THIRD FIVE-YEAR REVIEW REPORT
PETERSON/PURITAN, INC. SUPERFUND SITE
OPERABLE UNIT 1
TOWNS OF CUMBERLAND AND LINCOLN
PROVIDENCE COUNTY, RHODE ISLAND
SEPTEMBER 2012

US Army Corps of Engineers®
New England District

Prepared by:

Army Corps of Engineers
Engineering/Planning Division,
New England District
Concord, MA

Prepared for:

U.S. EPA
Region 1
Boston, MA

Approved by:

James T. Owens III, Director
U.S.EPA, Region 1
Office of Site Remediation and Restoration

Date:

9/24/12

EXECUTIVE SUMMARY

A five-year review was performed for the Peterson/Puritan, Inc. Superfund Site in Cumberland and Lincoln, Rhode Island (Site) as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) when hazardous substances are left onsite that do not allow unrestricted use of a site. The purpose of this third five-year review is to assess whether the remedy selected for Operable Unit 1 (OU-1) of the Site remains protective of human health and the environment. Also, where pertinent, this report includes information on progress in select areas of the Site beyond OU-1. This third five-year review covers the period from September 2007 to September 2012.

The Site encompasses over two miles of mixed industrial/residential property in the towns of Cumberland and Lincoln, Rhode Island. The Site is situated in the north-central portion of Rhode Island along the Blackstone River and includes a portion of the Blackstone River Valley National Heritage Corridor between the Ashton Dam to the north, and the Pratt Dam to the south along the river's course. To address the various environmental issues efficiently, the Site is broken into sub-areas defined as Operable Units (OUs). There are currently two OUs: OU-1(Primary Source Area), and OU-2 (J. M. Mills Landfill and the associated parcels south of OU-1), and there remains a third area under consideration known as the "potential" OU-3 area (Mackland Farm/Kelly House, north of OU-1). The Site also includes the Lincoln Quinnville Well field and the Cumberland Lenox Street municipal well. These wells were used by the towns of Lincoln and Cumberland as a municipal water supply until 1979 when they were closed by the Rhode Island Department of Health due to the presence of chlorinated volatile organic compounds (CVOCs) in the water. EPA included the Site on the Superfund National Priorities List on September 8, 1983. Issues related to OU-2 will be addressed in a future Decision Document, and are not included in this five-year review report.

The Record of Decision (ROD) apportioned the OU-1 remedy to two areas, CCL Custom Manufacturing (CCL) and Pacific Anchor Chemical (PAC) Remediation Areas, each with a source area and downgradient area within them. In the PAC Source Area, the Settling Defendants (SDs) implemented source control through excavation and removal, complemented by an active source control oxidation system. With only limited success in permanently reducing arsenic concentrations and meeting cleanup goals, the oxidation system was decommissioned in 2000. At the request of the PAC SDs, EPA is considering a modification of the remedy for the remaining dissolved arsenic for this area to exclude the active source control oxidation system from the remedy, leaving the excavation source control measure with monitored natural attenuation (MNA). Within the CCL Source Area, the enhanced source control and management of migration appears to be containing the plume and reducing source mass, but at a slower rate than anticipated in the original Record of Decision (ROD) and Consent Decree (CD). Based on the nature of the release(s) at the CCL Source Area, dense non-aqueous phase liquid source material (i.e., residual DNAPL) may reside in the saturated overburden and possibly within the shallow bedrock beneath the tank farm, acting as a continuing source of groundwater contamination for the foreseeable future. Thus, the persistence of relatively high VOC concentrations in groundwater after more than 15 years of groundwater extraction suggests that continued operation of the source area extraction system may not achieve the ROD cleanup levels of MCLs without additional remediation enhancements/modifications.

A protectiveness determination for the remedy at OU-1 cannot be made at this time until further information is obtained. Further information will be obtained to determine protectiveness in the short term by completing the ongoing vapor intrusion assessment at the CCL Source Area and determining whether or not potential risk due to VI exists. It is expected that these actions will take approximately six months to complete, at which time a protectiveness determination will be made.

For other elements of the groundwater component of the remedy at OU-1, the following facts should be noted for protectiveness in the short term:

- alternative water supplies are available to meet current demand, and
- some ICs have been formally implemented.

However, in order for the groundwater component of the remedy to be protective in the long term, the following issues need to be addressed: a) arsenic concentrations above the MCL of 10 µg/L , b) the potential persistence of residual DNAPL at the CCL Source Area further extending the cleanup time frame, c) evaluate extraction/treatment systems, and d) ICs, which are not fully implemented throughout OU-1, need to be completed.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: Peterson/Puritan Inc. Superfund Site		
EPA ID: RID055176283, Site ID# 0101247		
Region: 1	**State:** RI	**City/County:** Cumberland and Lincoln, Providence County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:** Click here to enter text.
Author name (Federal or State Project Manager): David J. Newton, USEPA (Lead); Daniel Groher, USACE (Support)
Author affiliation: U.S. Environmental Protection Agency, and USACE New England District
Review period: 10/01/2007 – 09/30/2012
Date of site inspection: 04/12/2012
Type of review: Statutory
Review number: 3
Triggering action date: September 26, 2007
Due date *(five years after triggering action date)*: September 26, 2012

Five-Year Review Summary Form (continued)

The table below is for the purpose of the summary form and associated data entry and does not replace the two tables required in Section VIII and IX by the FYR guidance. Instead, data entry in this section should match information in Section VII and IX of the FYR report.

Issues/Recommendations

OU(s) without Issues/Recommendations Identified in the Five-Year Review:
None

Issues and Recommendations Identified in the Five-Year Review:

OU(s): 1	**Issue Category: Remedy Performance**			
	Issue: Arsenic in groundwater of the PAC area remains above the drinking water standard.			
	Recommendation: Pursue potential decision document revision for PAC Source Area to exclude further active oxidation treatment from the remedy for this area, leaving excavation source control measures with MNA. Perform the necessary monitoring to ensure that MNA is achieving the goals for the site.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	4th fiscal quarter 2013
OU(s): 1	**Issue Category: Remedy Performance**			
	Issue: CVOCs remain above drinking water standards for the CCL Remediation Area and, using the current CCL Source Area remedy, will not meet remediation goals within an acceptable timeframe as described in the ROD.			
	Recommendation: Develop revised estimate of remediation timeframe for the CCL Source Area to achieve ROD specified treatment goals. Evaluate potential presence of residual DNAPL in the CCL Source Area. Develop a plan to enhance/modify the remediation system to achieve the treatment goals in a reasonable timeframe.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	3rd fiscal quarter 2016
OU(s): 1	**Issue Category: Institutional Controls**			
	Issue: Institutional controls are not fully implemented, access agreements to some properties are not documented, lapsed, or have not been obtained.			
	Recommendation: Implement and maintain all institutional control agreements on all appropriate parcels, and secure access for all OU-1 parcels.			

Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	PRP	EPA/State	2nd fiscal quarter 2015
OU(s): 1	**Issue Category: Remedy Performance**			
	Issue: Vapor intrusion to occupied structures is a potential concern in the CCL Source Area.			
	Recommendation: Complete vapor intrusion pathway assessment, and develop ongoing VI monitoring, if needed.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	PRP	EPA/State	3rd fiscal quarter 2013
OU(s): 1	**Issue Category: Site Access/Security**			
	Issue: The Quinnville wellheads are not properly secured and are vulnerable to vandalism and potential groundwater contamination.			
	Recommendation: Work with water commission to approve a plan to secure the wellheads and complete ICs for property.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
Yes	Yes	Other/Town of Lincoln	State/EPA	2nd fiscal quarter 2014
OU(s): 1	**Issue Category: Remedy Performance**			
	Issue: CCL SD considering modification of the downgradient groundwater extraction system to remove some groundwater extraction wells and install a new extraction well near the MW-501 well cluster.			
	Recommendation: Develop a plan and use groundwater modeling to support changes to the pumping regime. Consider impact of flood mitigation measure being developed by USACE.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	PRP	EPA/State	2nd fiscal quarter 2015

Protectiveness Statement(s)
Include each individual OU protectiveness determination and statement. If you need to add more protectiveness determinations and statements for additional OUs, copy and paste the table below as many times as necessary to complete for each OU evaluated in the FYR report.

Operable Unit:	*Protectiveness Determination:*	*Addendum Due Date (if applicable):*
1	Protectiveness Deferred	March 29, 2013

Protectiveness Statement:

A protectiveness determination for the remedy at OU-1 cannot be made at this time until further information is obtained. Further information will be obtained to determine protectiveness in the short term by completing the ongoing vapor intrusion assessment at the CCL Source Area and determining whether or not potential risk due to VI exists. It is expected that these actions will take approximately six months to complete, at which time a protectiveness determination will be made. For other elements of the groundwater component of the remedy at OU-1, the following facts should be noted for protectiveness in the short term: 1) alternative water supplies are available to meet current demand, and 2) some ICs have been formally implemented. However, in order for the groundwater component of the remedy to be protective in the long term, the following issues need to be addressed: a) arsenic concentrations above the MCL of 10 µg/L , b) the potential persistence of residual DNAPL at the CCL Source Area further extending the cleanup time frame, c) evaluate extraction/treatment systems, and d) ICs, which are not fully implemented throughout OU-1, need to be completed.

Sitewide Protectiveness Statement (if applicable)
For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement. -- NOT APPLICABLE --

Protectiveness Determination:	*Addendum Due Date (if applicable):*
Choose an item.	Click here to enter date.

Protectiveness Statement:

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES (APPENDIX A)

LIST OF ABBREVIATIONS AND ACRONYMS

µg/L	micrograms per Liter
ARARs	Applicable or Relevant and Appropriate Requirements
BTEX	Benzene, Toluene, Ethylbenzene, and Xylene
CAS	Carbon Adsorption System
CCL	CCL Custom Manufacturing, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
CVOC	Chlorinated Volatile Organic Compound
CWA	Clean Water Act
DCA	Dichloroethane
DCE	Dichloroethene
DNAPL	Dense Non-Aqueous Phase Liquids
EPA	Environmental Protection Agency
FYR	Five-Year Review
GAC	Granular Activated Carbon
GWTS	Groundwater Treatment System
IC	Institutional Control
ICL	Interim Cleanup Level
JGWMP	Joint Groundwater Monitoring Program
MCL	Federal Maximum Contaminant Levels
mg/kg	milligrams per kilogram
MNA	Monitored Natural Attenuation
MTBE	methyl-tert butyl ether
NBC TTO	Narragansett Bay Commission Total Toxic Organics
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operations and Maintenance
OSWER	Office of Solid Waste and Emergency Response
PAC	Pacific Anchor Chemical Company
PAH	Polycyclic Aromatic Hydrocarbon
PAL	Project Action Limit
PCB	Poly-Chlorinated Biphenyl
PID	Photo-Ionization Device
POTW	Publicly Owned Treatment Works
ppmv	parts per million by volume
PRPs	Potentially Responsible Parties
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Action/Remedial Design
RE	Removal Efficiency
RI/FS	Remedial Investigation/Feasibility Study
RIDEM	Rhode Island Department of Environmental Management
RIDOT	Rhode Island Department of Transportation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SDs	Settling Defendants at Operable Unit One of the Peterson Puritan, Inc. Site pursuant to Consent Decree, Civil Action No. 95-397, entered in U.S. District Court, December 13, 1995.
SDWA	Safe Drinking Water Act
SOW	Scope of Work
SVE	Soil Vapor Extraction
TBC	To be considered
TCA	Trichloroethane
TCE	Trichloroethene

TI	Technical Impractibility
TMDL	Total and Maximum Daily Load
TSDF	Temporary Storage and Disposal Facilities
TTO	Total Toxic Organics
USACE	United States Army Corps of Engineers
EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VC	Vinyl Chloride
VE	Vapor Extraction
VGAC	Vapor Phase Granular Activated Carbon
VI	Vapor Intrusion
VOC	Volatile Organic Compound

1.0 INTRODUCTION

Under an Inter-Agency Agreement, EPA, Region 1, New England (EPA) directed the U.S. Army Corps of Engineers, New England District (USACE) to support EPA's efforts in preparing this third Five-Year Review of the Peterson/Puritan, Inc. Superfund Site in Cumberland and Lincoln, RI (the Site). This review includes a progress update concerning the Settling Defendants' (SDs) remedial actions undertaken at Operable Unit 1 (OU-1) including detailed treatment system evaluation, trend analyses, and data summary reports in support of the review. EPA and USACE undertook various measures to inform the public and community stakeholders of the five-year review process. EPA also continued to identify and support emerging community needs and issues, and has supported stakeholder initiatives concerning reuse throughout the Site. This report documents the results of these efforts as they relate to the five-year review. This report also summarizes data and reports submitted by the SDs during the five-year review period.

