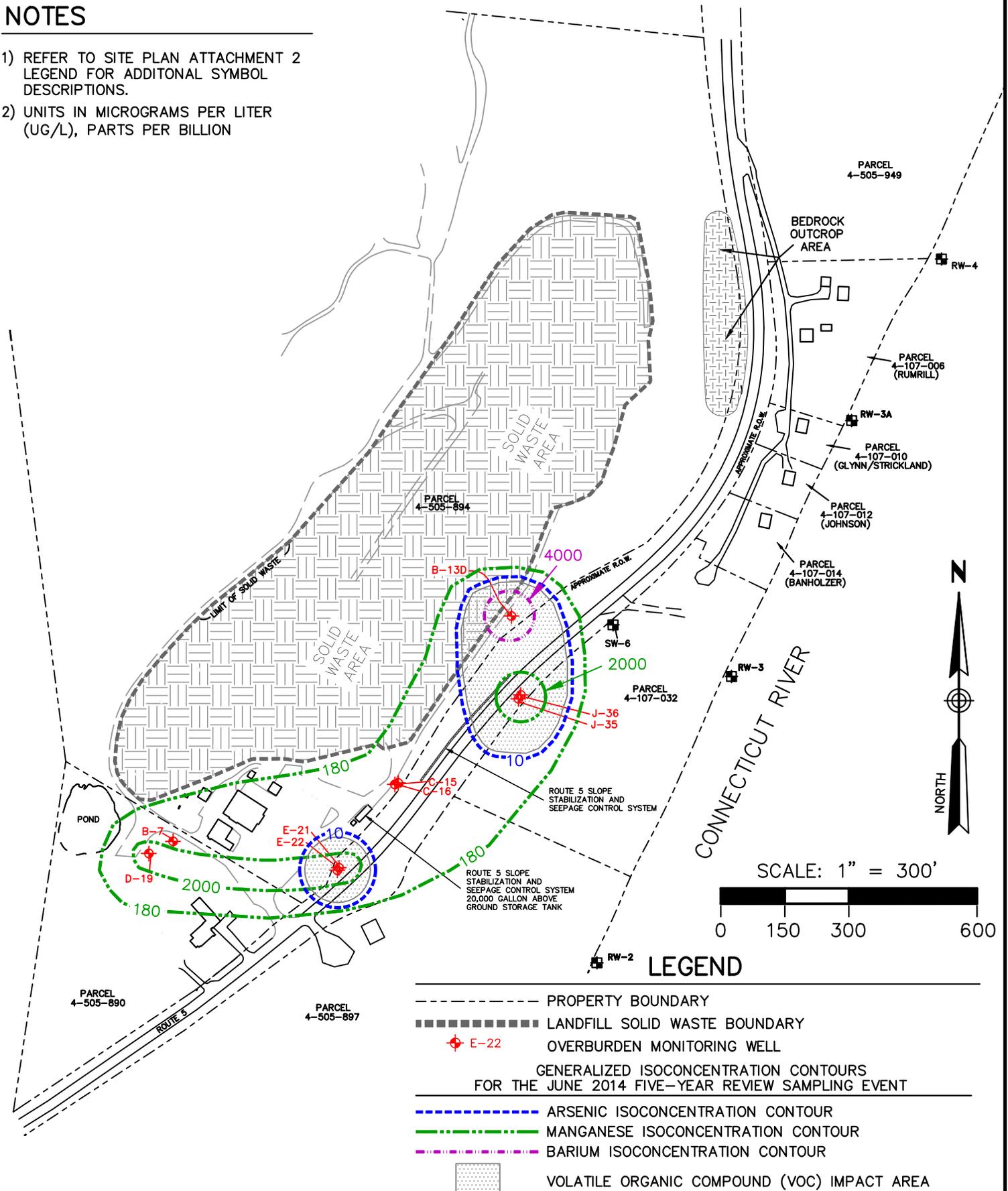
Parameter Group	Metals							Volatile Organic Compounds							Semi-Volatile Organic Compounds			Total Number of Exceedances at Well
	Interim Groundwater Cleanup Level (IGCL) **	10 ug/L	6 ug/L	1000 ug/L	50 ug/L	15 ug/L	180 ug/L	100 ug/L	5 ug/L	5 ug/L	0.7 ug/L	2 ug/L	5 ug/L	170 ug/L	400 ug/L	1 ug/L	6 ug/L	
Parameter / Well ID	Arsenic*	Antimony	Barium	Chromium	Lead*	Manganese	Nickel	Benzene	Trichloroethylene	Tetrachloroethylene	Vinyl Chloride	Methylene Chloride	2-butanone	Xylenes, total	Bis (2-chloroisopropyl) ether	Bis (2-ethyl hexyl) phthalate	Pentachlorophenol	
Bedrock Monitoring Wells	MW-3	X				X		/	/	/	/	/	X	X	NA			4
	MW-4	X				X									/			2
	MW-6	X				X									/			2
	MW-7					X									/			1
	MW-9				X					X						NA		2
	MW-10															NA		0
	H-27															NA		0
	H-28															NA		0
	B-3						X									NA		1
	G-25	X					X									NA		2
	G-26															NA		0
	C-17	X														NA		1
	C-18	X					X									NA		2
	E-23															NA		0
	E-24						X									NA		1
	J-37						X									NA		1
	J-38						X								/			1
K-39						X									NA		1	
K-40															NA		0	
Overburden Wells**	J-35	X				X		/	/	/	/	/	X	/	NA			3
	J-36														NA			0
	B-7					X									NA			1
	D-19					X									NA			1
	E-21					X									NA			1
	E-22	X				X		/	/	/	/	X	X		NA			4
	C-15					X									NA			1
	C-16					X									NA			1
B-13D	X		X			X		/	/	/	/	/	X	NA			4	
<b>Total # of Exceedances for Parameter</b>	<b>9</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>19</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>	

