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SECOND FIVE-YEAR REVIEW REPORT

For the

Burgess Brothers Landfill Superfund Site

Woodford and Bennington

Bennington County, Vermont

September 2010

PREPARED BY:

United States Environmental Protection Agency
Region 1
Boston, Massachusetts

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Date: 9-27-10

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SECOND FIVE-YEAR REVIEW REPORT

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Second Five-Year Review Report
Burgess Brothers Superfund Site
Woodford and Bennington, Vermont
September 2010

ES EXECUTIVE SUMMARY

This is the second five-year review for the Burgess Brothers Landfill Superfund Site (Site). This statutory five-year review is required since hazardous contamination remains at the Site above levels that allow for unlimited use and unrestricted exposure. The review was conducted in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act § 121, the National Contingency Plan, and the Comprehensive Five-Year Review Guidance (EPA, OSWER NO. 9355.7-03B-P June 2001).

Starting in the early 1950s, the Site was used as a metal salvage facility and disposal area. Metals, sludge, rejected small appliance, and military specialty batteries were also disposed at the Site. Site investigations and information provided by the former site operator indicate the landfill also received newspaper and building demolition debris. Two lagoon cells (unlined pits) received liquid wastes and sludge from approximately 1967 to 1976. Use of the Site for disposal ended in 1976.

In 1998, the US Environmental Protection Agency (EPA) issued a Record of Decision (ROD) for the Site located in the towns of Woodford and Bennington, Vermont. The ROD included implementation of a remedy to address landfill waste and impacts to groundwater, surface water and sediment. The ROD also included a provision that if EPA determined that the selected remedy was not effective and that remedial action objectives were not attained within an acceptable timeframe, then an alternate remedial action would be evaluated and implemented.

Pursuant to a Consent Decree signed by EPA, Vermont Department of Environmental Conservation (VTDEC), and the PRP Group, the components of the remedy have been implemented. The PRP Group installed a cap over the landfill and a portion of the Marshy Area and constructed an SVE/AS system. Long-term monitoring began with a baseline event in 2000 and continues semi-annually. In addition to the required institutional controls that were implemented, the groundwater beneath the Site was reclassified by the State of Vermont to non-potable. EPA issued the first five-year review report in March 2005. In 2007 the PRP Group submitted a draft Focused Feasibility Study to evaluate alternative remedial actions. This is currently under review by EPA and VTDEC.

Based on the data reviewed, observations from the site inspection, and interviews, the remedy is only partially functioning as intended by the ROD. While the Landfill and Marshy Area cap has prevented direct exposure to waste and contaminated soils, controlled gas emissions, and generation of leachate has been eliminated, the remedial action objective of preventing the migration of contaminated groundwater beyond the Landfill has not been attained. Consequently, highly contaminated groundwater has migrated a few hundred feet beyond the landfill compliance boundary. While the overall limit of the contaminant plume downgradient of the landfill boundary has not changed significantly since 1999, the leading edge of the high concentration plume continues to migrate southerly toward the institutional controls boundary. In addition, the remedial action objective of meeting surface water performance standards has not been met at

the edge of the Landfill and Marshy Area cap.

Five-Year Review Protectiveness Statement

Based on the information gathered in support of this Five-Year Review, the following protectiveness statement is made: The remedy at the Burgess Brothers Site currently protects human health and the environment because exposure pathways for direct contact and groundwater ingestion have been controlled by the Landfill and Marshy Area cap and institutional controls, respectively. However, in order for the remedy to be protective in the long-term, the source control and groundwater remedies need to be reevaluated and new remedial approaches selected.

Because the remedial action is currently protective, the Site is protective of human health and the environment. Recommendations for follow-up from this five year review include:

- Complete the Focused Feasibility Study;
- Develop a Proposed Plan that recommends a change in the remedy;
- Issue a ROD Amendment that formally selects the new remedy; and
- Add 1,4-dioxane to the groundwater monitoring program

Five-Year Review Summary Form

SITE IDENTIFICATION
Site name *(from WasteLAN)*: Burgess Brothers Landfill Superfund Site
EPA ID *(from WasteLAN)*: VTD003965415
Region: 1 State: VT City/County: Woodford and Bennington/Bennington
SITE STATUS
NPL status: Final
Remediation status: Construction complete with long-term operation, maintenance, and monitoring
Multiple Operable Units? No. Construction completion date: March 29, 2000
Has site been put into reuse? No. Burgess Brothers Construction Company continues to manage the remainder of their 60-acre property for various commercial uses.
REVIEW STATUS
Lead agency: EPA
Author name: Terrence Connelly
Author title: Remedial Project Manager
Author affiliation: EPA Region I
Period for this review: 01/25/10 to 09/30/10 (Time period covered by this review, 2005 – 2010)
Date of site inspection: 05/25/10 Type of review: Post-SARA Review number: 2nd Triggering action: Completion of first FYR Triggering action date *(from WasteLAN)*: 03/31/05 (first FYR) Due date *(five years after triggering action date)*: 03/31/10
ISSUES: 1. The selected remedy is only partially functioning as intended. While direct contact with the landfill waste and generation of leachate have been prevented, the SVE/AS system was also designed to prevent migration of contaminated groundwater beyond the landfill compliance boundary so that groundwater beyond the landfill would be restored in seven years after startup of the SVE/AS system. This was to be accomplished by controlling the contaminant source but

that has not occurred.

2. Groundwater beyond the landfill compliance boundary has not been restored to the interim cleanup levels and in some of monitoring wells, VOC concentrations are increasing. Based on available data, it does not appear that concentrations will meet the interim cleanup levels in the foreseeable future.
3. Additionally, the remedy was to meet surface water performance standards. These are not being met at the immediate edge of the Landfill and Marshy Area cap and there are sporadic exceedances farther downstream.
4. The potential exists that 1,4-dioxane may be present in the groundwater as it is used as a stabilizer in the manufacturing of 1,1,l-TCA which is a contaminant of concern at the Site. This chemical has not been included in the groundwater monitoring.

RECOMMENDATIONS and FOLLOW-UP ACTIONS:

The 2005 FYR recommended that the effectiveness of the remedy be reevaluated. This reevaluation is underway with the submittal of a draft Focused Feasibility Study by the PRPs in 2007. This Five-Year Review makes the following recommendations:

1. Complete the FFS
2. Prepare a Proposed Plan for the new remedy
3. Issue a Record of Decision Amendment
4. Add 1,4-dioxane to the groundwater monitoring program

PROTECTIVENESS STATEMENT:

Based on the information gathered in support of this Five-Year Review, the following protectiveness statement is made: the remedy at the Burgess Brothers Site currently protects human health and the environment because exposure pathways for direct contact and groundwater ingestion have been controlled by the Landfill and Marshy Area cap and institutional controls, respectively. However, in order for the remedy to be protective in the long-term, the source control and groundwater remedies need to be reevaluated and new remedial approaches selected.

OTHER COMMENTS: None

1.0 INTRODUCTION

The purpose of a five year review is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and identify recommendations to address them.

The United States Environmental Protection Agency (EPA) is preparing this Five-Year Review report pursuant to CERCLA § 121 and the National Contingency Plan. CERCLA §121 states:

If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that the action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.

EPA interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR § 300.430 (f) (4) (ii) states:

If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.

EPA, Region I, conducted this five-year review of the remedy implemented at the Burgess Brothers Superfund Site (Site), located in the Towns of Woodford and Bennington, Vermont. This review was conducted from March 2010 through September 2010. This report documents the results of the review.

This is the second five-year review for the Site. This statutory five-year review is required because hazardous contamination remains at the Site above levels that allow for unlimited use and unrestricted exposure. The triggering action for the initial statutory review was initiation of the remedial action. The review was completed in accordance with EPA Guidance OSWER NO. 9355.7-03B-P.

2.0 SITE CHRONOLOGY

CHRONOLOGY OF SITE EVENTS

Date	Event
1940s	Location of the Site was a sand and gravel operation
Early 1950s – 1976	Site was used as a metal salvage facility and disposal area for industrial waste, including solid, semi-solid and liquid wastes
1967 - 1976	Portion of Site used for a liquid waste and sludge lagoon
1976	Disposal operations ceased
1976	VTAEC site inspection; surface waster and leachate samples collected
1984 – 1989	Preliminary environmental investigations and monitoring performed by VTDEC, EPA, and Union Carbide Corporation
1985	VTDEC conducted Preliminary Site Assessment.
1988	EPA proposed Site for listing on National Priorities List (NPL)
1989	EPA added Site to NPL
1991	EPA entered into Administrative Order by Consent with PRPs to conduct a Remedial Investigation/Feasibility Study (RI/FS). Initiated multi-phase RI
1994	Groundwater monitoring begins
1997	RI and Baseline Risk Assessment completed
1998	FS completed
1998	EPA issued Record of Decision selecting a remedy
1999	EPA, VTDEC and PRPs entered into a Consent Decree for Remedial Design/Remedial Action (RD/RA)
1999	Completed RD; Start of onsite construction of remedy
2000	Site attained construction completion milestone
2000	EPA approved Final Remedial Design Report
2000	Initiated Operation and Maintenance (O&M) of SVE/AS system
2001	EPA approved Final Remedial Action Construction Report
2001	EPA approved Post-Closure O&M Plan
2001	Start of full scale SVE/AS operation
2002	AS shut down (SVE operation continued)
2003	Groundwater Reclassification Petition Approved
2004	Final Year 2 Remedy Evaluation Report
2005	Grant of Environmental Protection Easement and Declaration of Restrictive Covenants recorded on portion of Burgess Brothers Construction Company property
2005	SVE system shut down
2005	First Five-Year Review Report
2005	PRPs performed additional field work in response to Five-Year Review Report
2007	EPA requested a Focused Feasibility Study be prepared to address groundwater contaminant plume and impact to surface water. SVE system restarted
2008 – 2010	Long-term monitoring of groundwater, surface water and sediments continues

3.0 BACKGROUND

3.1 Physical Characteristics

The Site is located in southern Vermont in the Towns of Woodford and Bennington, between Burgess Road and the Walloomsac Brook, as shown in Figure 1. The latitude of the Site is 42 52' 40" and the longitude is 73 09' 00". The Site, as described in the Record of Decision (ROD), is approximately a three-acre area located in the northeastern section of a 60-acre parcel owned by Clyde Burgess Jr. (hereinafter the Burgess Property) Subsequent to the ROD, and as discussed herein, two institutional controls were placed on twelve acres, encompassing the three-acre Site. The landfill area of the Site occupied approximately 60,000 square feet, which included two cells covering an area of approximately 4,000 square feet. Access to the Site is through the Burgess Brothers Construction Company's facility on Burgess Road, approximately one mile southeast of the junction of Burgess Road and State Highway 9.

The general topography surrounding the Site consists of land surfaces sloping toward the Site from both east and west and the land surface of the Site itself sloping from north to south. The land surface slope lessens south of the landfill to the site boundary. All surrounding land adjacent to the Site is Burgess Property. To the north, the Green Mountain National Forest borders the Burgess Property.

Surface water flow from the hillside area east of the landfill (known as Harmon Hill) is controlled by several drainage swales, which flow southwesterly into a surface water body that became known as the "Unnamed Stream" during the RI/FS. The Unnamed Stream originates on the Burgess Property and it flows southwesterly into Barney Brook, which empties into the Walloomsac River. Both Barney Brook and the Walloomsac River are classified by the State of Vermont as Class B waters, which are set forth as waters of a quality that consistently exhibit good aesthetic value and provide high quality habitat for aquatic biota, fish and wildlife. The uses of Class B waters are public water supply (with filtration and disinfection), irrigation and other agricultural uses, swimming and recreation and the Walloomsac River serves as a public drinking water source for the Bennington Water Resources Department.

The Site contains two groundwater systems. Shallow groundwater is found within the overburden soils and flows generally from the landfill to the south-southeast. Groundwater elevation data indicate generally upward gradients in the overburden in the Marshy Area, with the groundwater discharging into the Unnamed Stream. Hydraulic testing indicates that the overburden soils have low permeability, low yield, and low saturated thickness. Farther downgradient from the landfill, the groundwater flow direction is south-southwest. Groundwater within the bedrock flows towards the west-southwest, generally following the hill slope topography.

The site geology consists of an unconsolidated overburden comprised of a kame sand and ablation glacial till, underlain by a lodgement till, underlain by bedrock. Combined, the kame sand and ablation glacial till are up to 35 feet thick. The lodgement till, which separates the kame sand and ablation till from the bedrock, is approximately 35 to 90 feet thick. Bedrock consists of shallow weathered bedrock, deep weathered bedrock, and competent bedrock. The weathered bedrock consists of schist and gneiss; the competent bedrock consists of massive to thick bedded quartzite with frequent high-angle fractures.

3.2 Land and Resource Use

The primary land use in the vicinity of the Site is undeveloped forest. Burgess Brothers Construction Company (Burgess Brothers) uses the area immediately to the north for limited sand and gravel mining operations, the stockpiling of soil (for screening and resale), and for limited scrap metal storage.

Industrial, commercial, and residential properties are located along Burgess Road, approximately one mile southwest of the Site. Approximately half-mile to the northwest is a residential development along Barney Road, which is connected to municipal water. Since completion of the Remedial Action, a combination residential dwelling and commercial building has been constructed by Burgess Brothers approximately 1000 feet to the northwest of the landfill. This building is connected to the municipal water supply system on Barney Road.