This report does not address activities performed at other operable units of the Peterson/Puritan Inc., Superfund Site. For information regarding other areas of the Site, the reader is directed to the EPA internet site: http://www.epa.gov/region1/superfund/sites/peterson.

1.1 Regulatory Background

The United States Environmental Protection Agency (EPA) must implement five-year reviews consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This is the third five-year review for the Peterson/Puritan Site. (Topographic and aerial maps of the Site are presented in Figures 1 and 2 in Appendix A.) This review is required by statute because the selected remedies for site contaminants result in contaminants remaining at concentrations exceeding those associated with unrestricted exposure to site media. The trigger for this statutory review was completion of the second Five-Year Review in September 2007.

CERCLA §121(c), as amended, 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 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.*

The NCP part 300.430(f)(4)(ii) of the Code of Federal Regulations (CFR) 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.*

1.2 Purpose of the Five-Year Review

The purpose of this five-year review is to determine whether the remedy for OU-1 (see Figure 3, Appendix A for a detailed map of OU-1) of the Site is functioning as intended and is protective of human health and the environment. Specifically, the report addresses the following three questions stated in EPA's Five-Year Review Guidance Document (EPA, 2001):

Question A: *Is the remedy functioning as intended by the decision documents?*

Question B: *Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?*

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*

The findings and conclusions of this review are documented in this report. The report also identifies issues found during the five-year review process and offers recommendations to address such issues.

2.0 SITE CHRONOLOGY

The chronology of the site, including all significant site events and dates is included in Table 1.

Table 1. Chronology of Site Events

Date	Event
1950s	Blackstone River valley first developed as a municipal water supply source for the town of Cumberland along its east bank (Martin Street Well).
1957	Town of Lincoln installs first of three municipal wells on a parcel in Quinnville, next to the west bank of the Blackstone River (the "Quinnville Wellfield").
1959	The former Peterson/Puritan plant built; operated as a packager of aerosol consumer products on Martin Street in Cumberland.
1964	Town of Cumberland installs Lenox Street Well, one mile south of Martin Street for additional water service.
1967	Martin Street Well closed by municipality due to iron and manganese fouling.
1970-1975	Town of Lincoln adds two more wells at the Quinnville Wellfield to service community.
1974	Peterson/Puritan experiences a spill of approximately 6200 gallons of solvent from a rail car and tankage incident during a delivery within the plant's tank farm.
1979	During routine statewide sampling, Rhode Island Department of Health discovers chlorinated volatile organic compounds (CVOCs) exceeding drinking water standards in Quinnville and Lenox St. municipal wells; wells closed.
1980-1984	A series of initial investigative studies into the source of the contamination is conducted.
02/21/1981	Volatile organic compounds (VOCs) detected in supply well at Okonite; well closed.
12/30/1982	Site proposed on National Priorities List (NPL).
1982-1987	EPA negotiated with Potentially Responsible Party to conduct and finance the Remedial Investigation/Feasibility Study (RI/FS).
1983 – 1992	Peterson/Puritan (Malcolm Pirnie) installs recovery well, RW-1, on O'Toole property, downgradient of tank farm and begins pumping (Pre-NPL response).
09/08/1983	Final listing of Site on NPL.
05/16/1986	EPA fund-lead Site-wide RI/FS commences along a 2-mile segment of the river between the Ashton and Pratt dams.
05/29/1987	Administrative Order by Consent (AOC) is signed with EPA, and the Potentially Responsible Party (PRP) takes over Site-wide RI/FS.
1990	Due to the expansive study area and the number of identified areas of concern, EPA administratively divided the Site into Operable Units. Dexter Quarry is removed from the Site's listing description and is delegated to the State for appropriate response actions. Pacific Anchor facility (PAC Remediation Area) is added to the OU-1 investigation. Other portions of the Site, including J. M. Mills Landfill and vicinity to the south, and Mackland Farm (a.k.a. Kelly House property) to the north are identified for potential future response action areas. OU-1 (area encompassed by the industrial park and the Quinnville Wellfield) is earmarked for continued RI/FS, leading to OU-1 Record of Decision.

Date	Event
03/10/1992	EPA amended the 1987 AOC.
09/30/1993	Record of Decision (ROD) for OU-1 signed.
04/22/1994-07/25/1995	EPA conducts negotiations for Remedial Design/Remedial Action (RD/RA) for OU-1.
04/14/1995	Consent Decree signed by CCL SDs. The RD/RA Scope of Work (SOW) attached to the Consent Decree (CD) defined the response activities and deliverable obligations that the SDs were obligated to perform. The activities described in the SOW were based upon the EPA ROD for OU-1.
06/22/94 – 08/17/94	EPA negotiated Prospective Purchaser Agreement with owners of Hope Global parcel allowing for re-use of a portion of OU-1. (agreement includes access and ICs for CCL remedial construction work).
07/25/1995	Consent Decree lodged by the Court.
10/02/1995	CCL Remediation Area IRS award of construction contract and mobilization.
07/01/1995 - 10/24/1995	Developed a Joint Ground Water Monitoring Program (JGWMP).
10/24/1995	JGWMP begins.
12/18/1995	Consent Decree for OU-1 entered by Court.
01/09/1996 - 03/11/1996	CCL Remediation Area Near-source extraction well installation and development.
01/29/1996	CCL SDs and Rhode Island Department of Environmental Management (RIDEM) finalize an agreement compensating the State for oversight costs, compensating the State for groundwater natural resource claims, and establishing an interim groundwater residual zone under State law within which the parties agree that it may be impossible or impractical to reach groundwater cleanup standards. The residual zone covers part of the CCL Remediation Area in OU-1.
04/09/1996	CCL Remediation Area Long-term Remedial Steps (LTS) construction contract was awarded, and mobilized.
10/01/1995 - 07/01/1996	CCL Remediation Area groundwater treatment system (GWTS) building construction and system installation.
07/31/1996	Peterson/Puritan Site identified by EPA as one of the pilot sites for the Oversight Reform initiative.
08/22/1996	CCL Remediation Area IRS construction complete.
08/23/1996	PAC Source Area construction contract signed, trigger of five-year review; PAC Remediation Area remedial action start.
08/22/1996 - 10/22/1996	CCL Remediation Area 60-day start-up period for GWTS (RW-1 [renamed EW-1] turned back on).
1997	EPA's Assessment leads to Second Removal Action at J. M. Mills Landfill; landfill was re-secured by removing identified friable asbestos insulation and by extending the fence (OU-2).
04/09/1997	PAC Source Area oxidation system operation begins.
06/15/1997	All OU-1 remedial systems construction complete.
11/25/1998— 07/13/2001	EPA negotiates with PRPs to conduct OU-2 RI/FS.
10/1997	OU-1 SDs reach agreement with EPA on the form of Institutional Controls (ICs).

Date	Event
12/31/1997	Start of operation and maintenance activities for OU-1.
03/14/2000	PAC Source Area oxidation system shutdown / Rebound Assessment initiated.
07/13/2001	RI/FS for a re-defined OU-2 commences. Work plans for the PRP-lead RI/FS were reviewed. One additional area of potential groundwater concern (Mackland Farm/Kelly House property) in Lincoln, RI and the segment of the river and aquifer to the north of OU-1 (within Cumberland and Lincoln) remained as a "potential" OU-3.
Fall 2001	A Site Inspection of OU-2 is conducted for the planning phase of the RI/FS. Low water levels in the Blackstone River allow access to Unnamed Island. Observations include additional locations where disposal practices on the island are identified. A large abandoned excavator, only previously observed at a distance from the location of the bike path, is inspected and found to be partially dismantled; vandalized cab and engine compartments and hydraulic lines severed. The excavator is identified as a potential concern to be further reviewed during the RI. Local citizen action groups initiated communications with EPA for the removal of the excavator from the river way.
12/2001	EPA's OU-2 enforcement investigations identified a significant number of additional parties potentially liable for the future cleanup of this portion of the Site. These enforcement investigations are ongoing. EPA forwarded a citizen complaint to RIDEM concerning the large excavator. Complaint includes the concern that fuel tanks and hydraulic lines contain oily fluids, which may overtop and cause a release during future flooding events on the island. RIDEM agreed to take the lead and investigate/remove fluids from the excavator. (OU-2) Forest City Residential Group, Inc. completes due diligence investigations, submits a Hazardous Materials Release Notification to RIDEM, and initiates discussions with EPA over concerns that Ashton Mill is within the boundary of the Site. These actions prompted EPA to consider its northern boundary configuration and initiates plans for limited site investigations north of OU-1 at Mackland Farm/Kelly House ("potential" OU-3).
01/03/2002	Final Declarations of Covenants and Environmental Protection/Conservation Easement signed for Lonza/PAC property. (IC for PAC Source Area parcel in place).
03/2002	Site is selected by EPA Region I as a pilot for the Superfund Redevelopment Initiative. Region I publishes the Peterson/Puritan, Inc. Superfund Site Preliminary Reuse Plan and introduces the Plan to the local community and stakeholders.
04/2001 - 09/2002	EPA conducts first five-year review for the whole Site.
07/12/2002	RI Department of Transportation conducted a series of test pits in Cumberland (150 ft. northeast of the Pratt Dam) to delineate the lateral extent of suspected solid waste landfill operations along the river. This work was conducted as part of the design for Segment 4B of the Blackstone River Bikeway. EPA is consulted regarding a State plan to remove contaminated soils located within the proposed flood plain compensation area for the Bikeway. This area encroaches upon the southern boundary of the OU-2 portion of the Site and is considered an extension of buried wastes deposited within the Nunes parcel.
07/26/2002	EPA Administrator Christine Whitman visited the Site and announces a plan to award a $100,000 Superfund redevelopment grant to the towns of Cumberland and Lincoln for reuse planning.