**Notes:**

- X Parameter reported above laboratory detection limit and reported concentration exceeds the cleanup criteria indicated.
- / Parameter reported as Not Detected; however laboratory detection limit is above the cleanup criteria indicated.
- NA Not Analyzed - SVOC analysis was completed at selected wells only
- \* Interim Groundwater Cleanup Levels (IGCLs) established in the 1994 ROD for bedrock compliance wells. The IGCL for arsenic is being reduced from 50 to 10 ug/L and the IGCL for lead is being reduced from 20 to 15 ug/L in this ESD; therefore, the revised (lower) IGCLs for lead and arsenic were used to prepare this table.
- \*\* Overburden groundwater quality is compared to IGCLs when assessing the progress of the site remedy.

# NOTES

- REFER TO SITE PLAN ATTACHMENT 2 LEGEND FOR ADDITIONAL SYMBOL DESCRIPTIONS.
- UNITS IN MICROGRAMS PER LITER (UG/L), PARTS PER BILLION



## ATTACHMENT 4 – EXTENT OF CONTAMINANTS OF CONCERN IN OVERBURDEN GROUNDWATER

BFI ROCKINGHAM SANITARY LANDFILL SUPERFUND SITE  
MISSING LINK ROAD (ROUTE 5) – ROCKINGHAM, VERMONT

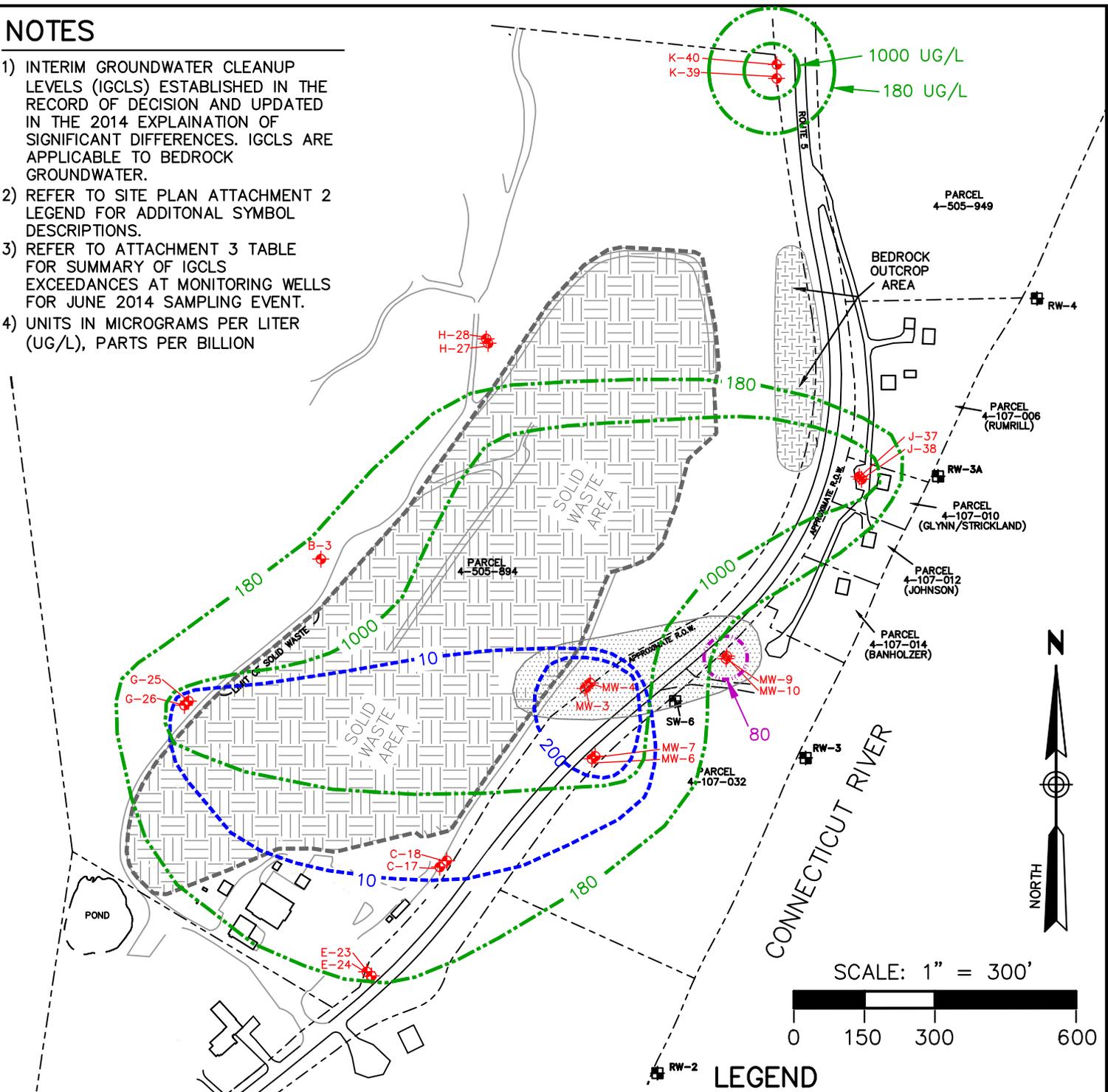
JOB: 16819 | DATE: AUG. 2014 | DRAWN BY: SBM | FILE: 16819-ESD-EX



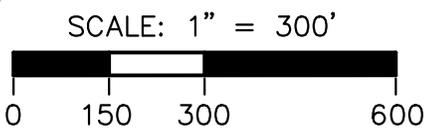
Tel.: (207) 795-6009  
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640 MAIN STREET  
LEWISTON, ME 04240