Two municipal water supply systems, Ryder Spring and Morgan Spring, are located within one mile of the Site. These systems are operated by the Bennington Water Resources Department. Two private drinking wells are located within one mile of the Site. Repeated sampling of the residential wells and springs during the RI and Supplemental RI (1990-1996) indicated no impact from the Site. Since completion of the RI and Supplemental RI, additional monitoring wells have been installed at the Site downgradient of the landfill that have been used to define the limits of the contaminant plume. Sample results from these downgradient wells have been used to confirm that the contaminant plume does not reach any of these municipal and private water supplies.

3.3 History of Contamination

Starting in the early 1950s the Site was used as a metal salvage facility and disposal area. Metals, sludge, rejected small appliance and military specialty batteries were also disposed at the Site. The two lagoon cells (unlined pits) received both liquid wastes and sludge from approximately 1967-1976. These wastes consisted of lead contaminated wastewater, spent solvents, and battery wastes. From 1971-1976, approximately 2,371,100 gallons of liquid waste (primarily trichloroethene (TCE) and tetrachloroethene (PCE), and 241,090 pounds of solid or semi-solid wastes (primarily lead sludge) were reportedly disposed of at the Site. Site investigations and information provided by the former site operator indicated the landfill also received newspaper and building demolition debris.

The groundwater in the kame sand and ablation till has been impacted by the landfill, and most probably by the disposal of wastes into the former lagoon cells. Volatile organic compounds, (VOCs) including vinyl chloride, chloroethane, 1,1-dichloroethene, 1,2- dichloroethene,1,1,1-trichloroethane, PCE, TCE, methylene chloride, and benzene, and several metals have been detected at elevated levels.

The VOC contamination in the groundwater in the kame sand and ablation till extends approximately 300 feet downgradient from the edge of the Landfill and Marshy Area cap. Long-term sampling of groundwater monitoring wells indicates that the limit of the VOC plume has not changed significantly since monitoring began in 1994. The limited downgradient extent of VOCs in the kame sand and ablation till is consistent with the low permeability of these geologic units.

Sampling of existing bedrock groundwater monitoring wells appears to indicate that the groundwater within the bedrock remains unaffected by the landfill.

Sediments in the Marshy Area were impacted by landfill operations. Surface water in that portion of the Unnamed Stream that flows near the landfill continues to show low level impacts of VOCs and there are sporadic detections of VOCs found farther downstream.

3.4 Initial Response

In 1976, the Vermont Agency of Environmental Conservation (VTAEC, now Vermont Department of Environmental Conservation (VTDEC)) conducted a site inspection and collected samples of surface water and leachate from seeps in the landfill side slopes. In 1984, VTAEC again sampled surface water and leachate, and also private drinking water supplies in the area. In 1985, VTAEC completed a Preliminary Assessment and Site Investigation.

In February 1989, at the request of VTDEC, EPA conducted a site inspection which included surface water sampling. Additional EPA sampling included soil gas surveys, soil sampling in the former lagoon area, surface water sampling and sediment sampling in the Marshy Area. In March 1989, EPA placed the Site on the NPL.

In 1989, Eveready Battery Company (now Energizer) installed wells and sampled groundwater, surface water, soil, and sediment. Due to the remote location of the Site, access by trespassers was not a recurrent problem and placing a fence around the Site was not deemed necessary at that time. Burgess Brothers restricted access to the Site by requiring that all visitors sign in at its office as they entered or exited the property.

Early response actions also included the removal of all scrap metal from the landfill area and regrading the landfill and surrounding land to promote surface water drainage.

3.5 Basis for Taking Action

Pursuant to an Administrative Order by Consent effective August 27, 1991, the Settling PRPs commenced a Remedial Investigation and Feasibility Study (RI/FS) for the Site under EPA oversight. The Settling PRPs completed and EPA issued an RI Report in February 1997, and the Settling PRPs completed and EPA issued an FS Report in March 1998.

The RI found elevated levels of VOCs, semi volatile organic compounds (SVOCs), and metals within the landfill and, specifically, within the former lagoon cells which were considered a "hot spot". Significantly elevated levels of VOCs, SVOCs, and metals were found within the soils and sediments in the Marshy Area. Elevated levels of VOCs were found in the overburden groundwater in the Landfill Area, former lagoon cells, Marshy Area, and downgradient of the landfill.

The greatest human health risks were projected for the future ingestion of shallow groundwater at the Site.

Both average (1×10^{-3}) and maximum (7×10^{-2}) cancer risk estimates exceeded EPA's benchmark of 10^{-4}. The highest noncarcinogenic hazard potential (HI=300) was also projected with the ingestion of maximum concentrations of shallow groundwater from wells at the Site. Both average (HI=20) and maximum (HI=300) noncancer hazard estimates exceeded EPA's benchmark of unity. Vinyl chloride, PCE, TCE, and 1,1-dichloroethene are some of the key contributors to these risk estimates.

All carcinogenic and noncarcinogenic risk values estimated for consumption of groundwater from deeper aquifers were below 10^{-4} or a HI<1 and were not determined to warrant a remedial action. Exposure to surface and subsurface soils outside of the landfill boundary were below 10^{-4} or a HI<1 and were not determined to warrant a remedial action. All carcinogenic and noncarcinogenic risk values estimated for exposure to stream sediments and surface water were also below 10^{-4} or a HI<1.

The ecological risk assessment concluded that exposure to contaminants in surface soils outside of the original landfill boundary and Marshy Area could impact some wildlife species foraging in those areas.

4.0 REMEDIAL ACTIONS

This section describes the remedial actions selected for and implemented at the Site.

4.1 Remedy Selection

The ROD for the Burgess Brothers Site was signed on September 25, 1998. Remedial Action Objectives (RAOs) were developed as a result of data collected during the RI to aid in the development and screening of remedial alternatives to be considered for the ROD. The RAOs for the Site were as follows:

Landfill RAOs

- Prevent, to the extent practicable, the potential for water to contact or infiltrate through the debris mass and lagoon.
- Prevent, to the extent practicable, the generation of landfill seeps and the migration of landfill impacted surface water into the unnamed streams adjacent to the landfill (Marshy Area).
- 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 substances, 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 landfill cap.
- Prevent, to the extent practicable, direct contact with and ingestion of soil/debris within the landfill and beneath the landfill.
- Control, to the extent practicable, surface water runoff to minimize erosion.
- Prevent, to the extent practicable, the migration of contamination from the lagoon area.
- Prevent, to the extent practicable, the saturation of the landfill debris mass from upgradient groundwater.

Groundwater RAOs

- Prevent, to the extent practicable, the ingestion of landfill impacted bedrock groundwater exceeding Maximum Contaminant Levels (MCLs), Vermont Primary Ground Water Quality Standards, or in their absence, the more stringent of an excess cancer risk of 1×10^{-6} for each compound or a hazard quotient of unity for each noncarcinogenic compound by any individual who may use the bedrock groundwater or within an area that the groundwater could become impacted as a result of pumping activities.

- Restore the bedrock groundwater at the edge of the Waste Management Unit (downgradient edge of Landfill and Marshy Area cap) to MCLs, Vermont Primary Ground Water Quality Standards, or in their absence, the more stringent of excess cancer risk of 1×10^{-6} for each compound or a hazard quotient of unity for each noncarcinogenic compound.

Surface Water RAOs

- Protect off-site surface water by preventing the occurrence of landfill impacted seeps.
- Prevent, to the extent practicable, ecological impacts from contaminants in the Marshy Area.
- Meet federal and state Applicable Relevant and Appropriate Requirements (ARARs) for any surface water discharge.

Ecological RAOs

- Protect surface water, to the extent practicable, from exceedances of the Ambient Water Quality Criteria (AWQC) Acute and Chronic Standards.
- Protect sediments, to the extent practicable, from exceedances of the Aquatic Sediment Quality Guidelines of the Ontario Ministry of the Environment.

The major components of the remedy selected in the ROD included the following:

- Construction and maintenance of a multi-barrier, low permeability cap with drainage controls over the landfill area;
- Construction and maintenance of a cap over the Marshy Area;
- Installation of a landfill gas management system;
- Installation, operation and maintenance/monitoring of an SVE/AS system in the area of the former lagoon cells, including off-gas treatment;
- Institutional controls such as access restrictions and deed restrictions;
- Long-term monitoring of groundwater, surface water and sediment;
- Modeling and evaluation of contaminant degradation rates and pathways to evaluate the effectiveness of natural attenuation; and
- Five-year reviews to evaluate the protectiveness of the selected remedy.

4.2 Remedy Implementation

This section describes the implementation of the components of the remedy specified in the 1998 ROD.

In May 1999, the EPA entered into a Consent Decree with three responsible parties for the RD/RA of the remedy selected by EPA. The PRPs had initiated the RD prior to the entry of the Consent Decree, however, and it was completed in June 1999. Construction activities were conducted at the Site between July 6 and October 28, 1999.

The site achieved Construction Completion status on March 29, 2000. The following describes the implementation of the major components of the remedy:

a. Landfill Cap Area

The top slope of the Landfill Area was graded to approximately three percent and the side slopes were graded at three horizontal to one vertical (3:1) or flatter. Prior to any intrusive activity, erosion and sedimentation controls were implemented to protect the swales, Unnamed Stream, and wetlands adjacent to and south of the Landfill Area. These controls were inspected on a routine basis and maintained until soil stabilization was established. Grading of the Landfill Area took into account the adjacent swales, Unnamed Stream, and wetlands and minimized adverse effects to these areas. Landfill grading and capping led to the loss of approximately 0.64 acres of wetlands. (As required by the Consent Decree, the responsible parties resolved their liability for any natural resource damages associated with the loss of wetlands). The adjacent swales were re-routed through a conduit adjacent to the Landfill and Marshy Area cap. A continuous multi-layer, or composite barrier, cap was constructed over the Landfill Area. The cap was designed and constructed, and is being operated and maintained to meet the performance requirements of the Resource Conservation and Recovery Act (RCRA) Subtitle C regulations.

b. Landfill Gas Management

Landfill gas within the gas collection layer of the landfill capping system is passively vented to the atmosphere through two gas vents located at the highest elevation of the landfill. Ambient air and gas vent monitoring was conducted prior to startup of the SVE/AS system on December 13, 2000. Ambient air monitoring was conducted at three locations (one upgradient and two downgradient), and, at the same time, the two passive gas vents within the landfill cap were also field screened and sampled.

Sampling results of the gas vents found VOC concentrations below Performance Levels set forth in the 1998 ROD by at least four orders of magnitude. Although Performance Levels are not applicable to ambient air, the sampling results of ambient air found VOC concentrations below the Performance Levels by at least six orders of magnitude.

c. Marshy Area Cap

The Marshy Area cap was constructed using a 24-inch thick permeable soil barrier, with the top 6 inches comprised of topsoil. The barrier design was based on factors such as constructability, maintenance, and ability to achieve RA objectives. The Marshy Area cap covers an area of approximately one-half acre. To promote positive drainage from the area, soils were shaped to achieve a minimum 3% grade toward drainage swales that were constructed as part of the multi-barrier cap over the landfill.

d. SVE/AS System

The SVE/AS system was constructed to remediate soils in the lagoon area considered to be the source of groundwater contamination. The air sparging system was designed to be used in conjunction with the SVE system to remediate the saturated zone soils by forcing air into the groundwater beneath the lagoon area. This induced airflow accelerates the volatilization of VOCs in both the saturated and vadose zones, forcing them upwards towards the air extraction wells. The SVE system removes VOCs from the vadose zone soils by drawing air through the extraction wells and producing a vacuum in the subsurface. VOCs contained within the vadose zone migrate toward the air extraction wells where they are removed for capture in granular activated carbon canisters. Any condensate collected from system operation is characterized and treated off-site, as appropriate.

e. Surface Water Management

Surface water drainage controls were constructed to minimize erosion of the cap and impacts to abutting wetlands. Drainage swales were installed on the top and perimeter of the landfill to control runoff. The Landfill Area was also revegetated and is maintained to prevent erosion. Storm water runoff from the Landfill Area is managed in accordance with Vermont Water Quality Standards. The drainage system of the cap is capable of handling a 100-year, 24-hour storm event.

f. Institutional Controls

Institutional controls were established to:

1. Protect the capped areas;
2. Prevent the use of groundwater potentially impacted by the Site, and,
3. Inform future purchasers of the restrictions associated with the property.

Institutional controls restricting access consist of appropriate signage, fencing, and a secured gate. A Grant of Environmental Protection Easement and Declaration of Restrictive Covenants was placed on the Burgess Brother property for the twelve acres encompassing the landfill, Marshy Area, and the downgradient area. In addition to these controls, the State of Vermont reclassified the groundwater for the same area to further limit future use of the site.

The Grant of Environmental Protection Easement and Declaration of Restrictive Covenants by Clyde Burgess Jr. serves to ensure the integrity of the Remedial Action as constructed, including the Landfill and Marshy Area cap, the SVE/AS, the landfill gas collection system and the surface water drainage infrastructure. This easement also prohibits the use of the groundwater as a drinking water supply and the use of the land for residential purposes.

The groundwater beneath and immediately around the landfill has been reclassified by the state from Class III (suitable for human consumption with minimal treatment) to Class IV (not potable). This was accomplished through a petition submitted by the VTDEC, at the request of the PRPs, to the Secretary of the Agency of Natural Resources of the State of Vermont. This request was approved on November 6, 2003. The Reclassification prohibits the Site groundwater from use as a domestic water supply and from irrigation, agricultural, and general industrial and commercial uses.