Date	Event
06/2002	EPA conducted a limited site investigation at Mackland Farm/Kelly House ("potential" OU-3) in support of Ashton Mill "Brownfield" redevelopment project under a State lead .
Fall 2002	Based upon data and results received from EPA's and Forest City's investigations, EPA no longer considers the Ashton Mill Property to be a part of the Peterson/Puritan Superfund site. No further actions by EPA are anticipated by EPA. Further investigation into the source of the Kelly House property groundwater contamination remains in the planning stage with EPA and RIDEM. This determination is agreed to and documented in 1st Five-Year Review.
09/2002	EPA completes First Five-Year Review Report for the Site.
2003	Owens Corning Limited Removal Investigation into extent of fiberglass waste present on the Unnamed Island (OU-2). Soil sampling and analyses for selected contaminants resulted in the removal of fiberglass waste in 2003. McNulty Properties Investigation conducted to evaluate groundwater quality and hydraulic relationship to known groundwater contamination to the south and northwest (OU-2).
05/2003	Lonza submits to EPA the Evaluation of Technical Impracticability (TI) of Groundwater Restoration for arsenic for the PAC Remediation Area.
06/2003	Lonza submits to EPA results of file review identifying the Mutual Gas Station facility as the likely source of aromatic hydrocarbons in the southwest corner of the PAC Source Area.
07/2003	Lonza submits Request for Residual Zone for arsenic in Groundwater to RIDEM for PAC Remediation Area.
07/16/2003	Owens Corning began its limited removal action work at the Unnamed Island (OU-2). Work included construction of an access way (bridge improvement) in order to cross equipment and materials to/from the island and allowing parallel remedial investigations to take place by others. During the removal action, the large excavator abandoned on the Unnamed Island was removed, eliminating the risk of hydrocarbons impacting the river. This effort was conducted jointly by RIDOT, RIDEM, USACE, EPA, and local citizen action groups. (OU-2).
11/13/2003	Fieldwork for Owens Corning's Limited Removal Action at Unnamed Island (OU-2) was completed.
03/1/2004	Owens Corning receives approval of the Completion Report concerning the limited Removal Action at the Unnamed Island (OU-2).
06/28/2004	Final Declarations of Covenants and Environmental Protection/Conservation Easement signed for Swissline/Tony Realty and Pawlick properties, (2 parcels) OU-1 PAC Source Area OU-1 (ICs in place for a portion of OU-1).
07/2004	A removal action was completed by Vanasse, Hangen, & Brustlin, Inc. on behalf of the Rhode Island Department of Transportation during the construction of Segment 4B of the Blackstone River Bike Path. This action included the removal of approximately 11,600 tons of hazardous waste soil, solid wastes, and other soil (OU-2).
08/2004	PAC Remediation Area oxidation system is decommissioned and associated wells abandoned in accordance with the EPA and RIDEM-approved closure plan.

Date	Event
2005	Remedial Investigation (RI) Phase 1B for OU-2 conducted. Soil, groundwater, surface water, and sediment were sampled and analyzed for various contaminants. Conducted sediment probing, benthic community surveys and benthic toxicity tests in Blackstone River. Fish community survey conducted with fish samples collected on whole bodies, filets and carcasses. Wildlife and vegetation habitat surveys also conducted along with Rapid Bioassessment Protocol.
05/09/2005	The Environmental Protection Agency (EPA) Region 1 announces the partial deletion of a portion of the Site, owned by Macklands Realty, Inc. and Berkeley Realty, Co., from the National Priorities List. (OU-2).
06/2005	Owens Corning began the excavation of 3,451 tons of fiberglass-containing materials from a former disposal area at Mackland Farm/Kelly House property ("potential" OU-3).
10/15/2005	The Guardian Trust-Lonza Site Acceptance Agreement was signed. IC Implementation for a portion of the PAC Remediation Area commenced.
2006	Nunes Parcel Investigation commenced to delineate limits of buried waste. Soil sampled and analyzed for various contaminants (OU-2).
01/18/2007	Nixon-Peabody, on behalf of SuperValu, submitted a draft final Preliminary Survey of the SuperValu parcel (Dean Warehouse) of OU-1 to EPA as a component of the work required for ICs within OU1.
04/16/2007	CCL SDs (Conopco, Inc., d\b\a Unilever) signs Site Acceptance Agreement with Guardian Trust.
06/2007	Owens Corning submitted Final Closeout Report for Limited Removal Action at Mackland Farm/ Kelly House. ("Potential" OU-3). All work under the terms and conditions of the bankruptcy agreement are complete.
06/15/2007	EPA receives revised SuperValu parcel survey as a component of the work in proceeding with ICs on affected properties (PAC Downgradient Area).
06/30/2007	Draft RI Report for OU-2 submitted to EPA. EPA has identified certain deficiencies that required extensive modifications to portions of the report prior to completing its review. As such, a comprehensive review is on hold pending these first revisions.
09/30/2007	EPA completes Second Five-Year Review Report for the Site.
07/28/2008	Meeting between OU-1 SDs, EPA, and RIDEM to discuss long-term monitoring, data requests from EPA, and path forward.
10/17/2008	SDs submit a proposed long-term monitoring plan entitled, Peterson/Puritan OU-1 Joint Groundwater Monitoring Plan, by email.
02/24/2009	EPA provides comments on October 17, 2008 draft groundwater monitoring plan and identifies Carbon Adsorption System (CAS) monitoring and VI assessment as issues of concern for further study.
06/18/2009	EPA letter identifies necessary steps for potential TI Waiver for arsenic groundwater standard in PAC Source Area.
07/01/2009	EPA formally requests Vapor Intrusion (VI) Study for former Peterson/Puritan facility.
07/09/2009	In response to EPA letter of June 18, 2011, Lonza withdraws the TI Waiver Request for the PAC Source Area in light of the likely cost and timing of necessary steps.
08/7/2009	EPA defers VI Study request to seek further information.

Date	Event
08/25/2009	CCL SDs collect and analyze CAS air samples by EPA Method TO-15.
11/9/2009	EPA renews VI Study request, indicating that EPA will send scope of work in later mailing.
12/09/2009	CCL SDs collect and analyze CAS air samples by EPA Method TO-15.
02/04/2010	Meeting between OU-1 SDs, EPA, and RIDEM regarding remediation issues, including PAC Source Area arsenic discussion, long-term monitoring plan, oversight costs, and ICs.
03/16/2010	CCL SDs report on CCL CAS emissions testing.
6/24/2010	EPA requests VI Study work plan based on attached scope of work.
08/25/2010	CCL SDs submit CCL VI Investigation Work Plan.
09/20/2010	EPA requests report on CAS optimization efforts.
09/29/2010	CCL SDs collect and analyze CAS air samples by EPA Method TO-15.
10/21/2010	CCL SDs submit CAS Status Report and Engineering Evaluation Work Plan.
11/15/2010	EPA issues modifies submitted VI Work Plan to conform with scope of work offering SDs choice of one of two work plan options.
12/10/2010	CCL SDs select VI Investigation Work Plan Option B, with includes preliminary data screening collection event of indoor and ambient air without subslab air.
12/17/2010	CCL SDs collect and analyze CAS air samples by EPA Method TO-15.
12/21/2010	EPA issues notice to proceed with VI Investigation Work Plan Option B.
12/21/2010	EPA conditionally approves CAS Engineering Evaluation Work Plan.
03/03/2011	EPA requests that Lonza update its linear model for arsenic MNA, originally completed in January, 2001.
03/29/2011	Lonza submits an updated analysis to support modification of PAC Source Area remedy to MNA for arsenic without active source control. This analysis was later updated again in April 2012 to include more recent sampling results. Conopco, Inc. updates CAS status report.
07/01/2011	CCL SDs submit CAS Engineering Evaluation, including system modification proposal.
07/15/2011	CCL SDs submit preliminary VI study data screening report to EPA.
08/05/2011	EPA conditionally approves CAS modification proposal, including milestones.
09/01/2011	EPA requests full VI Study pursuant to Section 2.4.4 of the VI Investigation Work Plan Option B with sampling events in December 2011 and June 2012 for indoor, ambient and subslab air.
09/09/2011	CAS modifications completed, including installation of two additional carbon vessels.
10/07/2011	SDs submit Third Five Year Review (Data Summary) Report to assist Agency's assessment of the remedy and determination of protectiveness for this Five Year Review period.
01/17-26/2012	EPA announces the start of the third five-year review for OU-1 of the Site.
02/12/2012	USACE and EPA hold a public meeting at the Town of Cumberland, RI Library to gather citizen input on the five-year review of the site.
03/29/2012	CCL SDs submit Vapor Intrusion Investigation Data Report – Winter 2011 documenting vapor sampling conducted between December 29-30, 2011.

Date	Event
03/29/2012	CCL SDs submit report assessing the modifications to the CAS, indicating that system modifications have brought CAS into compliance with Rhode Island Air Pollution Control Regulations 9 and 22 ARARs.
04/04/2012	USACE and EPA meet with representatives of the Towns of Cumberland and Lincoln to gather input from Town officials on the status of OU-1 and the cleanup at OU-1 for the purpose of the third five-year review.
04/12/2012	USACE and EPA meet with AECOM and conduct a site inspection of OU-1 as part of the third five-year review.
09/2012	EPA completes the third five-year review as per the date of signature accompanying this report.

3.0 BACKGROUND

This section presents a summary of Site background information, including physical characteristics of the Site, land and resource use, contamination history, initial response, and a summary of the basis for the remedial actions currently under way at the Site. A more comprehensive description of the site background, particularly operable units 2 and 3 of the Site, can be found in Section 3 of the Second Five-Year Review Report (dated September 2007).

3.1 General Site Setting

The Site is located along the Blackstone River within the Towns of Cumberland and Lincoln, Rhode Island. The Site "study area" occupies about 500 acres and is approximately two miles long from the Ashton Dam to the north to the Pratt Dam at its southern end, and extends 2,000 feet to the east and west of the main river channel. The study area comprises a portion of the Blackstone River and aquifer system from the Ashton Dam (northern end) to the Pratt Dam (southern end). More specifically, this area includes:

- an industrial park incorporating the former Peterson/Puritan, Inc. facility (formerly known as CCL Custom Manufacturing Inc.),
- the former Pacific Anchor Chemical Company (PAC),
- other fully-operational industrial facilities within the Berkeley Industrial Park (along Martin Street on the Cumberland side of the river),
- impacted (now closed) municipal water supply wells for Lincoln and Cumberland,
- a segment of the active Providence and Worchester Railroad line (currently a single rail line which also services some of the local industries within the Site)
- an inactive landfill known as J. M. Mills Landfill,
- an inactive solid waste transfer station,
- an unnamed island, located within the floodway of the river and where wastes were also disposed during site operations,
- sand and gravel operations,
- the Blackstone River State Park (recreational uses include a bikeway and canoe trail and historic places along the Lincoln side of the river), and
- numerous interspersed areas of undeveloped land, flood plain, and wetlands.

The Site study area contains over 40 separate parcels owned both privately and by local governments and is being addressed under Superfund as a multi-source groundwater contamination site with multiple Operable Units (OUs) (Figures 1 and 2, Appendix A). The Site also lies within the designated John H. Chaffee Blackstone River Valley National Heritage Corridor. For consistency with prior documentation, the property at 35 Martin Street will be continue to be referred to as CCL, and the former PAC property (now owned and operated by Berkley Acquisition Corporation) will continue to be referred to as PAC throughout this document.

3.2 OU-1 Description

OU-1 is comprised of the PAC and CCL Remediation Areas and is located within the towns of Cumberland and Lincoln, in Providence County, Rhode Island. OU-1 is approximately one mile long (oriented generally in a north south direction) south of the Rhode Island Route 116 overpass and includes properties located within approximately 2,000 feet to the east of the main river channel of the Blackstone River. OU-1 consists of an industrial park (including the former CCL [and previously, the

Peterson/Puritan] facility, the former PAC (formerly Lonza) facility, SuperValu (formerly the Wetterau warehousing facility and Roger Williams' Foods, currently Dean Warehouse), the former O'Toole property, Okonite, Hope Global, and other manufacturing facilities) (Figure 3).