# NOTES

- 1) INTERIM GROUNDWATER CLEANUP LEVELS (IGCLS) ESTABLISHED IN THE RECORD OF DECISION AND UPDATED IN THE 2014 EXPLANATION OF SIGNIFICANT DIFFERENCES. IGCLS ARE APPLICABLE TO BEDROCK GROUNDWATER.
- 2) REFER TO SITE PLAN ATTACHMENT 2 LEGEND FOR ADDITIONAL SYMBOL DESCRIPTIONS.
- 3) REFER TO ATTACHMENT 3 TABLE FOR SUMMARY OF IGCLS EXCEEDANCES AT MONITORING WELLS FOR JUNE 2014 SAMPLING EVENT.
- 4) UNITS IN MICROGRAMS PER LITER (UG/L), PARTS PER BILLION



- LEGEND**
- PROPERTY BOUNDARY
  - LANDFILL SOLID WASTE BOUNDARY
  - ★ MW-6 BEDROCK MONITORING WELL
- GENERALIZED CLEANUP LEVEL EXCEEDANCE ISOCONCENTRATION CONTOURS FOR THE JUNE 2014 FIVE-YEAR REVIEW SAMPLING EVENT
- ARSENIC EXCEEDANCE CONTOUR (IGCL = 10 UG/L)
  - MANGANESE EXCEEDANCE CONTOUR (IGCL = 180 UG/L)
  - CHROMIUM EXCEEDANCE CONTOUR (IGCL = 50 UG/L)
  - VOC EXCEEDANCES AREA (IGCL VARIES)



## ATTACHMENT 5 – CLEANUP LEVEL EXCEEDANCES IN BEDROCK GROUNDWATER

BFI ROCKINGHAM SANITARY LANDFILL SUPERFUND SITE  
MISSING LINK ROAD (ROUTE 5) – ROCKINGHAM, VERMONT

JOB: 16819 | DATE: AUG. 2014 | DRAWN BY: SBM | FILE: 16819-ESD-EX



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## **ATTACHMENT 6 RESPONSIVENESS SUMMARY**

### **A. PREFACE**

The purpose of this Responsiveness Summary is to document EPA's responses to questions, comments, and concerns raised during the public comment period on the draft Explanation of Significant Differences prepared by the EPA for the BFI Rockingham Landfill Superfund Site. A Responsiveness Summary, although not required, is allowed under CERCLA §117 and the NCP §§300.430(f)(3)(i)(F) and 300.430(f)(5)(iii)(B).

The EPA held a 15-day comment period from September 11 to September 25, 2014. Written comments were received by mail from a single citizen and the original letter and comments submitted to EPA are included in the Administrative Record.

No other parties submitted comments to the EPA.

EPA considered all of the comments provided during the comment period and summarized in this document before preparing this ESD for the Site. None of the comments received by EPA was in opposition to any of the changes brought forth by the ESD. The State of Vermont concurs with and is supportive of this ESD for the Site.

### **B. COMMENTS RECEIVED AND EPA RESPONSE**

The comments provided by a citizen are summarized below and the EPA response follows.

#### Comment

1. A citizen acknowledged receipt of the explanation of significant differences for the Rockingham Landfill Superfund Site and indicates the Town of Rockingham, Vermont has concluded that land values in the area of the Site have depreciated due to landfill contamination. The citizen explains that this has resulted in realtors and several potential buyers and or renters concluding their property is undesirable and unsafe. The citizen states that because they purchased their property in good faith, they feel the actions of the responsible party have placed them in an undesirable economic position and therefore request an agreed upon solution, preferably financial, to address the matter.

#### EPA Response:

The Agency appreciates the citizen voicing their concern on the possible economic impact the BFI Rockingham Landfill Superfund Site may have on the surrounding community. EPA and VT DEC are committed to keeping the community informed and welcomes community input regarding Site activities as the remedy is implemented, through a combination of formal and informal means. If at any time unsafe or questionable conditions at or around the Site are observed, the public is encouraged to report them to the responsible party and or local authorizes as soon as possible,

depending on the nature of the hazard. With regard to changes in property values and remuneration from the responsible party, the issue is outside of the scope of the ESD and EPA takes no position on the matter.