This reclassification is to serve as an interim control to remain in effect while the selected remedy is proceeding and shall remain in effect until the cleanup and performance levels are attained.

4.3 Systems Operation/O&M

The operation, maintenance, and environmental monitoring activities for the Site are being implemented by the PRPs in accordance with the long term operation and maintenance plan approved by EPA on April 12, 2001. Post-Closure Environmental Monitoring (PCEM) is being performed at the Site to monitor air, groundwater, surface water, and sediment for documentation of compliance. PCEM is also performed to monitor effectiveness of remedial actions, including capping of the landfill and operation of the SVE/AS. Sampling is conducted in accordance with the Environmental Monitoring Plan (EMP) and the Quality Assurance Project Plan (QAPP).

Since the 2005 FYR, the primary activities associated with the O&M include the following:

- Visual inspection of the cap with regard to access restrictions (fence & gate), vegetative cover, settlement, stability, and any need for corrective action. In addition, the cap is scheduled to be mowed semi-annually;
- Inspection of the drainage swales for blockage, erosion and instability, and any need for corrective actions;
- Inspection of the condition of groundwater monitoring wells;
- Environmental monitoring: semi-annual monitoring is conducted for most shallow (sand) wells, annual monitoring is conducted for ablation glacial till wells, surface water, and sediment, and bi-annual monitoring is conducted for all bedrock groundwater wells;
- Operation and maintenance of the SVE system

The major cleanup activities of the Burgess Brothers Site occurred during the construction phase of the Remedial Action (Landfill and Marshy Area cap). The remaining components of the remedy are the operation of the SVE system to address source control and monitoring of the groundwater plume. Because of this, as indicated in the planned O&M activities listed above, the primary O&M activities are geared towards the operation of the SVE system, monitoring of groundwater, surface water, and sediments, inspections, and monitoring of the cap.

O&M costs include cap and drainage structure maintenance, operation and maintenance of the SVE system, environmental sampling and monitoring, monitoring well maintenance, and reporting. O&M annual costs decreased from the initial operation of the SVE/AS because of the termination of the air sparging component and the decrease of VOCs concentrations in the SVE influent. Costs associated with carbon consumption continue to decline as the concentrations of VOCs in the air influent decline.

Annual costs associated with the O&M of the remedy are not available.

5.0 PROGRESS SINCE LAST FIVE-YEAR REVIEW

This is the second five-year review for the Site. The first five-year review was completed by EPA in 2005. The 2005 FYR therefore made the following protectiveness statement:

> The remedy at the Burgess Brothers Site currently protects human health and the environment because exposure pathways for direct contact and groundwater ingestion have been addressed by landfill/marshy area caps and institutional controls, respectively. However, in order for the remedy to be protective in the long-term, the source control and groundwater remedies need to be re-evaluated. If necessary, modification to the remedies should be made.

The 2005 Five-Year Review identified two issues:

- The SVE/AS was no longer as effective as it once was in removing the VOC contamination in the lagoon area. The lagoon area appeared to be a continuing source of VOC contamination.
- Groundwater contamination in downgradient monitoring wells was well above interim cleanup levels and in some wells VOC concentrations were increasing. Based on the available data, it did not appear that these concentrations would decrease in the foreseeable future.

Consequently, the 2005 Five-Year Review made the following recommendations:

- The effectiveness of the SVE/AS system must be reevaluated. Alternatives for either increasing its effectiveness or addressing the VOC source through other treatment options must be conducted.
- Groundwater contaminant levels and locations must be reevaluated to ensure contamination is not migrating vertically or laterally from known locations in sampled monitoring wells. An evaluation must be conducted to ensure that the groundwater plume remains set forth and that additional monitoring wells are not needed. The groundwater reclassification area should be revaluated to ensure that the current delineation is appropriate. Because groundwater concentrations at many locations have not decreased as predicted, the potential for groundwater to be remediated through natural attenuation needs to be re-evaluated. Finally, a more detailed groundwater model capable of predicting contaminant concentrations in down gradient monitoring wells based on current site conditions is needed.

Actions Taken Since the Last Five-Year Review

Issues from Previous Review	Recommendations/ Follow-up Actions	Party Responsible	Milestone Date	Action Taken and Outcome	Date of Action
SVE/AS not effective	Reevaluate the remedy	PRPs/EPA/ VTDEC	Fall 2007	PRPs submitted draft FFS to agencies	2007
Groundwater contamination may not be sufficiently characterized	Collect additional data to allow for further evaluation of plume dimensions and flow lines	PRPs	Fall 2005	PRPs performed additional fieldwork	Fall 2005

6.0 FIVE-YEAR REVIEW PROCESS

6.1 Administrative Components

EPA, the lead agency for this five-year review, notified VTDEC in February 2009 that the five-year review would be completed this fiscal year. Gerold Noyes of VTDEC was part of the review team.

The schedule established by EPA included completion of the review by September 2010.

6.2 Community Notification and Involvement

For this five-year review EPA prepared a public notice for the local paper announcing the five-year review and requesting public participation. The public notice was published in the Bennington Banner on August 18, 2010 and the Banner included an article on the review the following day. There has been no response from the public to either VTDEC or EPA regarding the five-year review.

In the initial stages of the Superfund program, community concern and involvement in the Site was minimal; some site-related meetings held by EPA were not attended by any members of the community beyond the PRPs. The level of interest has not changed since the 2005 five-year review.

The Bennington Free Library serves as the local repository for the site records. EPA's project manager contacted the reference librarian on August 13, 2010 to gauge the level of interest in the site file. According to the reference librarian, there has been very little interest in the site file.

6.3 Document Review

This five-year review included a review of relevant documents including decision documents, responses to the 2005 five-year review, monitoring reports, and the institutional controls. A list of the documents reviewed is included as Appendix A.

6.4 O&M and Monitoring Data Review

A review was completed of the O&M and monitoring reports. A summary of relevant data regarding the components of the remedy is presented below.

6.4.1 SVE Operation

Operation of the SVE system was suspended in February 2005. This followed a two-year period where the some of the vapor extraction wells were operated continuously, some intermittently, and others remained shut down (the air sparging component was shut down in 2002). The SVE system remained shut down through the remainder of 2005 and all of 2006. At the direction of EPA, operation of the SVE system resumed on August 30, 2007. Breakthrough of VOCs in the next-to-last carbon vessel occurred on October 11, 2007, after 41 days of operation. Following change-out of the spent carbon, the system was restarted on June 17, 2008. Operation of the system has continued since then, primarily with extraction wells VW-1 and VW-6, the two most downgradient extraction locations.

Similar responses were observed after both the August 2007 and June 2008 start-ups. Initial total system influent concentrations were approximately 1000 and 600 ppm, respectively (it is noted that influent concentrations are measured, as approved in the O&M Plan, with a photo ionization detector or PID, and the accuracy of this field screening instrument should be regarded as approximate, suitable for the concentrations present in the influent. Effluent concentrations are measured with a portable gas chromatograph in order to more accurately monitor both breakthrough through the carbon canisters and final discharge to assure compliance with performance standards). Within two weeks after each start-up, total system influent concentrations decreased to approximately 200 ppm and then the concentrations stabilized.

6.4.2 Groundwater Monitoring

Eighteen groundwater monitoring events have been performed under the PCEM program since the landfill was capped in 1999. The PCEM program includes monitoring of wells screened in the kame sand, ablation till, and bedrock zones. Samples are collected on a semi-annual or annual basis for Target Compound List (TCL) VOCs and on a bi-annual basis for those metals with interim cleanup levels (ICLs) as set forth in the ROD. Four additional monitoring wells and thirteen piezometers were installed in 2005 and 2006, to confirm the hydrogeologic model and contaminant fate and transport evaluations. These wells and piezometers, except P-15, have all been sampled at least once. In summary, since closure of the landfill, groundwater samples have been collected from 42 locations to evaluate the potential horizontal and vertical migration of site-related contaminants.

6.4.2.1 Groundwater VOC Concentrations

Groundwater in the kame sand and ablation till have concentrations of vinyl chloride, methylene chloride, 1,1-DCE, 1,2-DCE, TCE and PCE that exceed the ICLs. VOC concentrations are below ICLs in all wells closest to or along the Groundwater Reclassification Boundary. The former Marshy Area and areas southeast and south of the landfill have VOC concentrations above ICLs, with the highest concentrations now being south of the landfill compliance boundary.

For this review, TCE and PCE are used to highlight the nature and extent of contamination because they are the contaminants most frequently detected and have the highest concentrations. Figures 2 and 3 are groundwater contaminant plume maps for TCE and PCE, respectively, for the entire plume.

Upgradient of Landfill Compliance Boundary

This area includes the former lagoon area, portions of the landfill and portions of the former Marshy Area and is bounded downgradient by the landfill compliance boundary. For the PCEM, eight kame sand and four ablation till wells have typically been sampled. Concentrations of VOCs exist in both the kame sand and ablation till in this area that are orders of magnitude above ICLs. The trends in total VOC concentrations in these wells are summarized below, beginning with the most upgradient location and moving southward to the landfill compliance boundary.

<u>Kame Sand</u>

Concentrations in W-27S1, upgradient of the Lagoon Area, are below ICLs.

Concentrations in W-08S1 which is west and cross-gradient to the former Lagoon Area peaked in the hundreds of parts per billion in 1996-99 and are now below ICLs.

Concentrations in the former Lagoon Area are represented by W-31S. The concentrations appear to have decreased somewhat from July 2005 to June 2008, the last time it was sampled.

Concentrations in kame sand wells directly upgradient of the landfill compliance boundary are monitored in wells (from west to east) W-25S1, W-32S1, W-04D, W-03, and W-05. Well W-25S1 has been sampled extensively since 1993 and concentrations have fluctuated greatly, from near the ICLs to 13,000 ppb and back. The most recent concentrations are slightly above 500 ppb. These swings in concentrations suggest the groundwater flow paths from the former Lagoon Area shift over time, perhaps in response to changes in upgradient recharge. Concentrations at W-32S1 since 2005 have been indicative of dense non-aqueous phase liquid (DNAPL) with the most recent total VOC concentration of 69,000 ppb. Well W-04D is located about 60 feet downgradient of W-32S1 and concentrations began increasing after capping of the landfill and Marshy Area, suggesting the flow path may have shifted slightly from southeasterly to southerly. At well W-04D, the concentrations of TCE and PCE may have stabilized, but concentrations of vinyl chloride and 1,2-DCE appear to be increasing. The concentrations at W-04D also suggest DNAPL.

Wells W-03 and W-05 are located on the eastern side of the Marshy Area and represent conditions at the landfill compliance boundary for this portion of the Site. At W-03, total concentrations have decreased from 20,000 – 30,000 ppb (prior to the Landfill and Marshy Area capping) down to 10,000 ppb; with 1,2-DCE being the major component. There is limited data available for W-05; the decrease in concentrations at both W-03 and W-05 is consistent with a shift in the groundwater flow path direction.

Ablation Till

Concentrations in W-27T, upgradient of the Lagoon Area, have historically been below 10 ppb and have been below ICLs the last three sampling events.

Concentrations in the former Lagoon Area are represented by W-31T. The concentrations have steadily increased almost fourfold at W-31T from July 2005 to October 2008, this well's most recent sampling. These concentrations at W-31T are indicative of a possible DNAPL source.

Concentrations in the ablation till upgradient of the Landfill Compliance Boundary are monitored in W-32T, and W-04T. The limited data from W-32T suggests an increasing trend, possibly indicating a DNAPL source moving downgradient beyond the influence of the SVE/AS system. Concentrations at W-04T were below 4,000 ppb prior to the Landfill and Marshy Area capping then rapidly increased to 50,000 ppb in 2003-2004, and since then appear to have held steady in the 30,000 to 36,000 ppb range.

Downgradient of Landfill Compliance Boundary

This is the area located immediately downgradient of the landfill compliance boundary and extends southward approximately 300 feet. This area contains elevated levels of VOCs in groundwater that are orders of magnitude above the ICLs set forth in the ROD.

There are a limited number of kame sand monitoring wells in this area of the Site. The centerline of the VOC plume this area is based on data collected from P-09 and W-06D, P-10, and W-09S1. These wells are located approximately 50, 60, 100, and 275 feet downgradient of the landfill compliance boundary,

respectively. The lateral limits are set forth by P-11 to the west and by P-17 and P-18 to the east where VOC concentrations have been below ICLs.

Data from the plume centerline wells suggests migration of VOCs farther away from the landfill compliance boundary. Total VOC concentrations at P-09, installed after the 2005 five-year review, have steadily increased from 2006 to 2009. These concentrations, ranging from 29,000 to 44,000 ppb, suggest the possibility that VOCs as DNAPL have migrated beyond the landfill compliance boundary. Concentrations at W-06D, essentially non-detect from 1993 through 1999, may be exhibiting episodic releases of contamination from the former Lagoon Area, with peaks of 14,000 ppb in 2005 and 13,000 ppb in 2009. Concentrations at P-10, the next downgradient well on the plume centerline, steadily increased from 110 ppb after its installation following the 2005 five-year review to above 6,000 ppb in fall 2008 and 2,800 in spring 2009. Concentrations at W-09S1, the farthest downgradient well in this area, have demonstrated a similar pattern with total VOCs being below 70 ppb from 1993 through spring 2004 then increasing into the 100-270 ppb range through 2007. The spring and fall 2008 sampling recorded increases to 1,200 and 580 ppb, suggesting that the leading edge of the plume core has migrated farther downgradient from the landfill compliance boundary.