The former Peterson/Puritan plant was built in 1959 and served as the location for packaging aerosol consumer products. The primary sources of contamination on the former Peterson/Puritan facility are the release of approximately 6,200 gallons of tetrachloroethene (PCE) from a railroad tank car accident in the facility tank farm in July 1974, and historical releases of chlorinated volatile organic compounds (CVOCs) into a manhole and catch basins associated with the facility sewer system. Residual soil contamination is primarily located within vadose zone (i.e., unsaturated) soil on the former Peterson/Puritan property and immediately to the west on the adjacent former O'Toole property. This area is referred to as the CCL Source Area. The properties to the west and south of the former O'Toole property to the Blackstone River are referred to as the CCL Downgradient Area. These two areas are collectively referred to as the CCL Remediation Area.

In July 1981, the EPA conducted an inspection of the PAC facility under the Resource Conservation and Recovery Act that revealed that no CVOCs were used by the facility. However, the inspection revealed the existence of on-site septic tanks and leach fields. Samples of wastewater and non-contact cooling water taken from the facility indicated the presence of acetone, 2-propanol, toluene, ethylbenzene, and methyl isobutyl ketone. Samples of the facility's wastewater taken in 1981 (reported to the Blackstone Valley Sewer District) and in 1984 (collected by the Rhode Island Department of Environmental Management [RIDEM]) reportedly contained high concentrations of arsenic; however, later analyses have shown that these results were erroneous due to inaccurate laboratory testing procedures and subsequent confirmation rounds showing low or non-detect arsenic levels (ENSR, 2000).

The PAC facility manufactured specialty chemical materials for use in detergents, cosmetics, agricultural, food, and general industrial chemicals. The facility was originally operated by Universal Chemicals and subsequently by Lonza, Trimont Chemicals, and Pacific Anchor Chemical Corporation (ENSR, 2001). There were three leach fields located on the PAC facility, which were in use at various times. The two main leach fields, designated as Leachfield #1 and #2, were installed in approximately 1973, and were shut down in 1985. The third leach field, designated as Leachfield #3, is known to have been in use in 1972, and may have been installed as early as 1962. Contaminants of concern (COCs) were identified in association with these leach fields on the PAC facility, and also on a number of separately owned/operated parcels, including a warehouse and a former maintenance garage, which was formerly owned and operated by Wetterau Incorporated (Wetterau), and is currently owned and operated by Berkeley Acquisition Corp. (d\b\a Dean Warehouse) (ABB-ES, 1993). This area is referred to as the PAC Remediation Area, and includes the PAC Source Area and the PAC Downgradient Area. The PAC Source Area includes the area surrounding the PAC facility. The PAC Downgradient Area includes a number of separately owned/operated parcels, including the Dean Warehouse property.

Wells on the Former Owens Corning Property and Triangular Parcel were sampled as part of the environmental monitoring (EM) programs at the PAC Remediation Area. In addition, these properties are included for institutional control implementation. For these reasons, contamination originating on or present on the Former Owens Corning Property and the Triangular Parcel is included in this review.

3.3 Physical Characteristics

The Blackstone River is the most prominent feature of the Site, and forms the western and southern boundary of OU-1. The river flows in the southeasterly direction through the Blackstone River valley on a comparatively flat flood plain between river terraces. The industrial park facilities are located on the northeastern (Cumberland) side of the river. Within OU-1, the main channel of the river is approximately 150 feet wide, highly variable in depth, and meanders slightly (EPA, 2002). The Blackstone River begins in Worcester, Massachusetts and flows southeasterly for 46 miles to the tidal Seekonk River in Pawtucket, Rhode Island, which, in turn, flows south to the Providence River (a northern extension of Narragansett Bay). The Blackstone River Valley is the birthplace of the American Industrial Revolution, and as such has been significantly impacted by industrial discharges. In recent decades, the Blackstone River has undergone resurgence through the efforts of federal, state, and local government agencies, non-profit organizations, and the private for-profit sector. Surface water quality is much improved due to enforcement of the federal Clean Water Act (CWA). Of cultural significance, the Blackstone Canal runs parallel to the river along its western side and is listed in the National Register of Historic Places.

Approximately two-thirds of the Site lies within the 100-year flood plain of the Blackstone River. In general, the northeast portion of the Site sits at a higher elevation (EPA, 1993).

Groundwater generally flows towards the Blackstone River in the southwest direction on the Cumberland side and to the east from the Lincoln side of the river. Incorporated within the Site, the Blackstone River Valley occupies a bedrock trough filled with kame terrace deposits and glacial/post glacial alluvium. The kame terrace deposits are composed of homogeneous, well-sorted fine to coarse sands and gravel. The alluvial sediments are reworked glacial deposits. These unconsolidated deposits are relatively thin (10 to 20 feet) in the northwestern portion of the Site where the valley is shallow and quite narrow. Deposits thicken to greater than 130 feet to the southeast as the trough widens and deepens to the south end of the Site. Deposits pinch out along the steep bedrock valley walls to the east and west. Till is found at the base of the bedrock trough and is primarily dense with high silt content and somewhat more sandy in some locations. The till also contains boulders of various sizes, some more than five feet in diameter. The bedrock is comprised primarily of hard quartzite and, to a lesser extent, more friable schist (EPA, 2002).

3.3.1 Land and Resource Use

Current land uses surrounding the Site are comprised of a mixture of industrial, commercial, residential, and recreational parcels. Immediately to the north and west of the Site is predominately residential. To the east is commercial/residential and to the south predominately commercial. There are over 1,000 residences within a one-mile radius, and 12,000 people live within a 4-mile radius of the Site. The nearest residence is less than 1/4 mile away (EPA, 2002).

Groundwater within OU-1 is not currently used for drinking water, though it has been in the past. The current state-designated groundwater classification at the Site is GAA-NA. The GAA classification, as designated by RIDEM's Rules and Regulations for Groundwater Quality, is defined as "those groundwater resources which the Director has designated to be suitable for public drinking water use without treatment" (RIDEM, 2005). The NA classification is defined as "those areas that have pollutant concentrations greater than the groundwater quality standards for the applicable classification" (EPA, 1993).

At the time of the Baseline Risk Assessment – Final Report in 1993 (CDM, 1993), the Blackstone River was classified by the State of Rhode Island as a Class C surface water body. The C classification designates uses of the river for a fish and wildlife habitat, secondary contact recreation, such as boating, and industrial processes and cooling. Class C waters are not designated for primary recreational uses or public water supply even after treatment. Since that time, the river has been reclassified as a Class B 1 surface water body. This classification designates uses of the river for primary and secondary contact recreational activities and fish and wildlife habitat. They shall be suitable for compatible industrial processes and cooling, hydropower, aquacultural uses, navigation, and irrigation and other agricultural uses. These waters shall have good aesthetic value. Primary contact recreational activities may be impacted due to pathogens from approved wastewater discharges. However all Class B criteria must be met. Since the time of the Baseline Risk Assessment for OU-1, the river and canal area within the Site have also been developed into a recreational park for activities such as biking, walking, and canoeing (EPA, 2002).

3.3.2 Blackstone River Flood Mitigation

The Berkeley Industrial Park is composed of approximately 80 acres of industrial property along the east bank of the Blackstone River. The three primary businesses that currently exist with the industrial park are Hope Global, Okonite and the Dean Warehouse facilities. The industrial park also contains the Town of Cumberland's animal shelter. These businesses in the Berkley Industrial Park experienced severe flooding in 2005 and again in 2010. This industrial park supports hundreds of jobs critical to the local economy of Cumberland and surrounding communities. The flooding caused economic impacts and disruption of operations at these facilities, with at least one business acknowledging the likelihood to move operations if flood mitigation measures are not enacted within the Berkeley Industrial Complex.

The USACE, in a separate, independent capacity from its role as an oversight contractor for EPA, initiated a study in collaboration with the State and Town of Cumberland called the "Blackstone River at Cumberland, Rhode Island Flood Risk Management Feasibility Study." USACE also executed a Feasibility Cost Sharing Agreement (FCSA) with the Rhode Island Department of Administration (RIDOA) in October 2011 for the purpose of evaluating several flood hazard reduction alternatives that meet the National Economic Development (NED) plan, but is also environmentally acceptable and feasible. The alternatives are currently being developed and evaluated to provide a clear basis for choice among options by the decision makers and the public. The USACE flood hazard reduction plans will likely be published after this five-year review period closes. However, it is anticipated that any mitigation measures may be implemented during the next five-year review period. Potential impacts of the flood mitigation measures upon (1) OU-1 remediation activities, and (2) future OU-2 cleanup plans and designs will be evaluated by EPA as these flood hazard alternatives become available later this year (2012).

3.4 History of Contamination

VOCs were first detected in the vicinity of the Site in October 1979. At that time, routine testing of groundwater supply wells by the RI Department of Health found PCE and 1,1,1-trichloroethane (TCA) (among other contaminants) in water collected from the Quinnville Wellfield in Lincoln, Rhode Island, at levels exceeding EPA drinking water standards. The Lenox Street municipal well in Cumberland had similar measurements. (Another Cumberland municipal well, located on Martin Street, was placed out of service by the Town due to excessively high iron and manganese and poor water quality production prior to October 1979). The Lenox Street Well in the Town of Cumberland and the Quinnville Wellfield in the Town of Lincoln were closed in 1979 due to contamination, and

remain out of service. (The Quinnville Wellfield operated periodically from 1979 to 1981 when the VOC concentrations decreased below EPA guidance values.) Attempts to flush contaminants from Lincoln's three wells were abandoned after repeated efforts to remove the contaminants from the aquifer failed. The Town of Lincoln since has been connected to an alternate water supply (through a third party settlement) while the Town of Cumberland absorbed the cost of losing its wells by increasing production from remaining town water supplies.

3.5 Basis for Taking Action

Groundwater at OU-1 is contaminated with CVOCs, non-chlorinated VOCs, phthalates, and heavy metals such as arsenic. Hazardous substances at concentrations above health based levels were identified during the Remedial Investigation and Feasibility Study (RI/FS) conducted from 1986 to 1993. EPA completed a baseline human health risk assessment for OU-1 in June 1993. Potential human health effects associated with exposure to contaminants of potential concern were estimated for various exposure scenarios. Response actions were developed to address risks for exposure scenarios that exceeded acceptable levels as defined by the federal government. An ecological risk assessment conducted at the same time determined that contaminants associated with OU-1 would not likely cause significant ecological harm. The COCs for OU-1 as identified in the ROD (EPA, 1993) are presented in Table 2.

Table 2. Operable Unit 1 COCs for Soil and Groundwater

Soils	Groundwater
1,1-Dichloroethene	1,1-Dichloroethene
1,2-Dichloroethene	Cis-1,2-Dichloroethene
Methylene Chloride	Methylene Chloride
Trichloroethene	Tetrachloroethene
Tetrachloroethene	1,1,1-Trichloroethane
1,1,1-Trichloroethane	1,1,2-Trichloroethane
Ethylbenzene	1,2-Dichlorethane
Styrene	Trichloroethene
Toluene	Benzene
Xylenes	Vinyl Chloride
	Bis(2-ethylhexyl)Phthalate
	Chlordane
	Acetone
	Cadmium
	Copper
	Arsenic

3.6 Initial Response

No CERCLA pre-ROD response actions were undertaken at OU-1. From 1981 through 1986, Peterson/Puritan, Inc. investigated the contamination within the Site and submitted its findings to EPA in two technical reports. These reports were not formally accepted as RI/FS reports pursuant to the NCP, but were used as supporting data in the development of subsequent studies.

In September 1983, the Site was listed on the National Priority List (NPL). Malcolm Pirnie, under contract to Peterson/Puritan, Inc., installed a groundwater recovery well, RW-1, immediately downgradient of the CCL tank farm in October 1983. With the exception of routine maintenance, this recovery well operated continuously until the spring of 1992. Extracted groundwater was discharged

under permit to the municipal sewer interceptor. Permitting issues related to total toxic organics (TTO) discharge limits necessitated the shutdown of the recovery well until the full CCL Remediation Area groundwater extraction and treatment system was installed.

In 1986, EPA decided to conduct the RI/FS, and initiated field efforts in January 1987. On May 29, 1987, Peterson/Puritan, Inc. signed an Administrative Order on Consent to perform an RI/FS for the entire Site Study Area. The Site Study Area was divided into operable units by EPA in 1990 to allow for resources and response actions to be focused in a phased approach. Consequently, a second, more focused phase of study commenced at OU-1. This study included a FS that presented remedial alternatives for the CCL and PAC Remediation Areas in the operable unit (ABB-ES, 1993).

The ROD for OU-1 was signed September 30, 1993 (EPA, 1993) and addressed both the CCL Remediation Area and the PAC Remediation Area. Activities associated with the remediation of the CCL Remediation Area are being performed by Conopco, Inc. and activities associated with the remediation of the PAC Remediation Area are being performed separately by the PAC Remediation Area SDs, Lonza and SuperValu. The Consent Decree (CD) for OU-1 was issued on December 18, 1995.

Under a separate negotiation in January 1996, CPC International finalized a Settlement Agreement, Release, and Covenant Not to Sue (Agreement) with the State of Rhode Island regarding the CCL Remediation Area. CPC International entered the Agreement to:

1) Compensate the State for functions performed at OU-1 in overseeing remediation pursuant to the CD;
2) Compensate the State for its natural resource damages claims under federal, state and local law;
3) Recognize that the existing contamination at OU-1 includes dense non-aqueous phase liquids (DNAPL) which may be difficult or impossible to remediate completely and designate an interim residual zone under state law; and
4) Designate a final residual zone under state law if and to the extent that the work is determined to be impracticable or impossible.

The Settlement Agreement with the State includes a final residual zone designation that will be determined by computer modeling once the CCL Source Area remediation is completed in accordance with the Remedial Action/Remedial Design (RD/RA) Statement of Work (SOW) (EPA, 1995) or if the SDs determine that they have reached the limit of their ability, using technically and economically practicable measures, to reduce the levels of existing contamination. Preliminary model results indicate that the residual zone will reach the river if 90% of the source is removed, and will fall short of the river if a reduction in source strength of 99% is achieved. Further evaluation of these predictions may be required prior to any determination that the OU-1 remedy has met the objectives and goals of the federal and state decision documents.

3.7 Subsequent Actions

In 2003, Lonza, at EPA's recommendation as documented in the First Five-Year Review (EPA, 2002), submitted the Evaluation of Technical Impracticability of Groundwater Restoration for Arsenic (ENSR, 2003a). Concurrent with this request, Lonza submitted the Request for Residual Zone for Arsenic in Groundwater to RIDEM (ENSR, 2003b). Following the Technical Impracticability (TI) submittal, there were numerous discussions between the SDs and EPA concerning the potential

implementation of a TI Zone for arsenic as well as concerning alternate approaches to modify the arsenic remedy for the PAC Source Area. On June 18, 2009, EPA identified the steps necessary for a TI Waiver for the arsenic groundwater standard in the PAC Source Area. On July 9, 20009, Lonza withdrew its TI Waiver request in light of the cost and timing of the necessary steps outlined by EPA.

On March 29, 2011, AECOM (on behalf of Lonza) and at EPA's recommendation, submitted an updated evaluation of the effectiveness of MNA for arsenic in the PAC Source Area. Based on this information, EPA is further evaluating a potential modification of the remedy for the PAC Source Area to exclude the use of the active source control oxidation system and to rely on the excavation source control with MNA.

4.0 REMEDIAL ACTIONS

The EPA documented the selected final cleanup remedy for OU-1 in a ROD on September 30, 1993 (EPA, 1993). The following RAOs identified in the OU-1 ROD were developed based on data collected during the RI and the alternatives evaluated in the FS (ABB-ES, 1993):

- Minimize/mitigate the mass of contaminants at the source.
- Prevent further migration of contaminants from the sources to potential receptors and downgradient areas including the Blackstone River.
- Prevent ingestion of/contact with groundwater containing carcinogens at levels in excess of maximum contaminant levels (MCLs) and a total excess cancer risk of greater than $1x10^{-4}$ to $1x10^{-6}$.
- Prevent ingestion of/contact with groundwater contaminated with non-carcinogens at levels greater than MCLs, health-based ARARs, and a total hazard index greater than 1.
- Restore the contaminated groundwater in the aquifer, from the source to the outer boundary of the contaminant plumes, to a level protective of human health and the environment as soon as practicable.
- Prevent the leaching of contaminants from the soil that would result in groundwater contamination in excess of the noted health and risk-based ARARs, and
- Ensure a coordinated remediation between all points of source contamination, such that restoration of OU-1 is achieved as soon as practicable.

The goal of the remedial action at OU-1 is to restore groundwater to its beneficial use as a potential drinking water resource. The ROD included provisions for a statutory review of the OU-1 remedy at least every five years after the initiation of the remedial action. Additionally, the ROD called for the monitoring of treatment system performance on a regular basis, the application of modifications as necessary to enhance, facilitate, and accelerate the cleanup of the contaminant plume, and the periodic re-evaluation of remedial technologies for groundwater restoration to ensure that the remedy remains protective of human health or the environment. The ROD also stated that, if following a reasonable period of system operation, it is determined that the selected remedy cannot meet cleanup levels, the EPA may elect (or the SDs may propose) to consider contingency measures to modify the selected remedy.

4.1 Remedy Selection for OU-1

The selected remedy for OU-1 is comprised of two components; enhanced source control, and management of plume migration. The ROD apportioned remedial actions to the two remediation areas as follows:

<u>CCL Remediation Area</u>:

- Excavation (manholes and catch basins).
- Capping of source area soils.
- Soil venting of source area soils.
- Source area groundwater extraction, treatment and discharge to the Publicly Owned Treatment Works (POTW) sewer.

- Downgradient area groundwater extraction with direct discharge of untreated groundwater to the POTW sewer.
- Natural attenuation of groundwater at the Quinnville well field.
- Institutional Controls (ICs) throughout the area.
- Environmental monitoring.

Pacific Anchor Chemical (PAC) Remediation Area:

- Excavation and disposal of two leachfields and associated soils in the PAC Source Area.
- In-situ oxidation treatment of the soils to reduce the mobility of the arsenic in the PAC Source Area.
- Natural attenuation of arsenic in the PAC downgradient groundwater.
- ICs throughout the PAC Remediation Area to prevent use or hydrologic alteration of contaminated groundwater as well as to prevent direct exposure to contaminated soils where such exposures exceed EPA's risk range.
- Focused investigation of other potential sources of contamination in the area including installation of new monitoring well nests, and sampling and analysis of groundwater.
- Environmental monitoring (EM) to evaluate the rate and success of the remedial actions including natural processes acting on the contaminated media, to monitor the migration and reduction of contaminants in the PAC Remediation Area, and to demonstrate compliance with soil cleanup levels.

Following the ROD, the SDs agreed to perform the RD/RA for OU-1 according to the Consent Decree (CD) entered by the Court on December 13, 1995. The SDs conducted the RD/RA in conformance with the ROD.

4.2 Remedy Implementation

This section provides summaries of the implementation of each of the remedial actions (PAC Remediation Area and CCL Remediation Area) specified in the ROD. Both the PAC and CCL Remediation Areas include a source area and a downgradient area.

The remedial designs/remedial actions for the two areas were conducted in phases between July 1995 and July 1997 subject to approval by EPA. The ROD called for the monitoring of treatment system performance on a regular basis with modifications as necessary to enhance, facilitate, and accelerate the cleanup of the contaminant plume. Periodic re-evaluation of remedial technologies for groundwater restoration also was stipulated to ensure that the remedy remains protective of human health and the environment. If system operation cannot meet cleanup levels, the EPA may elect (or the SDs may propose) to consider contingency measures as a modification to the selected remedy.

The Joint Groundwater Monitoring Program (JGWMP) was established in 1995 to meet the requirement for environmental monitoring specified in the ROD. The program is conducted in accordance with the Joint Groundwater Monitoring Plan and Project Operations Plan (ENSR/ABB-ES, 1995). With the most current round of groundwater sampling recently completed in April 2012,

twenty-three rounds of groundwater sampling have been conducted between October 1995 and April 2012 as part of the JGWMP.[1]

4.2.1 PAC Source Area

The following long-term monitoring and maintenance activities were initiated on March 17, 1998 and continue to be implemented in accordance with the operation and maintenance (O&M) plans:

- Periodic inspection of the groundwater monitoring wells to maintain good operational condition.
- Periodic environmental monitoring in accordance with the ROD and the Project Operations Plan as part of the remedy for the PAC Source Area.
- Maintenance of the specified institutional controls for the PAC Source and Former Owens Corning portions of OU-1 in order to protect the public from hazardous substances, to monitor cleanup progress and integrity, and to assess compliance with the easements.

During the period between signing the ROD and the first five-year review, excavation was performed as a partial remedy in the PAC Source Area. Leachfields #1 and #2 in the PAC Source Area were excavated to prevent leaching of organic compounds from contaminated soils into the groundwater and to eliminate a source of oxidizable carbon in the aquifer. In the area north of the PAC facility, near Leachfield #1, soils outside of the excavation area that may have contained additional carbon were capped with asphalt to minimize recharge and therefore leaching of residual carbon from the vadose zone to the groundwater. An oxygen delivery system (oxidation system) was installed within the excavation at former Leachfield #1 to reverse the chemically reduced state of the groundwater. This system was comprised of gas transfer module that super-oxygenated potable water that was then pumped into an infiltration gallery placed within the former leach field. The oxidation system was shut down in March 2000 due to irreversible degradation in performance of the gas transfer modules and subsequently decommissioned in October 2004.

EPA considered Lonza's request for a Technical Impracticability Waiver, but after EPA specified the necessary steps to complete the waiver in June 2009 Lonza withdrew its request in July 2009. The SDs and EPA subsequently discussed revising the remedy for the PAC Source Area to exclude the active source control oxidation system, leaving just source control through excavation and removal with MNA. Monitoring data for the site indicate that arsenic concentrations are generally declining naturally with ongoing biodegradation of organic carbon. Based on this evaluation, EPA may prepare a decision document to modify the long-term remedy for arsenic in the PAC Source Area.

4.2.2 PAC Downgradient Area

The PAC Downgradient Area is comprised of an operating warehouse and former maintenance garage. Investigation revealed residual petroleum hydrocarbons in soil at former USTs in the northwest corner of the area. Two USTs immediately upgradient of MW-306 were removed in 1992 along with approximately 50 cubic yards of soil (ABB-ES, 1993). CVOCs were detected in groundwater but no distinct source for the contamination was found in the area. MNA was the selected remedy for CVOCs in this area. When the arsenic remediation goal was 50 µg/L, remediation of arsenic was not required in this area. However, arsenic is present in groundwater in this area above the revised cleanup standard

[1] Note: Round 23 data was not incorporated into this Five-Year Review data set, but will be incorporated into future reviews.

of 10 µg/L. Similar to the PAC Source Area, long-term monitoring and maintenance activities continue to be implemented and evaluation of groundwater data indicates that MNA of dissolved arsenic is also occurring in the PAC Downgradient Area, and will eventually return the downgradient aquifer to below the MCL. More detailed discussion of arsenic concentrations can be found in Section 6.6.3.3.