Monitoring well W-09T is the only well constructed in the ablation till in this area and is located along the plume centerline approximately 300 feet downgradient of the landfill compliance boundary. Concentrations prior to the Landfill and Marshy Area capping were near 100 ppb and have since exhibited an upward trend now above 1,000 ppb. Given the concentrations in the ablation till upgradient of the landfill compliance boundary, and the relatively horizontal groundwater flow, it is likely that concentrations in the ablation till immediately downgradient would exhibit a similar progression of the plume core migrating away from the landfill compliance boundary.

The following table presents downgradient TCE and PCE data from the plume centerline wells since the Landfill and Marshy Area capping and start-up of the SVE/AS system. Figures 3 and 4 illustrate concentrations along the plume centerline at W-09S1 and W-09T, respectively, over time.

TCE and PCE CONCENTRATIONS SINCE CAPPING OF THE LANDFILL AND MARSHY AREA Concentrations in μ g/L						
Date		**P-09**[1]	**W-06D**	**P-10**[1]	**W-09S1**	W-09T
Spring 2001	TCE		220		23	61
	PCE		120		6	25
Spring 2002	TCE		210		22	320
	PCE		160		6	180
Spring 2003	TCE		1600		3	460
	PCE		1300		1	330
Spring 2004	TCE		4500		29	560
	PCE		6400		12	520
Spring 2005	TCE		3600		92	410
	PCE		8000		50	350
Spring 2006	TCE	13,000	1700	12	140	570
	PCE	12,000	4400	2	100	640
Spring 2007	TCE	13,000	[2]	120	87	270
	PCE	19,000		38	79	410
Spring 2008	TCE	15,000	1500	940	510	310
	PCE	22,000	4500	440	550	500
Fall 2008	TCE	14,000	1300	2400	260	390
	PCE	24,000	5000	1800	270	640
Spring 2009	TCE	11,000	1700	1100	190	320
	PCE	21,000	6700	760	220	480

Notes: [1] Wells P-09 and P-10 installed after the 2005 Five-Year Review
[2] Well not sampled in this round

Attenuated Downgradient Plume

The VOC plume in this area contains levels of VOCs that exceed ICLs as set forth in the ROD, but the levels approach the ICLs. The area extends southwesterly from about 300 feet downgradient of the landfill compliance boundary to the current limits of the contaminant plume, between P-02 and P-08, and southerly to the Unnamed Stream.

As stated above in Section 1.3., the kame sand pinches out in this area of the Site away from the Unnamed Stream and the groundwater is only present in the ablation till. Groundwater along the central flowpath is monitored at ablation till wells P-01, P-02, P-08, and W-30T. These wells are located about 150, 250, 400, and 450 feet downgradient from the W-09 well cluster.

Groundwater as it discharges into the Unnamed Stream is monitored at P-19, P-20, P-21, P-22, and P-23, piezometers that were installed adjacent to the stream in 2005 and 2006. The piezometers were constructed in the kame sand which appears to be localized adjacent to the stream channel.

P-01 is the first downgradient sampling location in the attenuated plume area and is located about 150 feet south of W-09S1. While TCE at P-01 has increased slightly since the completion of the landfill capping from 200 ppb in fall 1999 to 310 ppb in fall 2008, PCE has increased over five-fold from 40 ppb in fall 1999 to 94 ppb in spring 2001 to 230 ppb in spring 2009.

Downgradient of P-01, the concentrations have not increased at P-02, P-08, and W-30T since monitoring began at these locations. At the time of this review, it is uncertain whether these concentrations will remain stable, indicating the plume will continue to attenuate or will duplicate the increasing trends seen immediately downgradient of the landfill compliance boundary and P-01 wells. If concentrations increase in these wells then it suggests that the plume will not attenuate prior to the institutional control boundaries.

A similar pattern is seen in the kame sand piezometers along the Unnamed Stream. Total VOC concentrations at P-19, the most upstream piezometers, have remained essentially stable fluctuating from 11 to 29 ppb in sampling from fall 2006 through spring 2009. Farther downstream, total VOC concentrations in the next four piezometers P-20, P-21, P-22, and P-23 have remained below ICLs.

6.4.2.2 Groundwater Metal Concentrations

The baseline Human Health Risk Assessment for the 1998 ROD identified four metals in the overburden groundwater, two metals in the bedrock groundwater, six metals in the surface water, and six metals in sediments as potential contaminants of concern. Of these media, only ingestion of the overburden groundwater represented an unacceptable human health risk, and the ROD identified only VOCs as the key contributors to the risk estimates.

Similarly, the baseline ecological risk assessment indicated that surface soils in the Marshy Area outside the landfill presented a risk to animals based on modeling simulations, and this risk was addressed by the capping of the Marshy Area.

The Post Closure Environmental Monitoring Plan included metals analysis for groundwater, surface water, and sediments. Of the four metals identified as potential contaminants of concern in the overburden groundwater, arsenic, lead, manganese, thallium, only the latter two have had exceedances of their respective ICLs beyond the landfill compliance boundary. Because of the sporadic nature of the thallium detections, manganese appears to be the only metal associated with the landfill that has been mobilized in the groundwater.

6.4.3 Surface Water Monitoring

Six surface water locations have been sampled annually for VOCs and metals in the spring. These locations include upstream of the landfill (SW-08), the landfill toe of slope swale (SW-18), the Unnamed Stream (SW-15/SW-P21 and SW-04/SW-P23), and Barney Brook (SW-05 and SW-06). In 2005 and 2006, eight stream piezometers were installed in the Unnamed Stream. Surface water samples were collected adjacent to seven of these piezometers in fall 2006 at SW-P17, SW-P18, SW-P19, SW-P20, SW-P21, SW-P22, and SW-P23

Of the long-term sampling locations, SW-18 remains the most contaminated location. SW-18 is located just downgradient of the landfill compliance boundary. The overall trend at SW-18 appears to be decreasing with occasional increases. With the Landfill and Marshy Area capping, the groundwater flow path has shifted more southerly. The occasional increases observed at SW-18 suggest there is still some periodic discharge of the groundwater flow southeast of the former lagoons.

Concentrations have been increasing at SW-P19, 150 feet downstream from SW-18. This suggests that the groundwater plume core is continuing to migrate farther away from the landfill compliance boundary. Concentrations at locations farther downstream have also had concentrations slightly above the performance standards.

The following table summarizes the maximum concentrations of TCE, PCE and 1,2-DCE detected in the 2006 expanded sampling event and the most recent data for those locations that were sampled. In addition, the maximum concentration detected prior to landfill closure are shown in parentheses, for those surface water locations where sample data are available. The locations are listed from upstream to downstream, with the first location listed being the background surface water location.

Ongoing monitoring of the surface water has continued to detect silver above its Performance Level as well as aluminum and iron. Only the iron appears to be site-related.

	MAY 2006 CONCENTRATIONS			*MOST RECENT CONCENTRATIONS, MAY 2009*		
Contaminant and Performance Level (µg/l)	**1,2-DCE(b)**	**TCE 2.7**	**PCE 0.8**	**1,2-DCE (b)**	**TCE 2.7**	**PCE 0.8**
Station Name and Location						
Upgradient of Landfill Compliance Boundary						
SW-08 Upstream of Landfill	- (-)	- (-)	- (-)	NS	NS	NS
Downgradient of Landfill Compliance Boundary						
SW-18 Toe of Slope Swale (TOSS)	100	32	24	87	18	24
SW-P-17 Unnamed Stream East of TOSS	-	-	-	NS	NS	NS
SW-P-18 75' downstream of SW-P-17	-	-	-	-	-	-
SW-P19 150' downstream of TOSS, near W-09 Cluster	7	2	2	9.7	2	3
Attenuated Downgradient Plume Area						
SW-P20 225' downstream of TOSS *(sampled in fall event)*	7	2	2	16	3.4	5.2
SW-P21/SW-15 300' downstream of TOSS	5 (1.4)	1 (40)	1 (10)	6.1	1.2	1.8
SW-P22 375' downstream of TOSS *(sampled in fall event)*	4	1	1	6.7	1.5	2.2
SW-P23/SW-04 450' downstream of TOSS	3 (20)	0.8 (6)	0.7 (1)	3.3	0.66J	0.9J
Barney Brook						
SW-06 Upstream of confluence with Unnamed Stream	- (-)	- (-)	- (-)	NS	NS	NS
SW-05 Downstream of confluence with Unnamed Stream	- (-)	- (-)	- (-)	NS	NS	NS

Notes:

- Below Method Detection Limits
(b) This compound does not have a PL, but is shown to evaluate groundwater discharge to surface water.
( ) maximum concentration detected prior to landfill closure
J estimated value

6.5 Site Inspection

A site inspection was conducted on May 25, 2010, by EPA and representatives from *de maximis* and Environmental Partners, Inc., consultants for the PRPs. The purpose of the inspection was to assess the protectiveness of the remedy, including the presence of fencing to restrict access, the integrity of the cap, the performance of the surface water drainage control structures, and the maintenance of the SVE system.

During the site inspection, the parties viewed the aboveground components of the SVE system, walked over the Landfill and Marshy Area cap, and located and inspected the monitoring wells. No significant issues were identified regarding the cap, the drainage structures, or the fence. The piping and carbon units for the SVE system were identified with each having appropriate markings, and the building housing the carbon units appeared to be well-kept. The cap was inspected for vegetative cover, settlement, erosion, animal burrows, and any standing water. The cap appeared to be well maintained with no indications of any breaches to its integrity. Additionally, the drainage swales were checked; no obstructions or excessive vegetative growth were noted. All monitoring locations currently in use were located and all appeared to be in satisfactory condition.

Pursuant to the approved O&M Plan, the PRPs conduct semi-annual inspections of the Site. There have been no major issues regarding the operation and maintenance of the landfill remedial system. Operations, maintenance, and monitoring have adequately established the landfill cap integrity, site access restrictions, and O&M of the SVE system.

Following the site inspection, the EPA representative drove around the neighborhoods contiguous to the Site to check for new homes and developments. The surrounding area remains predominantly rural residential interspersed with some commercial properties. There did not appear to be any recent changes on Burgess Brothers Road.

6.6 Interviews

EPA had general discussions with the PRPs' consultants during the site inspection. Following the site inspection, EPA spoke with Penny Burgess of the Burgess Brothers Construction Company.. Information regarding zoning was obtained from the Town of Bennington personnel following the site visit. An interview with a representative of the Bennington Free Library was conducted via telephone.

Gerold Noyes has been the VTDEC project manager since 1999. He has concurred with the monitoring modifications and reporting frequency currently in place and is participating in the reevaluation of the existing remedy.

7.0 TECHNICAL ASSESSMENT

7.1 Question A: Is The Remedy Functioning As Intended By The Decision Documents?

Landfill and Marshy Area Cap, Bedrock Groundwater: Yes
Contaminated Groundwater and Surface Water: No

Remedial action performance. The remedy is only partially functioning as intended by the ROD. While the Landfill and Marshy Area cap has prevented direct exposure to waste and contaminated soils, controlled gas emissions, and generation of leachate has been eliminated, the remedial action objective of preventing the migration of contaminated groundwater beyond the landfill has not been attained and surface water performance standards are not being met at the immediate edge of the Landfill and Marshy Area cap. All other RAOs (see Section 4.1) have been attained.

The other remedial objectives of the Landfill and Marshy Area cap have been achieved by preventing direct exposure to waste and contaminated soils and controlling gas emissions. There is no indication that the cap is leaking, therefore the RAO of reducing or eliminating the generation of landfill leachate has also been met. The capping system is extremely stable and maintenance free (with the exception of grass mowing), with no areas of erosion or settlement.

As discussed above, all institutional controls as required by the ROD have been implemented

The groundwater beneath and immediately around the landfill has been reclassified by the State from Class III to Class IV. This was accomplished through a petition submitted by the VTDEC, at the request of PRPs, to the Secretary of the Agency of Natural Resources of the State of Vermont. This request was approved on November 6, 2003. The Reclassification prohibits the site groundwater from use as a domestic water supply and from irrigation, agricultural, and general industrial and commercial uses.

Operations and Maintenance. O&M activities continue at the Site. On May 27, 2010, with concurrence from VTDEC, EPA approved changing the SVE maintenance schedule from monthly to every two months. This change was made because, as noted in Section 6.4.1, the influent VOC concentrations to the SVE system have become quite stable since the operation of the system resumed. The monitoring wells are maintained as part of regular maintenance.

Opportunities for Optimization. As discussed in Section 6.4.1, in the past few years, the SVE system has been operated in a de facto pulse on/off mode. With each restart, initial influent concentrations are relatively elevated but within days, the concentrations drop down to the levels previously detected. Also as noted in Section 6.4.2, the groundwater plume has migrated beyond the area of influence of the SVE system. As a result of these two trends, expansion of the SVE system was assessed following the 2005 FYR. Expansion was screened out because the minimal thickness of the vadose zone downgradient of the SVE system and landfill compliance boundary would require extensive and continuous dewatering in order to expand the SVE system beyond its current location. Consequently, because optimization of the SVE system is not practical, other technologies are being evaluated in the FFS.

Indicators of Remedy Problems. The continued movement of elevated concentrations in the groundwater away from the landfill compliance boundary, though still within the institutional controls boundaries,

which are themselves within the Burgess property, is an indication of remedy problems.