4.2.3 CCL Remediation Area

The CCL Remediation Area includes the former Peterson/Puritan facility and properties to the west and south to the Blackstone River. Long-term monitoring and maintenance activities are ongoing according to the approved O&M plans. Ongoing O&M activities are:

- Source area soil venting and groundwater extraction and treatment systems
- Maintenance of the treatment systems
- Periodic inspections of the bituminous and concrete caps at the source area
- Periodic inspection of the groundwater monitoring wells
- Periodic environmental monitoring
- Implementation of all required ICs[2]

4.2.3.1 CCL Source Area Remediation

The ROD specified excavation of manhole and catch basin sediment to remove sediments that were a continuing source of groundwater contamination. The excavations were successfully completed and the sediments are no longer a potential source of groundwater contamination.

Source area soils were capped to enhance the performance of the soil venting (aka, SVE) system. The SOW specified capping with concrete at the CCL tank farm and with asphalt at the former O'Toole property, although a steep slope between these areas was not capped due to minimal infiltration potential. Capping was successfully completed and guard rails and gates were installed along Martin Street to prevent unauthorized entry. Monthly inspections and access restrictions ensure that the cap is maintained.

Per the ROD, a multi-well groundwater extraction system is used to capture and contain the CVOCs present in the CCL Source Area. Groundwater extraction wells EW-4, EW-5, and EW-6 are located in the CCL tank farm, and extracted groundwater is treated in the GWTS, which has been in operation since June 12, 1997. Groundwater extraction wells EW-1, EW-2, and EW-3 are located on the former O'Toole Property, east of the railroad tracks. Treated groundwater is discharged to the POTW via the Narragansett Bay Commission (NBC) sewer system. Air stripper off-gas is treated by VGAC in the CAS. The CCL Source Area groundwater extraction system (including O&M activities and NBC discharges) is operational and in compliance with the ROD objectives and the ROD Scope of Work.

The ROD specified an SVE system to reduce the residual VOC contamination in soil above the water table in and near the tank farm. Fourteen vapor extraction (VE) wells were installed at the CCL tank

[2] In the first five-year review, EPA made recommendations to address deficiencies in achieving the RAOs specified in the ROD. In particular, institutional controls were not in place to prevent a hydrologic alteration of groundwater or exposure to soils. The noted institutional controls were similarly not in place during the second five-year review period.

farm area, and two at the former O'Toole property. The SVE system also includes groundwater depression wells that lower the water table to expose more vadose zone soil to the VE wells. The extracted soil vapors combine in a common header pipe, and pass through a moisture separator and filter prior to reaching the SVE blower. VOCs are removed from the vapor stream in the carbon adsorption system (CAS). The CAS consists of four vessels that contain vapor-phase granular activated carbon (VGAC). The original CAS design included two VGAC vessels. A recommendation of the second five-year review was to evaluate the efficiency of the CAS and, if necessary, improve the VOC removal from the vapor stream. In 2011, two additional VGAC vessels were added to the CAS. The upgraded system (depicted in Figure 4) now consists of two parallel trains of two VGAC units each. The first VGAC unit in each train is regenerated on-site using steam to desorb the VOCs from the VGAC. The solvent-laden steam is then passed through a condenser and separator to recover extracted solvent. Recovered solvent is stored in a solvent storage tank and ultimately transported off-site for disposal. The new, second VGAC unit in each train is used to "polish" the vapors before discharge to the atmosphere. Regeneration of these polishing VGAC units is performed by periodically replacing the carbon and disposal off-site.

Groundwater from the groundwater extraction wells is pumped to the GWTS and is treated by the groundwater air stripper system. Vapor from the air stripper is combined with the soil vapors prior to introduction to the CAS.

4.2.3.2 CCL Downgradient Area Plume Containment

The remedy allows for the operation of Downgradient Area groundwater extraction wells to reduce the time required to meet groundwater standards by additional mass removal. The downgradient extraction system is also expected to recover the contaminant plume that migrated from the CCL Source Area toward the Blackstone River. The groundwater from the downgradient extraction wells is discharged directly to the NBC sewer system without treatment, so this objective must be met while maintaining compliance with the discharge requirements as established in the NBC permit.

The seven downgradient wells, EW-7 through EW-13, associated piping, utilities, central metering vault, and individual well vaults were installed in 1996. In response to inundation of the well vaults during Blackstone River flooding (shortly after the initial startup of the system), the underground electrical systems were removed from the well vaults and reinstalled above grade. The CCL Downgradient Area groundwater extraction wells were brought on-line in 1997 after preliminary testing. Flow rates are maintained within the limits of the NBC permit to maximize the mass removal of VOCs. The downgradient groundwater extraction system (including operation and maintenance activities and NBC discharges) is operational and in compliance with the ROD objectives and the ROD SOW.

4.3 System Operation/Operation and Maintenance at the CCL Remediation Area

The following sections describe the system operation for the CCL Remediation Area as previously described (EPA, 2007). A process flow chart for the GWTS and SVE systems is presented in Appendix A, Figure 4 to aid the discussion. (As stated above in Section 4.2.1, the PAC Source Area remediation system was decommissioned in 2004.)

4.3.1 SVE System

The SVE system mechanical components are checked routinely during each site visit performed by United Water (approximately three times per week). United Water also performs maintenance (e.g., oil

changes) on the SVE mechanical components. The SVE system monitoring for extracted airflow rate, vapor phase VOC concentrations, air temperature, and applied vacuum at each SVE well is performed on a monthly basis by AECOM. The VOC measurements are currently made with a photoionization detector (PID). CVOC concentrations are estimated using the PID data, and mass removal rates for the SVE system are calculated for each well and the results are summed to obtain the overall mass rate for that day. System data is compiled into the Site-specific treatment system database to produce tables and graphs for data interpretation.

Typical of any SVE system, maintenance has resulted in occasional downtime. EPA and RIDEM have been notified immediately of any downtime longer than 48 hours. The system contains an hour meter that was installed in 1998 and that records the system "up-time". The meter indicates that the system has been operational an average of 81% of the time during the period of this review. This is the same up-time as reported in the second five-year review.

Figure 5 (Appendix A) shows SVE system mass removal rates from January 2007 through August 2011. As this figure indicates, VOC mass removal fluctuates from month to month. During the review period, the mass removal rate has ranged from near 0 lbs/day to 57 lbs/day. The average during this period has been approximately 9 lbs/day, or 270 lbs/month, which is approximately the same as the median mass removal rate. As Figure 5 (Appendix A) shows, the total mass removed by the SVE system between January 2007 and August 2011 was approximately 15,000 pounds (based on estimated average monthly rates). The consistent rate of mass recovery indicates that the SVE system continues to remove mass from the Source Area in accordance with ROD objectives. However, the mass removed during the First Five-Year Review was approximately 54 lbs/day and the mass removed during the Second Five-Year Review was approximately 26 lbs/day. The decline from prior periods is typical for SVE systems as the amount of solvent mass in the unsaturated soil decreases. Eventually, as the rate of mass removal approaches zero, continuance of SVE may become unnecessary. Determination of the appropriate time to consider discontinuance of the SVE system will be based upon a future rebound assessment of the system, as described in Section VI.A.2 of the Consent Decree, or through more recent rebound assessment guidance, such as that described in the USACE Engineer Manual on Soil Vapor Extraction and Bioventing (USACE, 2002).

The SVE system blower discharge vapor stream and the effluent vapor stream from the CAS are also measured monthly. Vapor stream measurements are made to confirm compliance with RIDEM air monitoring requirements of 95 percent or better removal of VOCs. Throughout the review period, the effectiveness of the CAS was monitored using a PID to monitor the CAS influent and effluent vapor phase VOC concentrations. The CAS has also been monitored through the use of Summa canisters and analyzing vapor samples in the laboratory by EPA method TO-15. Since the concentrations have declined to relatively low levels, recent data suggest that the use of a PID may be unreliable for determining removal efficiency (RE) for a variety of reasons. At a minimum, evaluation of RE and emissions compliance will be based on annual Summa can sampling and laboratory analysis via EPA method TO-15.

Overall, throughout the remedial action, VGAC removal efficiency has been above the 95% removal required by RIDEM regulations (RIDEM Air Pollution Control Regulation No. 9). Until this five-year review period, very few monthly monitoring events showed less than 95% removal, and the average RE since startup was well above the 95% required. Corrective actions have been taken during the brief periods of reduced RE, including reducing adsorb times, changing the activated carbon, and repairing the SVE blower. However, as the remediation has progressed, the vapor concentrations entering the CAS have declined (i.e., both the concentrations of the SVE vapors and the vapors from the GWTS

continue to decline; current CAS influent concentrations are 96% lower than the influent concentration in 2000). As the influent concentrations have declined, the GAC RE has also declined.

During this five-year review period, the performance of the CAS dropped below 95% removal. Therefore, additional corrective actions have been performed, most notably the installation of additional carbon. These CAS modifications, discussed in detail in Section 4.3.4 below, have resulted in improved GAC RE and appear to have returned the system to more than 95% removal (AECOM, 2012a). In a letter from the EPA dated May 16, 2012, the EPA approved, with conditions, the work conducted by AECOM and the CAS evaluation schedule provided in the March 2012 status report from the SDs (EPA, 2012a). More detail on the CAS system is provided in Section 4.3.4 below.

Table 3 shows emissions results for the CAS after modification. Composite samples of the CAS influent and effluent vapor streams over an entire sorption cycle were collected during the five-year review process in accordance with EPA Conditional Test Method 011 (CTM-011). The purpose of the sampling was to verify that the modified CAS is meeting the required 95% vapor phase VOC concentration reduction and that VC is less than or equal to 10 parts per million by volume (ppmv) in the effluent stream. Analysis results are included in Table 3. As this table shows, the permit requirements of 95 percent VOC removal and less than 10 ppmv VC in the effluent are being achieved by the CAS.

Table 3. Air Sample Results From Carbon Adsorption System, Operable Unit 1, CCL Remediation Area, Peterson/Puritan Superfund Site, RI (based on AECOM, 2012a)

Target Compound VOC	Influent, ug/m^3		Effluent, ug/m^3		VOC Reduction	
	October 2011	February 2012	October 2011	February 2012	October 2011	February 2012
Tetrachloroethene	**20,800**	**25,100**	**51**	13.6 U	99.8%	>99.9%
1,1,1,-Trichloroethane	**1,620**	**2,830**	21.8 U	10.9 U	>98.7%	>99.6%
1,1,2-Trichloroethane	10.9 U	10.9 U	10.9 U	10.9 U	NC	NC
Trichloroethene	**2,270**	**3,500**	21.4 U	10.7 U	>99.1%	>99.7%
cis-1,2-Dichloroethene	**6,030**	**6,900**	**435**	**19**	92.8%	99.7%
trans-1,2-Dichloroethene	**84**	**88**	15.9 U	7.9 U	>81.1%	>91.0%
1,1,-Dichloroethene	**39**	**55**	**18**	7.9 U	53.8%	>85.6%
Vinyl Chloride	**82**	**82**	**82**	**80**	0%	2.4%
TOTALS	30,925	38,555	656	161	97.9%	99.6%

Notes:

ug/m^3 = Micrograms per cubic meter

U = Not detected above method reporting limit

VOC = Volatile organic compound

Detected concentrations are in **bold**

Shaded cell indicates that effluent concentration was higher than influent concentration (effluent = 149). In this case, the effluent was set to the influent concentration and the resulting VOC reduction was 0%.

"NC" means not calculated because the influent and effluent concentrations were sufficiently close that using the reporting limit for the calculation would skew the results. In all other cases, reporting limits were used to calculate VOC reduction.

In all cases, % VOC Reduction = [(1-(Effluent/Influent))*100]

Reporting limit values were included in effluent totals

The volume of solvent recovered from the CAS, which treats vapors from the SVE and GWTS, is recorded when the solvent storage tank contents are transported off-Site for disposal. The total volume

recovered through August 2011, based on shipping manifests, is 18,500 gallons. During this review period (i.e., since the Second Five-Year Review), the CAS recovered approximately 1,000 gallons of liquids. It should be noted that some water is entrained in the collected solvent and shipped off-Site.

4.3.2 Source Area Groundwater Extraction and Treatment

The GWTS is maintained by United Water on a routine basis. The system is checked approximately three times per week and pertinent operational parameters are recorded on log sheets. The log sheets are compiled and the data is entered into a Site-specific database. The GWTS is equipped with various alarms that, depending on their severity, can initiate an outside call to the O&M technician via the integrated auto-dialer. The auto-dialer also can receive incoming calls and provide a brief status report as to the condition of the GWTS. Alarm calls are logged in the Site logbook. AECOM performs a system inspection approximately once per month. Additional maintenance activities (e.g., pump replacement, electrical control troubleshooting) are performed on an as-needed basis in order to keep the system operating at the maximum possible efficiency.

Although not a compliance standard, groundwater pumping rates are monitored to ensure capture of the plume emanating from the tank farm area. Initial modeling (ABB-ES, 1993) was performed which indicated a flow rate of 55 gpm was adequate to capture the plume from traveling downgradient, therefore, the 55 gpm flow rate was considered a target for the minimum combined flow rate of the GWTS. Figure 6 (Appendix A) shows the GWTS extraction rates during the period of the Third Five-Year Review. Based on flow totalizer data collected between January 2007 and August 2011, the GWTS flow rate fluctuated between approximately 38 gpm and 83 gpm, with an average of approximately 59 gpm. Groundwater potentiometric surface gauging measurements have consistently indicated that capture of Source Area groundwater has been maintained.

The main operational problem that has temporarily affected flow rates for the GWTS is iron and bacterial fouling of the GWTS components. Several measures have been taken to reduce this iron and bacterial fouling including:

- Removal and cleaning of submersible pumps and down-well piping;
- Redevelopment of EW-1, EW-2, and EW-3;
- Cleaning of lateral piping between EW-1, EW-2, and EW-3 and the treatment building;
- AquaFreed® development, pipe cleaning of EW-1, EW-2, EW-3, EW-4, EW-5, and EW-6;
- Routine acid washing of extraction wells;
- Installation of staging between the two air strippers for easier access and to facilitate cleaning;
- Installation of clean-outs on air stripper piping for periodic cleaning; and
- Installation of a bypass line on the influent manifold to reduce fouling of rotameters.

Currently, the methods used to address fouling are periodic cleaning of treatment plant piping and equipment as necessary, occasional transfer line cleaning and well redevelopment when well yields decline and/or when flow between the wells and the GWTS declines (AECOM, 2011c).

The GWTS influent and effluent streams are sampled on a monthly basis in order to ensure compliance with the NBC discharge permit (NBC, 1995 (original), 1999 (renewed), 2006 (renewed)). Narragansett Bay Commission Total Toxic Organics (NBC TTO) limits are 2.13 ppm with a single compound maximum of 1.0 ppm. Monthly self-monitoring compliance reports are submitted by Conopco, Inc. to the NBC and EPA, which summarize the effluent results. As documented in the monthly status reports, GWTS effluent samples collected since 1999 (i.e., since the first five-year

reporting period) have complied with the permit. Figure 7 (Appendix A) presents the monthly effluent TTO concentrations for treated water samples collected prior to the discharge to the sewer from the GWTS. As this figure illustrates, the discharge limits have been met throughout the period of operation.

Air stripper off-gas is routed to the CAS, where it is commingled with the SVE vapor stream prior to treatment via VGAC. The performance of the CAS is discussed in Section 4.3.4.

4.3.3 Downgradient Area Groundwater Extraction

The downgradient well system, described in Section 4.2.3.2, is maintained by United Water on a routine basis. AECOM performs a system inspection approximately once per month. Additional maintenance activities (e.g., pump replacement, electrical control troubleshooting) are performed on an as-needed basis in order to keep the system operating efficiently.

The downgradient well system operates at a maximum flow rate of 200 gpm (per NBC permit) with all wells pumping. The flow rates from the seven extraction wells are adjusted to provide the maximum mass removal rate possible while maintaining the NBC Discharge Permit effluent limits. Flow rates are checked and recorded during routine Site visits.

The downgradient well system effluent is sampled on a monthly basis in order to ensure compliance with the NBC discharge permit (NBC, 1995 (original), 1999 (renewed), 2006 (renewed)). NBC TTO limits are 2.13 ppm with a single compound maximum of 1.0 ppm. Monthly self-monitoring compliance reports are submitted by Conopco, Inc. to the NBC and EPA, which summarize the effluent results. As documented in the monthly status reports submitted to the NBC, the downgradient well system has been in compliance since startup. Figure 8 (Appendix A) presents the monthly TTO concentrations of extracted groundwater samples collected prior to the discharge to the sewer from the downgradient wells. As this figure illustrates, the discharge limits have been met per the NBC permit throughout this review period.

4.3.4 Carbon Adsorption System

The SDs performed process monitoring of the CAS in August 2009, December 2009, September 2010, and December 2010. Samples were collected into evacuated canisters for the duration of a carbon bed regeneration cycle (typically four hours). Measurements of air flow rate and moisture content were also made for the duration of the sampling events. Samples were analyzed for target VOCs in accordance with EPA Test Method TO-15.

Based on the samples collected in 2009, it was determined that the average RE for both of the carbon beds was below the target value of 95% required by RIDEM Air Pollution Control Regulation No. 9. In addition, calculations showed that PCE was emitted at a concentration above the Minimum Quantity (MQ) allowed by RIDEM Air Pollution Control Regulation No. 22.

The system efficiency decline appeared to be partially due to the reduction of contaminant concentrations in the CAS influent. As contaminants are being removed from the groundwater and vadose zone soils, the influent air streams concentrations have dropped to much lower levels than previously. The current concentrations are lower than the original system design parameters. At these lower vapor concentrations, the GAC sorbs a lower percentage of the volatile compounds, thus yielding a lower RE.

Further process monitoring in 2010 indicated that the RE of the CAS continued to be below the required 95%. Therefore, the SDs submitted an Engineering Evaluation Work Plan to RIDEM and EPA in March 2011. This work plan provided a summary of activities conducted by the SDs to attempt to optimize the CAS and a series of activities the SDs proposed to perform to identify an approach to bring the CAS into compliance with RIDEM regulations. The SDs conducted the review of the options that could bring the CAS into compliance with RIDEM regulations. On July 1, 2011, the SDs submitted a Carbon Adsorption System Engineering Evaluation to EPA that recommended modifications to the CAS system including operating the two existing CAS vessels in parallel (previously in use one at a time) and the addition of two new carbon vessels after the existing ones to "polish" the vapor stream. The CAS modifications, including the installation of additional carbon vessels, were completed in September 2011. Subsequent emission testing results reported in March 2012 (AECOM, 2012a) indicate that the revised CAS is meeting the system discharges limits (see Table 3). Periodic process monitoring and evaluation will continue to assure compliance.

4.4 Operations and Maintenance Costs

Operations and maintenance costs for the OU-1 remediation systems that were compiled (AECOM, 2011c) are summarized in Table 4.

Table 4. Annual System O&M Costs, Peterson/Puritan Superfund Site, RI (AECOM, 2011c).

Average for 2nd 5YR	2007	2008	2009	2010	2011	Average
SuperValu Property						
NA	$109,800	$84,300	$55,000	$60,100	$59,700	$73,780
CCL Remediation Area						
$272,400	$265,500	$270,100	$355,200	$344,200	$419,400	$330,900
PAC Source Area						
NA	$149,700	$87,600	$100,000	$72,600	$100,600	$102,100

NA = not available

4.5 Site Required Institutional Controls and Access

Institutional controls (ICs) are required as a component of the remedy for OU-1. ICs at OU-1 include binding land use agreements placed on real estate in order to protect human health. For OU-1, institutional controls include prohibitions on the future use or hydrologic alteration of contaminated groundwater throughout the Site and prevent the direct contact or exposure to contaminated soil (within source areas). To the extent that ICs in the form of deed restrictions are required on any property for the implementation of the Consent Decree, the SDs shall use best efforts to secure and implement the ICs in accordance with the schedule agreed to by EPA. Also, for OU-1, the terms set forth under the executed Consent Decree require the SDs to provide the United States, the State, and their representatives access at all reasonable times to the properties identified in OU-1. The SDs must use best efforts to secure and maintain such access agreements to properties owned or controlled by persons other than the SDs. In addition, if EPA in its sole discretion determines that that these access rights must run with the land, the SDs also must use best efforts to secure access as part of such deed restrictions.

EPA's review of the progress in securing ICs and maintaining access is further discussed in Section 6.8.

5.0 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

The following provides an update on progress during the latest five-year review period (2002-2007) for OU-1.

5.1 Protectiveness Statement from Last Five-Year Review

EPA determined in the second five-year review that the remedy for OU-1 protects human health and the environment in the short term because alternative water supplies were available to meet water demand. The remedy, however, was deemed not protective in the long term until follow-up actions could be taken. These follow-up actions included further definition of the occurrence of contaminants in bedrock, the fate and transport of contaminants, and the completion of institutional controls throughout OU-1 as identified in the first five-year review. Institutional controls had been implemented at a portion of the properties located within the PAC Remediation Area and steps were being taken to implement institutional controls at the remainder of OU-1 (EPA, 2007).

5.2 Status of Recommendations and Follow-up Actions from Last Review

Table 5 lists the recommendations and follow-up actions from the last five-year review and summarizes the status of these recommendations in 2012.