Implementation of Institutional Controls. The required institutional controls were implemented prior to the 2005 Five-Year Review and remain in place.

7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels And Remedial Action Objectives (RAOs) Used At The Time Of Remedy Selection Still Valid?

Yes.

Changes in Standards and TBCs. As part of this five-year review, Applicable or Relevant and Appropriate Requirements (ARARs) and To Be Considered (TBC) guidance for the Site presented in the ROD were reviewed. and a review of current ARARs was conducted. As noted in the 2005 FYR, the arsenic MCL was lowered from 50 µg/L to 10 µg/L in 2001. Consequently, when a risk assessment is performed at the completion of Remedial Action, this MCL will be used to evaluate the protectiveness of the remedy. There have been no other changes in the chemical-specific ARARs (MCLs or VT GWPRS) nor any location or action-specific ARARs. ARARs identified in the 1998 ROD are included in Appendix B of this report for reference.

Changes in Exposure Pathways. The exposure assumptions used to develop the Human Health Risk Assessment included both current exposures (youth trespassers) and potential future exposures (adjacent resident (child & adult), youth trespasser, and excavation worker). All of these assumptions remain valid. The ROD identified only ingestion of overburden groundwater in a future residential use exposure pathway as an unacceptable risk. Municipal water system service is provided to residences and businesses in the area near the Burgess property. The institutional controls in place continue to prohibit residential use in the twelve acres that encompasses the three-acre Site and there is no evidence of any violations of these controls.

In November 2002, five years after the Human Health Risk Assessment was completed, EPA issued a draft guidance document entitled "Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils". While this potential route of exposure has been found at other sites where residences and businesses are located above groundwater plumes, this is not the case at the Burgess Brothers Site. As described earlier, the Site is located entirely within the Burgess Property and the closest structures are located a thousand feet or more from the edge of the groundwater plume. Additionally, the restrictive covenant prohibits use of the Site for residential properties. Therefore, there is no current complete vapor intrusion pathway at the Site. If in the future new development occurs at the Site, there will be a need to conduct a thorough vapor intrusion assessment to ensure that there is no exposure or if exposure exists, the risks are quantified to determine whether any follow-up actions are necessary.

Land use surrounding the Site has not changed since the 2005 Five-Year Review and is not expected to significantly change as the Burgess Brothers Construction Company continues to operate. Future development of the Site itself is restricted by the restrictive covenants and the Groundwater Reclassification Order.

Should institutional controls or land uses change in the future, an evaluation of dermal contact with and inhalation of contaminants in groundwater via household uses may be necessary. An evaluation of

subsurface soil exposures via direct contact (ingestion and dermal contact) would also be evaluated should any development be proposed. Similarly, EPA has set a lifetime drinking water health advisory of 300 ppb for manganese that is protective of a child receptor, resulting in an HI around 1 for a child, and this would be evaluated should institutional controls or land uses change in the future,

Changes in Toxicity and Other Contaminant Characteristics. A review of toxicity was done for the Contaminants of Concern identified in the ROD. With the changes in toxicity, cancer risk would likely increase for chloroform and PCE and decrease for 1,4-dichlorobenzene, methylene chloride, and TCE; non-cancer hazard would likely increase for 1,2-dichlorethane and 1,2-dichlorethene. The carcinogenic toxicity value was withdrawn for 1,1-dichloroethene so there is no cancer assessment for this contaminant. Although the toxicity changes would result in changes in the cumulative risk, the changes in toxicity do not have any significant impact on the current remedy and its current protectiveness of public health.

No other changes in toxicity or characteristics for other contaminants have been identified that would impact the protectiveness of the remedy.

Changes in Risk Assessment Methods. There have been no changes in risk assessment methods since 2005 FYR that affect the protectiveness of the remedy. Since the target cleanup levels for groundwater beyond the landfill compliance boundary are the MCLs and VT GWPRS rather than site-specific risk-based concentrations, changes in risk assessment methods would not affect the protectiveness of the remedy.

Expected Progress Towards Meeting RAOs. The RAOs, with the exceptions of preventing the migration of contaminated groundwater beyond the landfill compliance boundary and meeting surface water performance standards, have been met. Because the groundwater contamination has not been contained by the SVE system, (and thus continues to discharge to the surface water) and the extent of the remaining source within the landfill is unknown, a timeframe for achieving these RAOs cannot be estimated at this time.

7.3 Question C: Has Any Other Information Come To Light That Could Call Into Question The Protectiveness Of The Remedy?

Yes, new information has come to light, but it does not call into question the protectiveness of the remedy.

Subsequent to the 1998 ROD, information about the industry's use of 1,4-dioxane as a stabilizer during the manufacturing of 1,1,1-TCA became known to EPA. As 1,1,1-TCA is a Contaminant of Concern at the Site, it is possible that 1,4-dioxane may also be present. EPA has classified 1,4-dioxane as a Probable Human Carcinogen, recognizing the possibility that repeated exposure may increase the risk of developing cancer if contact rates are too high and occur for too long. A number of states have set drinking water guidelines ranging from 3 to 85 μg/L (Vermont has set its standard at 20 μg/L); no federal drinking water standard has been set. EPA's risk-based groundwater screening level for drinking water ingestion is 6.1 µg/L. Accordingly, sampling for 1,4-dioxane in groundwater will be necessary to assess this potential contaminant.

No other information beyond what has presented regarding the ongoing migration of contaminated groundwater has been discovered that would call into question the protectiveness of the remedy.

7.4 Technical Assessment Summary

Based on the data reviewed, observations from the site inspection, and interviews, the remedy is functioning as intended by the ROD with two exceptions. The Landfill and Marshy Area cap was constructed in 1999 and is stable. Institutional controls have been implemented such that exposure pathways are currently controlled. However, contaminated groundwater continues to migrate beyond the landfill compliance boundary and surface water in the immediate area of the Landfill and Marshy Area cap does not meet performance standards. As ingestion of contaminated groundwater was the only unacceptable exposure pathway identified in the ROD, the remedy is currently protective of human health and the environment, but it may not be in the long-term. Consequently, a Focused Feasibility Study is underway to address the migration of the contaminated groundwater with the goal of completing and implementing a ROD Amendment before the plume migrates beyond the institutional controls boundaries.

The primary ARARs for site groundwater are the MCLs and the VT GWPRS. These are not being met either at the landfill compliance boundary or in the groundwater downgradient of the landfill compliance boundary. They are being met at the institutional control boundaries

Land use surrounding the Site has not changed and is not expected to change significantly in the future. as the Burgess Brothers Construction Company continues to operate. Future development of the Site itself is restricted by the institutional controls and the Groundwater Reclassification Order.

8.0 ISSUES

The 2005 FYR identified two issues; these issues remain and are being addressed through a Focused Feasibility Study. This five-year review identifies one issue that was implicitly noted in the 2005 FYR as it is associated with the inability of the SVE/AS system to prevent migration of the contaminated groundwater: discharge to surface water that is above the performance standards. This five-year review also identified a potentially new issue, the possible presence of 1,4-dioxane, a chemical associated with the manufacture of 1,1,1-TCA which itself has been detected in the site groundwater.

Issues

Issues	Affects Current Protectiveness (Y/N)	Affects Future Protectiveness (Y/N)
SVE/AS not effective	N	Y
Groundwater plume beyond landfill compliance boundary continues to migrate	N	Y
Surface water performance standards not being met at the edge of the cap	N	N
Assess possible presence of 1,4-dioxane in groundwater	N	N

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

This five-year review did not identify any new issues that affect the protectiveness of the remedy. Recommendations for follow-up actions on the four issues identified in Section 8 are listed below.

Recommendations and Follow-up Actions

Issue	Recommendation and Follow-up Action	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
SVE not effective	Completion of the Focused Feasibility Study	PRPs	EPA VTDEC	2011	N	Y
Groundwater not meeting ICLs	Completion of the Focused Feasibility Study	PRPs	EPA VTDEC	2011	N	Y
Surface water not meeting PS	Completion of the Focused Feasibility Study	PRPs	EPA VTDEC	2011	N	N
Possible presence of 1,4-dioxane	Add 1,4-dioxane to groundwater monitoring program	PRPs	EPA VTDEC	2011	N	N

Upon completion of these follow-up actions, EPA will then develop a Proposed Plan that recommends a change in the remedy and issue a ROD Amendment that formally selects the new remedy.

10.0 PROTECTIVENESS STATEMENT

Based on the information gathered in support of this Five-Year Review, the following protectiveness statement is made: The remedy at the Burgess Brothers Superfund Site currently protects human health and the environment because exposure pathways for direct contact and groundwater ingestion have been controlled by the Landfill and Marshy Area cap and institutional controls, respectively. However, in order for the remedy to be protective in the long-term, the source control and groundwater remedies need to be reevaluated and new remedial approaches selected.

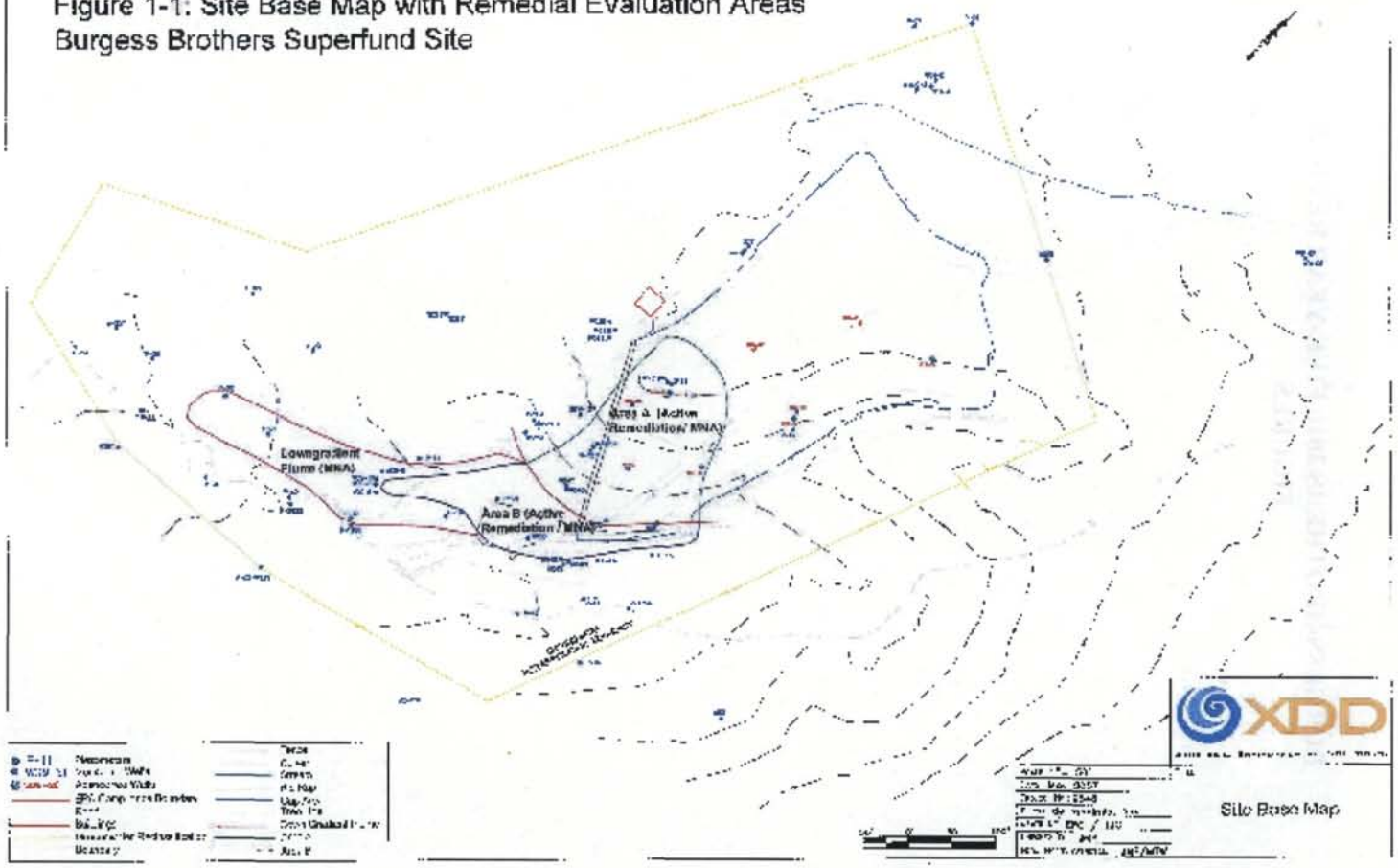
Because the remedial action is currently protective, the Site is protective of human health and the environment.

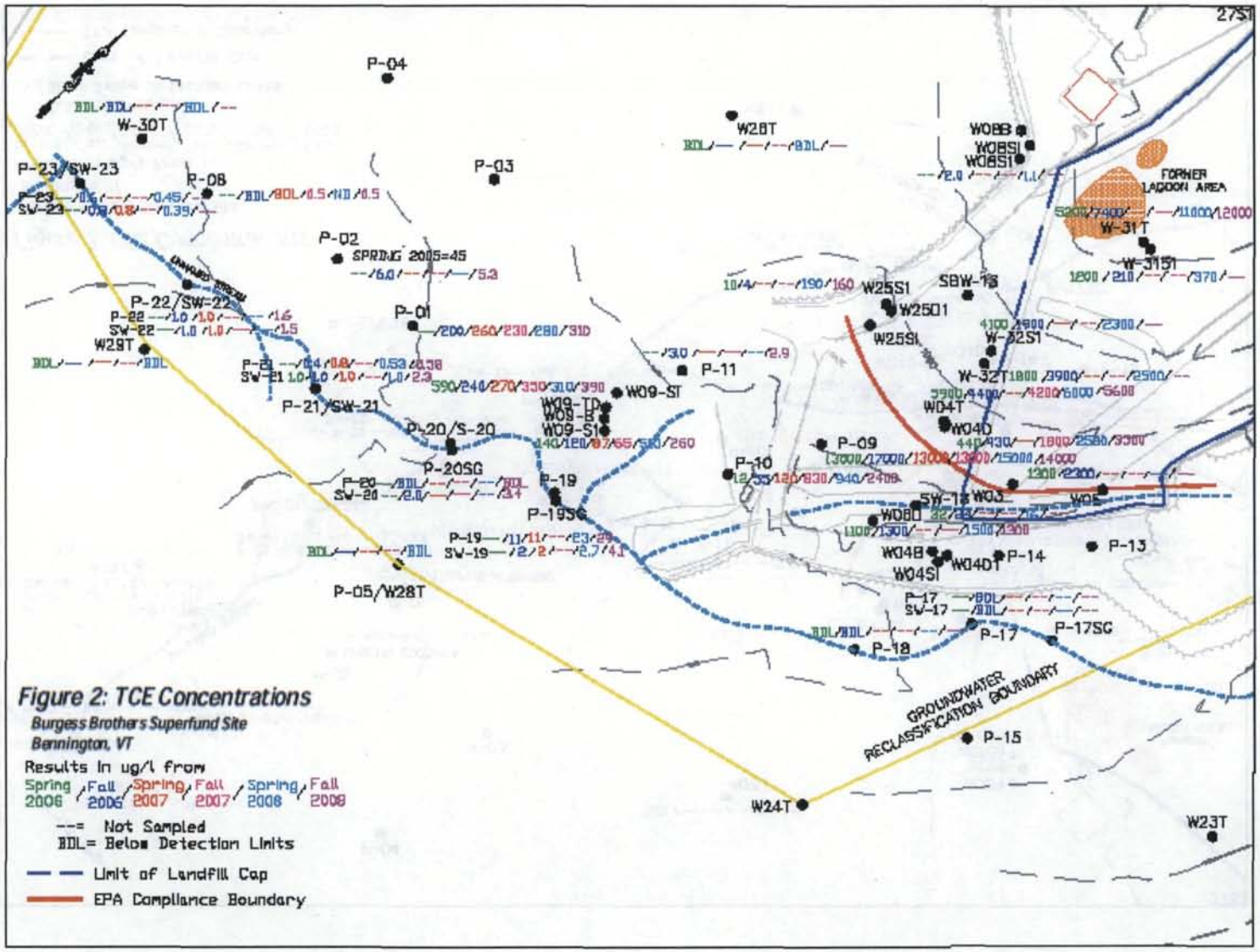
11.0 NEXT REVIEW

The next five-year review for the Burgess Brothers Superfund Site will be conducted in 2015. This review is required since hazardous wastes remain at the Site above levels that allow for unlimited use and unrestricted exposure.

BURGESS BROTHERS 2010 FIVE-YEAR REVIEW
FIGURES

Figure 1-1: Site Base Map with Remedial Evaluation Areas
Burgess Brothers Superfund Site




P-04
W-30T
P-23/SW-23
R-08
P-03
W28T
W08B
W08SI
W08S1
FORMER LAGOON AREA
W-31T
W-31S1
P-02
SPRING 2005=45
P-01
P-22/SW-22
W29T
P-21/SW-21
P-11
W09-ST
W09-TD
W09-B
W09-S1
P-20/S-20
P-20SG
P-19
P-19SG
P-05/W28T
W25S1
W25O1
W25SI
SBW-13
W-02S1
W-32T
W04T
W04O
P-09
P-10
SW-13
W03
W05
W08O
W04B
W04S
W04OT
P-14
P-13
P-17
P-17SG
P-18
GROUNDWATER RECLASSIFICATION BOUNDARY
P-15
W24T
W23T
Figure 2: TCE Concentrations
Burgess Brothers Superfund Site
Bennington, VT
Results in ug/l from
Spring 2006 / Fall 2006 / Spring 2007 / Fall 2007 / Spring 2008 / Fall 2008
--= Not Sampled
BDL= Below Detection Limits
Limit of Landfill Cap
EPA Compliance Boundary

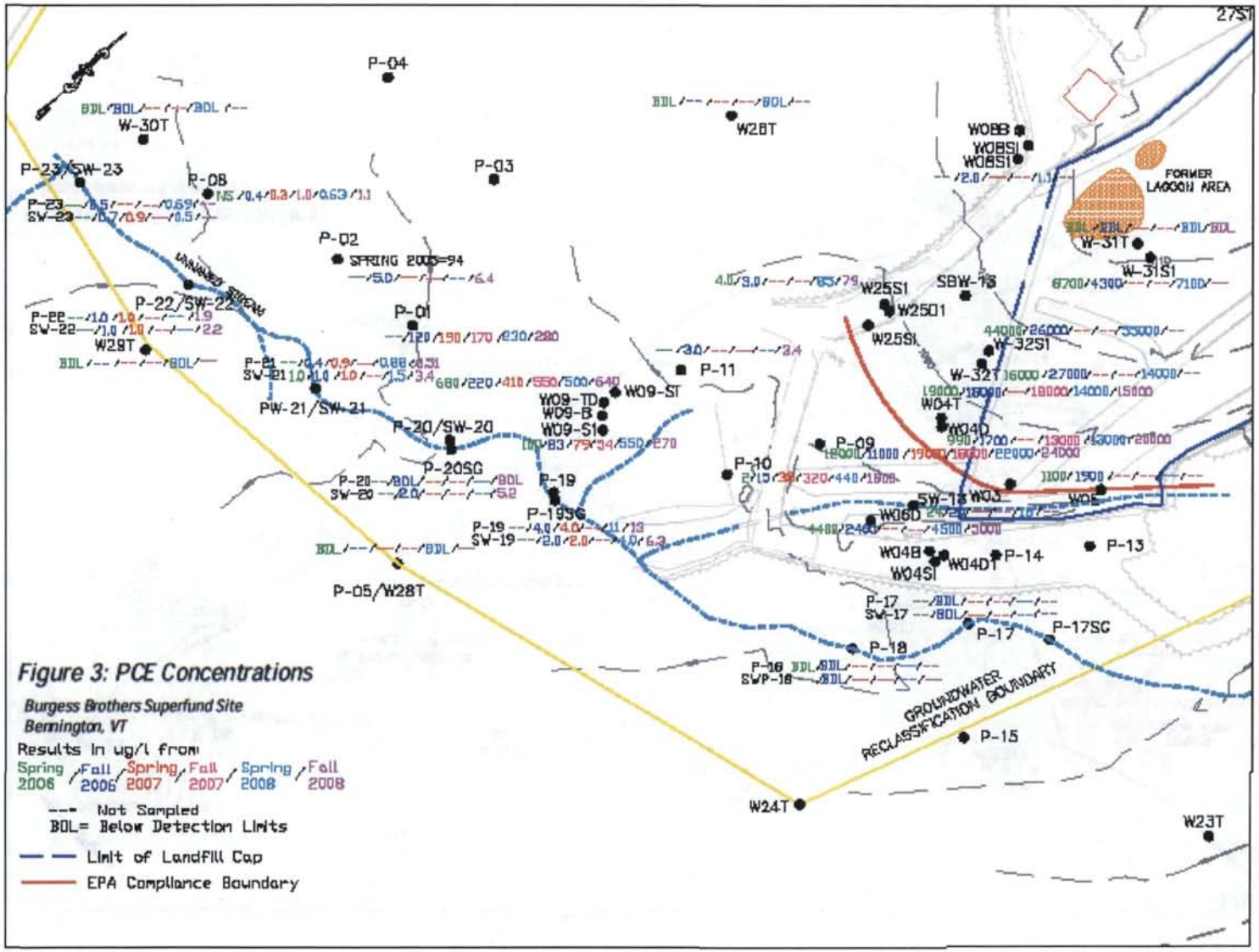
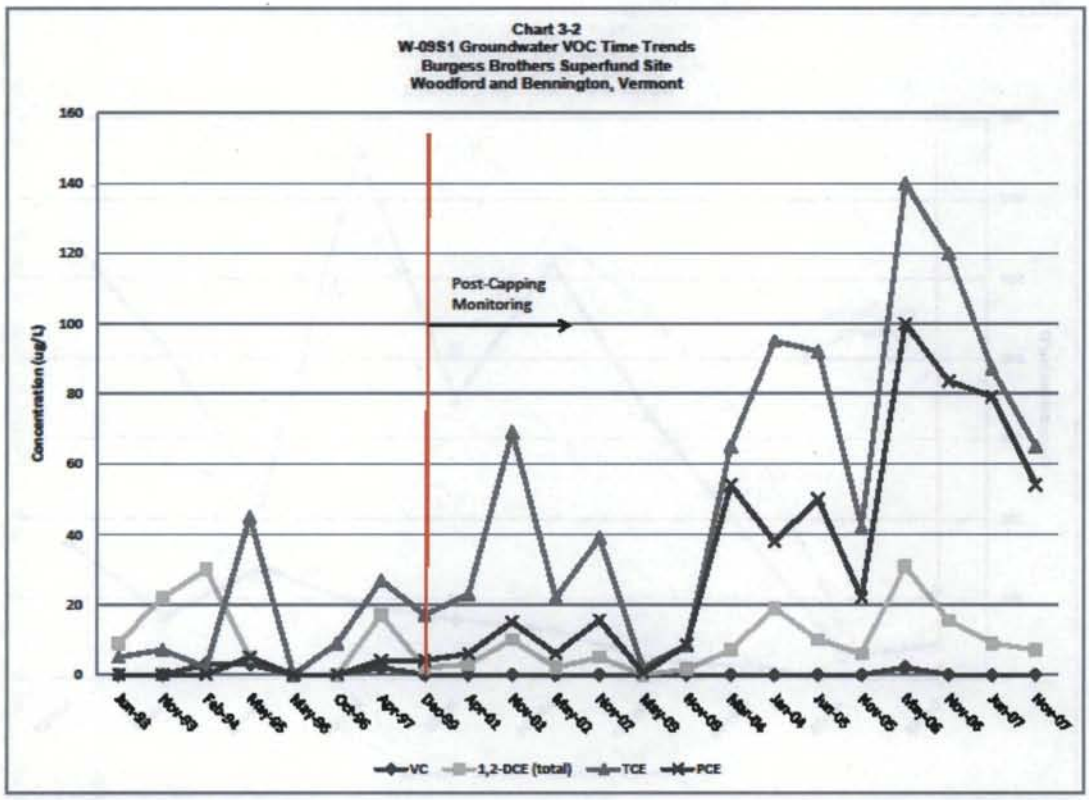


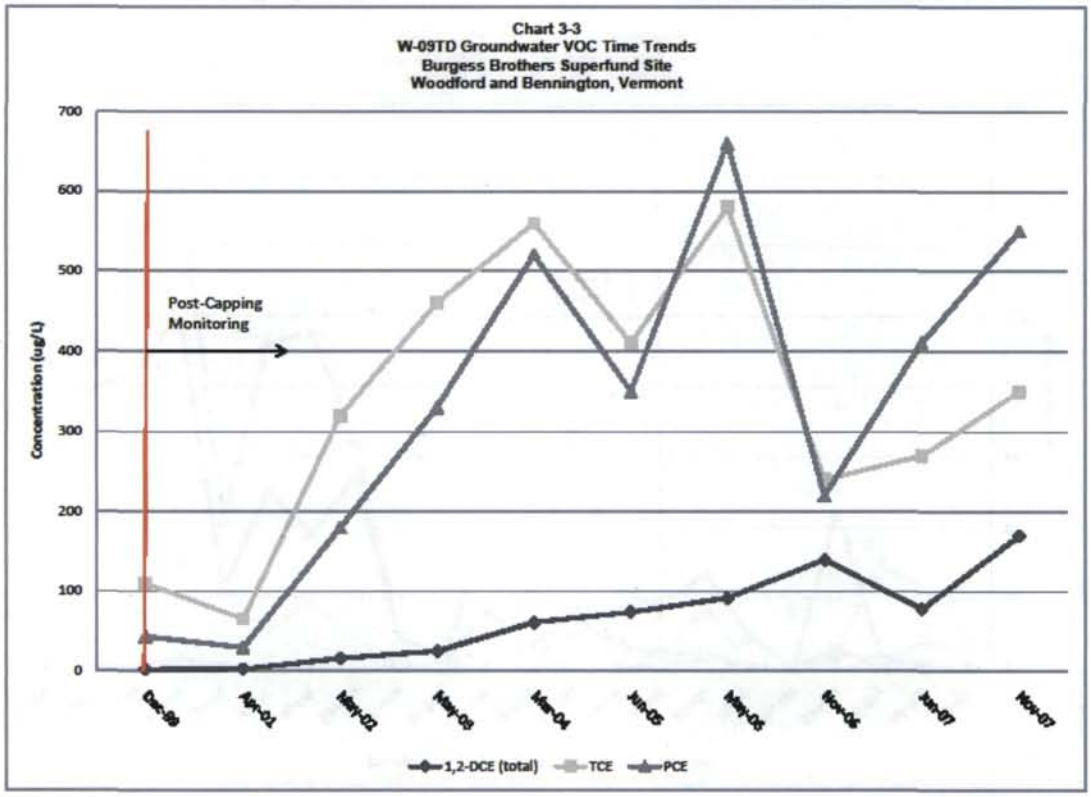
Figure 3: PCE Concentrations

Burgess Brothers Superfund Site
Bennington, VT

Results in ug/l from



NOTE: Landfill area was capped in December 1999.



NOTE: Landfill area was capped in 1999.

APPENDIX A: DOCUMENT REVIEW LIST

BURGESS BROTHERS 2010 FIVE-YEAR REVIEW

1. EPA, 1998. *Record of Decision, Burgess Brothers Superfund Site.* U.S. Environmental Protection Agency, Region 1, Boston, Massachusetts. September 1998

2. EPA, 2002. OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). November 29, 2002

3. EPA, 2005. *Five-Year Review.* U.S. Environmental Protection Agency, Region 1, Boston, Massachusetts. March 2005

4. EPA, 2005. Comments on Burgess 5 year follow-up report dated October 2005. U.S. Environmental Protection Agency, Region 1, Boston, Massachusetts. Oct 14, 2005

5. EPG, 2005. *Response to USEPA's Five-year Review Follow-up Requirements for the Burgess Brothers Superfund Site.* Environmental Partners Group, Inc. Quincy, Massachusetts. October 2005 (and Sept 30, 2005 cover letter from *de maximis, inc.*)

6. EPG, 2005. Responses to EPA's comments on *Response to USEPA's Five-year Review Follow-up Requirements for the Burgess Brothers Superfund Site* Environmental Partners Group, Inc. Quincy, Massachusetts. December 9, 2005

7. 2007, *Post-Closure Environmental Monitoring Report Spring 2005 (Round – 10)* Environmental Partners Group, Inc. Quincy, Massachusetts. June 2007

8. EPG, 2007, *Post-Closure Environmental Monitoring Report Round - 11 Fall 2005* Environmental Partners Group, Inc. Quincy, Massachusetts. June 2007

9. EPG, 2007, *SVE/Air Sparge System Operations Summary for Burgess Brothers Superfund Site* Environmental Partners Group, Inc. Quincy, Massachusetts. July 24 2007

10. EPG, 2008, *Post-Closure Environmental Monitoring Report Fall 2004 (Round – 9)* Environmental Partners Group, Inc. Quincy, Massachusetts. June 2008

11. EPG, 2008, *Post-Closure Environmental Monitoring Report Round 12 - Spring 2006* Environmental Partners Group, Inc. Quincy, Massachusetts. June 2008

12. EPG, 2008, *Post-Closure Environmental Monitoring Report Round 13 - Fall 2006* Environmental Partners Group, Inc. Quincy, Massachusetts. June 2008

13. EPG, 2008, *Post-Closure Environmental Monitoring Report Round 14 - Spring 2007* Environmental Partners Group, Inc. Quincy, Massachusetts. June 2008

14. EPG, 2008, *Post-Closure Environmental Monitoring Report Round 15 - Fall 2007* Environmental Partners Group, Inc. Quincy, Massachusetts. June 2008

15. EPG, 2008, *2005 and 2006 Operations and Maintenance Progress Report* Environmental Partners Group, Inc. Quincy, Massachusetts. June 24, 2008

16. EPG, 2008, *Post-Closure Environmental Monitoring Report Round 16 - Spring 2008)* Environmental Partners Group, Inc. Quincy, Massachusetts. November 2008

17. EPG, 2008, *Post-Closure Environmental Monitoring Report Round 17 - Fall 2008* Environmental Partners Group, Inc. Quincy, Massachusetts. December 2008

18. EPG, 2009, *Post-Closure Environmental Monitoring Report Round 18 - Spring 2009* Environmental Partners Group, Inc. Quincy, Massachusetts. June 2009

19. EPG, 2009, *2007 and 2008 Operations and Maintenance Progress Report* Environmental Partners Group, Inc. Quincy, Massachusetts. June 22, 2009

20. EPG, 2010, *Post-Closure Environmental Monitoring Report Round 19 – Fall 2009* Environmental Partners Group, Inc. Quincy, Massachusetts. June 2010

21. EPG, 2010, *SVE/Air Sparge System Operations Report June 2010* Environmental Partners Group, Inc. Quincy, Massachusetts. August 5, 2010

APPENDIX B: ARARS and TBCs

BURGESS BROTHERS 2010 FIVE-YEAR REVIEW

R Compliance: Alternative 2 – Capping and Lagoon Treatment/N al Attenuation
Feasibility Study

Burgess Brothers Superfund Site
Bennington and Woodford, Vermont

Type	*Medium*	*Requirements*	*Status*	*Synopsis of Requirements*	*Action to be Taken to Attain ARAR*
Chemical-Specific	Groundwater	Vermont Groundwater Protection Regulations (EPR 12-702)	Applicable, for Enforcement Standards	Establish primary groundwater quality standards. Enforcement standards are applicable. Preventative action limits are not an ARAR.	Groundwater quality would improve due to the treatment of the lagoon soils and construction of a multi-barrier cap over the landfill. Source remediation and natural degradation processes would reduce the concentrations to below the primary groundwater quality standards.
		Vermont Health Advisories	To Be Considered	Vermont developed health advisories as guidance criteria for drinking water in the absence of Federal Maximum Contaminant Levels.	Considered in selection of remedial alternative, and will be used in the absence of numerical standards.
		Federal Safe Drinking Water Act - Maximum Contaminated Levels (MCLs) for Organic and Inorganic Chemicals (40 CFR 141 Subparts B, G and I)	Relevant and Appropriate	MCLs have been promulgated for a number of common organic and inorganic chemicals and action levels for lead and copper. These levels regulate the concentration of contaminants in public drinking water supplies, but may also be considered appropriate for groundwater aquifers potentially used for drinking water.	Groundwater quality would improve due to the treatment of the lagoon soils and construction of a multi-barrier cap over the landfill. Source remediation and natural degradation processes would reduce the concentrations to below MCLs.
		Federal Safe Drinking Water Act - Maximum Contaminant Level Goals (MCLGs) for Organic and Inorganic Chemicals (40 CFR 151 Subpart F)	Relevant and Appropriate, if non-zero	Establishes MCLGs for organic and inorganic contaminants. MCLGs that are non-zero will be relevant and appropriate.	Groundwater quality would improve due to the treatment of the lagoon soils and construction of a multi-barrier cap over the landfill. Source remediation and natural degradation processes would reduce the concentrations to below MCLGs.

Type	*Medium*	*Requirements*	*Status*	*Synopsis of Requirements*	*Action to be Taken to Attain ARAR*
		EPA Reference Doses (RfDs) and EPA Carcinogen Assessment Group Potency Factors	To Be Considered	RfDs are dose levels EPA has developed for use in risk characterization due to non-carcinogens in various media. The Potency Factors are used to evaluate an acceptable risk from a carcinogen.	Considered in selection of remedial alternative, and will be used in the absence of numerical standards.
		EPA Health Advisories	To Be Considered	EPA publishes contaminant-specific health advisories that indicate the non-carcinogenic risks associated with consuming contaminated drinking water.	Considered in selection of remedial alternative, and will be used in the absence of numerical standards.
Location-Specific	Wetlands	Federal Executive Order on Protection of Wetlands (E.O. 11990, 40 CFR Part 6, Appendix A)	Applicable	Requires federal agencies to avoid impacts associated with the destruction or loss of wetlands, minimize potential harm, preserve and enhance wetlands, and avoid support of new construction in wetlands if a practicable alternative exists.	Impacted wetlands would be restored or replicated.
		Federal Fish and Wildlife Coordination Act (16 USC 661 et. seq.) 40 CFR Part 6	Applicable	Establishes requirements for a consultation with U.S. Fish and Wildlife Service and state wildlife agencies to mitigate losses of fish and wildlife that result from modification of a water body.	Fish and Wildlife Service has been consulted regarding potential impacts to water bodies.
		Federal Clean Water Act (33 USC 1344), US Army Corps of Engineers Nationwide Permit Program (33 CFR Part 330), and Federal Guidelines for Specification of Disposal Sites" (40 CFR Part 230)	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative that has less effect is available. The requirements also describe actions to minimize adverse impacts.	Permit conditions would be evaluated during pre-design. Impacted wetlands will be restored or replicated.

Type	Medium	Requirements	Status	Synopsis of Requirements	Action to be Taken to Attain ARAR
Action-Specific	Air	Vermont Air Pollution Control Regulations (10 VSA Section 551 et. seq. EPR 5-101, 5-211, 5-231to 5-252, 5-253.20, 5-261, 5-301 to 5-311, 5-501 to 5-502, and 5-1010)	Applicable	Establishes air quality standards and allowable discharges.	SVE/air sparge system and system generator would be designed to satisfy discharge limits.
		Federal RCRA Air Emission Standards for Equipment Leaks, 40 CFR Part 264, Subpart BB	Applicable, if threshold limits are exceeded	Standards for air emissions for equipment that contains or contacts RCRA wastes with organic concentrations of at least 10% by weight.	SVE/air sparge system would be designed to satisfy emission standards if threshold limits are exceeded.
		Federal RCRA Air Emission Standards for Process Vents, 40 CFR Part 264, Subpart AA	Applicable, if threshold limits are exceeded	Standards for air emissions from process vents associated with distillation, fractionation, thin film evaporation, column extraction or air steam stripping operations that treat RCRA substances and have total organic concentrations of 10 ppm or greater.	SVE/air sparge system would be designed to satisfy emission standards if threshold limits are exceeded.
		Federal Clean Air Act - Non-Methane Organic Compounds (40 CFR Part 60 Subpart WWW)	Relevant and Appropriate, if threshold limits are exceeded	Regulations require NMOC-specific gas collection and control systems, monitoring, and gas generation estimates. The rule establishes a performance standard for NMOCs emissions of greater than 50 megagrams/year from municipal solid waste landfills.	Landfill gas venting system would be designed to satisfy performance standards if threshold limits are exceeded.
	Groundwater	Vermont Groundwater Protection Regulations (10 VSA Chapter 48, EPR 12-704 and 12-705)	Applicable	Establish standards and requirements for groundwater monitoring.	The groundwater monitoring program would be designed to satisfy these requirements.

Type	Medium	Requirements	Status	Synopsis of Requirements	Action to be Taken to Attain ARAR
	Surface Water	Vermont Water Quality Standards (10 VSA Chapter 47, EPR Sections 1-04, 2-01, 2-02, 2-03, 2-05, 3-01, 3-03, 3-04, and Appendix C and D)	Relevant and Appropriate	Outlines criteria for discharging to surface waters, such as dissolved oxygen, temperature, nutrients, pH, and alkalinity, and outlines water quality criteria for protection of aquatic biota.	Source control measures would control erosion, runoff and contaminant migration and thereby improve surface water quality over time. Water Quality Standards will be used to measure the effectiveness of source control measures.
		Federal Clean Water Act - Ambient Water Quality Criteria	Relevant and Appropriate	Pursuant to Section 304(a)(1) of the Clean Water Act, the EPA establishes Ambient Water Quality Criteria. These criteria present scientific data and guidance on the environmental effects of pollutants. The criteria can contribute to establishing regulatory requirements that govern impacts to water quality.	Source control measures would control erosion, runoff and contaminant migration and thereby improve surface water quality over time. Water Quality Criteria will be used to measure the effectiveness of source control measures.
	Sediment	Ontario Ministry of the Environment Sediment Quality Guidelines	To be Considered	The Sediment Quality Guidelines present scientific data and guidance on the environmental effects of pollutants. The criteria can contribute to establishing requirements that govern impacts to sediment quality.	Sediment quality would improve due to the presence of a cap. However, existing inorganic concentrations would not change significantly. Sediment Quality Guidelines will be used to measure the effectiveness of source control measures.
	Landfill Material	Federal RCRA Subtitle C, Regulations, 40 CFR Part 264 Subpart N - Landfills, Section 264.310 *	Relevant and Appropriate	Requirements for Hazardous Waste landfill closure.	Landfill cap design and construction would satisfy requirements.

Type	*Medium*	*Requirements*	*Status*	*Synopsis of Requirements*	*Action to be Taken to Attain ARAR*
		Federal RCRA Subtitle C Regulations, 40 CFR Part 264 Subpart B - General Facility Standards, Section 264.19 *	Relevant and Appropriate	Requirements for developing a Construction Quality Assurance Program for final cover system.	Landfill cap construction would satisfy requirements.
		Federal RCRA Subtitle C Regulations, 40 CFR Part 264 Subpart F - Releases from Solid Waste Management Units, Sections 264.95, 264.96(a) and (c), 264.97, 264.98 and 264.99 *	Relevant and Appropriate	Groundwater monitoring requirements and compliance points for determining the need for additional monitoring and corrective action.	The groundwater monitoring program would be designed to satisfy these requirements.
		Federal RCRA Subtitle C Regulations, 40 CFR Part 264 Subpart G - Closure and Post Closure, Sections 264.111, 264.114, and 264.117 *	Relevant and Appropriate	Establishes performance standards for closure of hazardous waste landfills and groundwater monitoring.	Landfill closure and post-closure requirements would be satisfied.
		USEPA Technical Guidance Document: *Final Covers on Hazardous Waste Landfills and Surface Impoundments* (EPA/530-SW-89-047)	To Be Considered	Presents technical specifications for the design of multi-barrier covers at landfills at which hazardous wastes were disposed.	Guidance would be considered during design of landfill cap.
		USEPA Technical Guidance Document: Construction Quality Management for Remedial Action and Remedial Design Waste Containment Systems (EPA/540/R-92/073, October 1992)	To Be Considered	Presents technical specifications for the design of multi-barrier covers at landfills at which hazardous wastes were disposed.	Guidance would be considered during design of landfill cap.

Type	Medium	Requirements	Status	Synopsis of Requirements	Action to be Taken to Attain ARAR
		USEPA Technical Guidance Document: QA and QC for Waste Containment Facilities (EPA/600/R-93/182, September 1993)	To Be Considered	Presents technical specifications for the design of multi-barrier covers at landfills at which hazardous wastes were disposed.	Guidance would be considered during design of landfill cap.
		USEPA Technical Guidance Document: Alternative Cap Design Guidance for Unlined Hazardous Waste Landfills, EPA Region I, September 30, 1997.	To Be Considered	Presents technical specifications for the design of multi-barrier covers at landfills at which hazardous wastes were disposed.	Guidance would be considered during design of landfill cap.

* RCRA requirements are made effective by the Vermont Hazardous Waste Regulations (EPR 7-502).

APPENDIX C: SITE INSPECTION CHECKLIST and PHOTOGRAPHS

BURGESS BROTHERS 2010 FIVE-YEAR REVIEW

Five-Year Review Site Inspection Checklist (Template)

I. SITE INFORMATION	
Site name: Burgess Brothers Landfill Superfund Site	**Date of inspection: May 25, 2010**
Location and Region: Bennington/Woodford VT Region 1	**EPA ID: VTD003965415**
Agency, office, or company leading the five-year review: EPA Region 1	**Weather/temperature: Sixties and Sunny**

Remedy Includes: (Check all that apply)

- X Landfill cover/containment
- X Access controls
- X Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____
- X Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** _____ _____ _____
   Name Title Date
   Interviewed X at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** _____ _____ _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; ☐ Report attached _____
_____

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

X O&M manual	X Readily available	X Up to date	☐ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☐ N/A

Remarks

2. **Site-Specific Health and Safety Plan** X Readily available ☐ Up to date ☐ N/A
   ☐ Contingency plan/emergency response plan X Readily available ☐ Up to date ☐ N/A
   Remarks

3. **O&M and OSHA Training Records** ☐ Readily available ☐ Up to date ☐ N/A
   Remarks

4. **Permits and Service Agreements**

☐ Air discharge permit	☐ Readily available	☐ Up to date	X N/A
☐ Effluent discharge	☐ Readily available	☐ Up to date	X N/A
☐ Waste disposal, POTW	☐ Readily available	☐ Up to date	X N/A
☐ Other permits	☐ Readily available	☐ Up to date	X N/A

Remarks

5. **Gas Generation Records** ☐ Readily available ☐ Up to date X N/A
   Remarks

6. **Settlement Monument Records** ☐ Readily available ☐ Up to date X N/A
   Remarks

7. **Groundwater Monitoring Records** X Readily available ☐ Up to date ☐ N/A
   Remarks: Semi-annual reports submitted to agencies

8. **Leachate Extraction Records** ☐ Readily available ☐ Up to date X N/A
   Remarks

9. **Discharge Compliance Records**

X Air	☐ Readily available	☐ Up to date	☐ N/A
☐ Water (effluent)	☐ Readily available	☐ Up to date	X N/A

Remarks: Submitted in O&M reports

10. **Daily Access/Security Logs** ☐ Readily available ☐ Up to date ☐ N/A
    Remarks

IV. O&M COSTS

1. **O&M Organization**

☐ State in-house ☐ Contractor for State
☐ PRP in-house X Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
☐ Other_____

2. **O&M Cost Records**

☐ Readily available ☐ Up to date **X Not readily available; requested from PRPs**
☐ Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐ Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐ Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS X Applicable ☐ N/A

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map X Gates secured ☐ N/A
Remarks: Fence in good repair

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
Remarks: Sign-in required at Burgess Brothers Construction Company office

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐ Yes **X** No ☐ N/A
Site conditions imply ICs not being fully enforced ☐ Yes **X** No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by): Self-reporting; Site is entirely within property owned and operated by one of the PRPs and as observed by PRPs' consultants
Frequency: As needed
Responsible party/agency: PRPs' consultants: de maximis and EPG, Inc.
Contact Geoff Siebel May 25, 2010
Name Title Date Phone no.

Reporting is up-to-date **X** Yes ☐ No ☐ N/A
Reports are verified by the lead agency **X** Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met **X** Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☐ No **X** N/A
Other problems or suggestions: ☐ Report attached

2. **Adequacy** **X** ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks: The Site is located on 3 acres that are entirely encompassed by 12 acres on which there are two institutional controls. The 12 acres are themselves entirely located within the PRP's 60 acre property.

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map **X** No vandalism evident

Remarks

2. **Land use changes on site:** **X** N/A

Remarks

3. **Land use changes off site:** **X** N/A

Remarks

VI. GENERAL SITE CONDITIONS

A. Roads **X** Applicable ☐ N/A

1. **Roads damaged** ☐ Location shown on site map **X** Roads adequate ☐ N/A

Remarks

B. Other Site Conditions

Remarks

VII. LANDFILL COVERS X Applicable ☐ N/A

A. Landfill Surface

1. **Settlement** (Low spots) ☐ Location shown on site map **X** Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Cracks** ☐ Location shown on site map **X** Cracking not evident
   Lengths_____ Widths_____ Depths_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map **X** Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Holes** ☐ Location shown on site map **X** Holes not evident
   Areal extent_____ Depth_____
   Remarks_____

5. **Vegetative Cover** **X** Grass **X** Cover properly established **X** No signs of stress
   ☐ Trees/Shrubs (indicate size and locations on a diagram)
   Remarks_____

6. **Alternative Cover (armored rock, concrete, etc.)** **X** N/A
   Remarks_____

7. **Bulges** ☐ Location shown on site map **X** Bulges not evident
   Areal extent_____ Height_____
   Remarks_____

8. **Wet Areas/Water Damage** X Wet areas/water damage not evident
☐ Wet areas ☐ Location shown on site map Areal extent_____
☐ Ponding ☐ Location shown on site map Areal extent_____
☐ Seeps ☐ Location shown on site map Areal extent_____
☐ Soft subgrade ☐ Location shown on site map Areal extent_____
Remarks_____

9. **Slope Instability** ☐ Slides ☐ Location shown on site map X No evidence of slope instability
Areal extent_____
Remarks_____

B. Benches ☐ Applicable X N/A
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. **Flows Bypass Bench** ☐ Location shown on site map X N/A or okay
Remarks_____

2. **Bench Breached** ☐ Location shown on site map X N/A or okay
Remarks_____

3. **Bench Overtopped** ☐ Location shown on site map X N/A or okay
Remarks_____

C. Letdown Channels X Applicable ☐ N/A
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. **Settlement** ☐ Location shown on site map X No evidence of settlement
Areal extent_____ Depth_____
Remarks: Swales were constructed to direct surface water runoff from the cap. These were constructed across the side slopes (the side slopes are not particularly steep, less than a 3:1 grade)

2. **Material Degradation** ☐ Location shown on site map X No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. **Erosion** ☐ Location shown on site map X No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. **Undercutting** ☐ Location shown on site map **X** No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. **Obstructions** Type_____ **X** No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. **Excessive Vegetative Growth** Type_____
X No evidence of excessive growth
X Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks: Vegetation in swales annual, non-woody plants (otherwise called weeds)

D. Cover Penetrations **X** Applicable ☐ N/A

1. **Gas Vents** ☐ Active **X** Passive
☐ Properly secured/locked **X** Functioning **X** Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. **Gas Monitoring Probes**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. **Monitoring Wells** (within surface area of landfill)
X Properly secured/locked **X** Functioning **X** Routinely sampled **X** Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

4. **Leachate Extraction Wells**
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance **X** N/A
Remarks_____

5. **Settlement Monuments** ☐ Located ☐ Routinely surveyed **X** N/A
Remarks_____

E. Gas Collection and Treatment: ☐ Applicable **X** N/A

1. **Gas Treatment Facilities**
   ☐ Flaring ☐ Thermal destruction ☐ Collection for reuse
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Gas Collection Wells, Manifolds and Piping**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Gas Monitoring Facilities** (*e.g.*, gas monitoring of adjacent homes or buildings)
   ☐ Good condition ☐ Needs Maintenance ☐ N/A
   Remarks_____

F. Cover Drainage Layer **X** Applicable ☐ N/A

1. **Outlet Pipes Inspected** ☐ Functioning ☐ N/A
   Remarks_____

2. **Outlet Rock Inspected** ☐ Functioning ☐ N/A
   Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable **X** N/A

1. **Siltation** Areal extent_____ Depth_____ ☐ N/A
   ☐ Siltation not evident
   Remarks_____

2. **Erosion** Areal extent_____ Depth_____
   ☐ Erosion not evident
   Remarks_____

3. **Outlet Works** ☐ Functioning ☐ N/A
   Remarks_____

4. **Dam** ☐ Functioning ☐ N/A
   Remarks_____

H. Retaining Walls ☐ Applicable **X** N/A

1. **Deformations** ☐ Location shown on site map ☐ Deformation not evident
   Horizontal displacement_____ Vertical displacement_____
   Rotational displacement_____
   Remarks_____

2. **Degradation** ☐ Location shown on site map ☐ Degradation not evident
   Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable **X** N/A

1. **Siltation** ☐ Location shown on site map ☐ Siltation not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Vegetative Growth** ☐ Location shown on site map ☐ N/A
   ☐ Vegetation does not impede flow
   Areal extent_____ Type_____
   Remarks_____

3. **Erosion** ☐ Location shown on site map ☐ Erosion not evident
   Areal extent_____ Depth_____
   Remarks_____

4. **Discharge Structure** ☐ Functioning ☐ N/A
   Remarks_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable **X** N/A

1. **Settlement** ☐ Location shown on site map ☐ Settlement not evident
   Areal extent_____ Depth_____
   Remarks_____

2. **Performance Monitoring** Type of monitoring_____
   ☐ Performance not monitored
   Frequency_____ ☐ Evidence of breaching
   Head differential_____
   Remarks_____

IX. GROUNDWATER/SURFACE WATER REMEDIES X*Applicable ☐ N/A

*** In addition to the Landfill and Marshy Area cap, a Soil Vapor Extraction/Air Sparging system was constructed and operated for about two years after which the air sparging component was shut down. Since the SVE/AS system includes extraction wells, pumps, and piping, Section IX.A will be used to describe this component of the remedy.**

A. Groundwater Extraction Wells, Pumps, and Pipelines X Applicable ☐ N/A

1. **Pumps, Wellhead Plumbing, and Electrical**
   X Good condition X All required wells properly operating ☐ Needs Maintenance ☐ N/A
   Remarks: Two vapor extraction wells operate continuously, other four periodically.

2. **Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   X Good condition ☐ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   X Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable X N/A

1. **Collection Structures, Pumps, and Electrical**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

2. **Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances**
   ☐ Good condition ☐ Needs Maintenance
   Remarks_____

3. **Spare Parts and Equipment**
   ☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided
   Remarks_____

C. Treatment System X Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
   ☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
   ☐ Air stripping X Carbon adsorbers
   ☐ Filters_____
   ☐ Additive (*e.g.*, chelation agent, flocculent)_____
   ☐ Others_____
   ☐ Good condition ☐ Needs Maintenance
   ☐ Sampling ports properly marked and functional
   ☐ Sampling/maintenance log displayed and up to date
   ☐ Equipment properly identified
   ☐ Quantity of groundwater treated annually_____
   ☐ Quantity of surface water treated annually_____
   Remarks_____

2. **Electrical Enclosures and Panels** (properly rated and functional)
   ☐ N/A X Good condition ☐ Needs Maintenance
   Remarks_____

3. **Tanks, Vaults, Storage Vessels**
   ☐ N/A X Good condition ☐ Proper secondary containment ☐ Needs Maintenance
   Remarks: System has six granular activated carbon containers

4. **Discharge Structure and Appurtenances**
   ☐ N/A X Good condition ☐ Needs Maintenance
   Remarks_____

5. **Treatment Building(s)**
   ☐ N/A X Good condition (esp. roof and doorways) ☐ Needs repair
   X Chemicals and equipment properly stored
   Remarks_____

6. **Monitoring Wells** (pump and treatment remedy)
   X Properly secured/locked X Functioning X Routinely sampled X Good condition
   X All required wells located ☐ Needs Maintenance ☐ N/A
   Remarks_____

D. Monitoring Data

1.01_ Monitoring Data
   X Is routinely submitted on time X Is of acceptable quality

1.02_ Monitoring data suggests:
   ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)

X Properly secured/locked X Functioning X Routinely sampled X Good condition
X All required wells located ☐ Needs Maintenance ☐ N/A
Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).
See Sections 4-7 of text for discussion on effectiveness of remedy and functioning as designed issue.

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.
O&M procedures for the SVE system are sufficient for the maintenance of the system. As noted in Section 7 of the text, the SVE system by itself does not provide current or long-term protectiveness.

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. Not applicable
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. EPA, VTDEC, and the PRPs are evaluating alternative technologies to implement in order to provide long-term protectiveness. A ROD amendment is expected in fiscal year 2011.