Table 5. Summary of Recommendations and Follow-Up Actions from the Last 5-Year Review

	Issues	Recommendations and Follow-up Actions	Responsible Party	Oversight Agency	Milestone Date	Status (as of 2012)
1	Arsenic in groundwater of the PAC area remains above the drinking water standard.	Apply state-of-the-art modeling techniques to predict the fate and transport of arsenic; analyze/describe geologic conditions, and monitor groundwater for key properties as needed to refine models. As appropriate, identify a Technical Impracticality zone based on this analysis.	PRP (PAC)	EPA/RIDEM	2009	Based on discussions between SDs, EPA and RIDEM, and continued groundwater monitoring, the SDs withdrew the TI Waiver request in 2009 and submitted an MNA evaluation of arsenic in the PAC Source and Downgradient areas in March 2011. The MNA evaluation indicated that arsenic concentrations within the two areas are attenuating/declining steadily. MNA evaluation continues.
2	BTEX concentrations continue to impact the PAC Remediation Area.	Continue periodic monitoring of BTEX-impacted area. Apply long-term monitoring optimization approach incorporating trend analyses and MNA principles.	PRP (PAC)	EPA/RIDEM	2011	Results from the JGWMP show that the BTEX has largely attenuated from this area. BTEX concentrations in the wells sampled during this Five-Year Review period showed BTEX at low to non-detected levels in most of the wells in this area. Only one well, AD-2, last sampled in JGWMP Round 21, showed benzene slightly above the MCL. The data generally show that MNA is progressing for BTEX within the PAC Downgradient Area.
3	CVOCs remain above drinking water standards at the CCL Remediation Area and will not meet remediation goals as described in the ROD.	Characterize the concentration and extent of CVOC's in groundwater; define ground-water flow patterns and mass fluxes to valley fill from bedrock.	PRP (CCL)	EPA/RIDEM	2011	The SDs' CSM for groundwater flow was generally confirmed by the USACE in the May 2009 Groundwater Modeling Status Report (USACE, 2009) prepared for EPA. Based on the existing data and collaborative analyses through modeling, the bedrock contributions to the downgradient overburden may be sufficiently characterized. The concentration and extent of CVOCs in groundwater is characterized periodically as part of the JGWMP.
4	Institutional controls are not fully implemented, access agreements to many affected properties are not documented, lapsed, or have not been obtained.	Implement and maintain all IC agreements on all appropriate parcels, and secure access (OU-1 and OU-2).	PRP (OU-1&OU-2)	EPA/RIDEM	2008 (access all areas) 2010 (ICs at OU-1)	The ICs are being implemented for CCL and PAC Source Area, by Guardian Trust. SuperValu is independently implementing ICs for the PAC Downgradient Area. SDs and Guardian Trust continue to prioritize properties to advance work tasks for IC implementation. However, progress has been sluggish throughout 2012. Additional subordinations were identified, and some progress has been made in this area. IC implementation remains in various stages of development. However, further commitments by the SDs to meet the implementation strategies for placing ICs on all affected parcels must be promptly undertaken.
5	The configuration of the extraction well network at the CCL Downgradient Area is not providing efficient removal of contaminants from groundwater.	Assess alternative technologies for removing CVOCs to reduce cleanup time. Apply borehole flow meter techniques to determine sources of water and aquifer properties at extraction wells. Apply quantitative modeling techniques to evaluate the continued value of wells for removing mass.	PRP (CCL)	EPA/RIDEM	2011	The groundwater results reported from the CCL Downgradient Area has improved substantially over the remedy's operational period. The CCL Downgradient Area extraction well network, coupled with the CCL Source Area remedy and periodic monitoring, indicates a significant reduction in the concentrations of CVOCs in groundwater. In 2010, the pumping rate in the downgradient wells increased from an average of less than 100 gpm to an average of greater than 160 gpm. The rate of mass removal increased when the pumping rate increased, and the groundwater concentrations continued their decline. Further trend analyses and technology assessment (such as described in the ROD) for enhancing the remedy to effectively meet cleanup goals as soon as practical remain as objectives.

	Issues	Recommendations and Follow-up Actions	Responsible Party	Oversight Agency	Milestone Date	Status (as of 2012)
6	Vapor intrusion to occupied structures is a potential concern near the Source Area.	Apply models to assess the potential threat of vapor migration of site-related contaminants into occupied structures. Perform a vapor intrusion pathway assessment, if needed.	PRP (CCL)	EPA/RIDEM	2010	The SDs performed a preliminary vapor intrusion screening event in the former Peterson/Puritan facility in May 2011. A more complete, winter round of VI sampling was subsequently completed in December 2011. Another round of VI samples were collected in July 2012. EPA is awaiting the submittal of these data from the SDs. When this data set is submitted to EPA, the two full rounds of concentration data will then be used by EPA to evaluate any potential human health risks stemming from this VI assessment.
7	Process monitoring has not demonstrated adequate capture of contaminants during extreme ambient conditions, has not assessed the quantities of water and solvent stored, and has not given adequate consideration to 1,1,1-TCA in the soil vapor mass calculations.	Repeat the gas vent testing at a high ambient temperature in accordance with the substantive requirements of Rhode Island State Air Pollution Control Regulation Number 22 (Air Toxics).	PRP (CCL)	EPA/RIDEM	2008 (periodic)	Process monitoring of the CAS was performed during the summer of 2009 (August 2009), December 2009, September 2010, and December 2010. Based on the results of this sampling, the SDs recommended modifications to the CAS to bring it into compliance with RIDEM regulations. These modifications were completed in September 2011. March 2012 data demonstrate that the CAS modifications were successful in meeting discharge requirements. Periodic process monitoring and evaluation will continue to assure compliance.
8	Reports containing periodic monitoring data should be upgraded to meet long term monitoring remedy optimization strategies, consistent with the stated goals of the ROD.	Analyses of monitoring data must account for extended cleanup timeframe and support of optimized long-term monitoring and remedial strategies.	PRP (CCL)	EPA/RIDEM	2010	The USACE prepared a Groundwater Modeling Status Report (USACE, 2009) in May 2009. The SDs' CSM for groundwater flow was generally confirmed by this model. SDs and EPA met to discuss long term monitoring. Outcome of meeting included review of monitoring network for annual and five-year review monitoring as part of the JGWMP. These actions have made progress toward developing a long term monitoring strategy, but there was no significant progress on developing a more comprehensive, multi-year long term monitoring plan at the present time.
9	The quality assurance project plan (QAPP) is out of date.	Update QAPP(s) to account for procedural changes and validity of analytical reporting limits no less than every five years.	PRP (CCL& PAC)	EPA/RIDEM	2008	A revised QAPP was finalized in June 2008 and updates have been provided periodically. The next complete revision is due in 2013.

Note: Recommendations and follow-up actions related to OU-2 and OU-3 from the 2nd Five-Year Review are not included in this table. Progress related to other portions of the Site can be reviewed at http://www.epa.gov/region1/superfund/sites/peterson.

6.0 FIVE-YEAR REVIEW PROCESS

This five-year review was conducted in accordance with EPA's most current five-year review guidance (EPA, 2001). Tasks completed as part of this five-year review included a review of pertinent Site-related documents, interviews with parties associated with or familiar with the Site, inspections of the Site, and a review of the current status of regulatory or other relevant standards.

6.1 Administrative Components

EPA notified members of the Towns of Cumberland and Lincoln, the PRP/SD Groups, and RIDEM of the initiation of the five-year review in 2012. The third Five-Year Review Team was led by David J. Newton, EPA Remedial Project Manager (RPM), and included members from USACE with expertise in geology, hydrology, biology, process engineering, and risk assessment. Paul Kulpa, RIDEM Project Manager, assisted in the review as the representative for the support agency.

In February 2012, the review team established the review schedule whose components included:

- Community Involvement
- Document Review
- Data Review
- Site Inspection
- Local Interviews; and
- Five-Year Report Development and Review

Inspections conducted at the Site were led by the RPM, on February 13, April 4, and April 12, 2012 and included all areas of the Site. The inspection team included engineers and scientists from the USACE, as well as the State Project Manager. The inspections included review and observations of the OU-1 treatment systems, observation of the integrity and wear of the protective bituminous and concrete caps over OU-1 source area soils, piping, manways, security, and daily operations and functionality of the remedial systems. Interviews with on-site workers and plant managers at both the CCL and PAC Remediation Areas also took place at this time, and meetings with the PRP representatives for OU-1 occurred throughout this period.

6.2 Community Involvement

Public interest in the Site is mostly centered around issues related to OU-2, and interest about OU-1 issues is minimal. Local citizen-supported environmental groups with interests in the River, the watershed, and the heritage of the Blackstone Valley have been attentive to the overall environmental progress and ongoing resource improvement projects taking place throughout the vicinity of the Site. During this five-year review period, a Technical Assistance Grant (TAG) was awarded to residents within the Blackstone River watershed that may be used to help explore Site-wide issues. Alice Clemente of Cumberland, RI is the TAG committee lead.

Throughout this third five-year review period, no program required public meetings were held regarding the Site. However, the EPA RPM for the Site did meet with town officials for Lincoln and Cumberland on several occasions, held meetings with PRP groups, and has conducted briefings for RIDEM, RIDOT, the Blackstone River Watershed Council (TAG recipient), and the Blackstone River Valley National Heritage Corridor Commission. EPA will publish a notice of the completion of the

Five-Year Review in the local paper and will distribute copies of the document to the Towns, RIDEM, and the local libraries.

6.3 Document Review

This third Five-Year Review consisted of a review of relevant OU-1 post construction technical and data summary documents prepared by the CCL and PAC Remediation Area SDs. This also includes but is not limited to the OU-1 remediation area-specific five-year review data for both CCL and PAC Remediation Area cleanup efforts (AECOM, 2011c).

6.4 Review of Applicable or Relevant and Appropriate Requirements (ARARs)

Applicable or Relevant and Appropriate Requirements (ARARs) for the Site were identified in the ROD (EPA, 1993) as follows:

Chemical-Specific Federal Standards

- Resource Conservation and Recovery Act (RCRA) Identification and Listing of Hazardous Waste (40 CFR Part 261)
- Safe Drinking Water Act (SDWA) Maximum Contaminant Level Goals
- SDWA Maximum Contaminant Levels

Chemical-Specific State Standards

- Rhode Island Rules and Regulations Pertaining to Public Drinking Water (July 1991)
- Rhode Island Rules and Regulations for Groundwater Quality (July 1993)

Location-Specific Federal Standards

- Protection of Wetlands Executive Order No 119900 (40 CFR Part 6)
- Floodplain Management Executive Order Number 11900 (40 CFR Part 6)

Location-Specific State Standards

- Rhode Island Rules and Regulations Governing the Enforcement of the Freshwater Wetlands Act (August 1990)

Action-Specific Federal Standards

- Clean Water Act (40 CFR, Part 61)
- RCRA Air Emissions (40 CFR, Part 264)
- RCRA General Facility (40 CFR, Subpart B 264.10264.18)
- RCRA Preparedness and Prevention (40 CFR Part 264, Subpart C)
- RCRA Contingency Plan and Emergency Procedures (40 CFR, Part 264, Subpart D)
- RCRA Releases from Solid Waste Management Units (40 CFR, Part 264, Subpart F)
- RCRA Closure and Post-Closure (40 CFR Part 264 (Subpart G)
- RCRA Use and Management of Containers (40 CFR, Part 264, Subpart I)
- RCRA Tanks (40 CFR, Part 264, Subpart J)
- RCRA Miscellaneous Units (40 CFR Part 264, Subpart X, 264.600264.999)

- RCRA Interim Status temporary storage and disposal facility (TSDF) Standards; Chemical, Physical, and Biological Treatment (40 CFR 265, Subpart Q, 265.400-265.406)
- RCRA Land Disposal Restrictions (40 CFR Part 268)

Action-Specific State Standards

- Rhode Island Pretreatment Regulations (June 1984)
- Rhode Island Underground Injection Control Regulations (June 1984)
- Rhode Island Air Pollutions Control Regulations, Air Pollution Control Regulation No. 1, Amended 1977
- Rhode Island Air Pollutions Control Regulations, Air Pollution Control Regulation No. 7, Amended 1990
- Rhode Island Air Pollutions Control Regulations, Air Pollution Control Regulation No. 9, Amended 1993
- Rhode Island Air Pollutions Control Regulations, Air Pollution Control Regulation No. 13, Amended 1982
- Rhode Island Air Pollutions Control Regulations, Air Pollution Control Regulation No. 15, Amended 1993
- Rhode Island Air Pollutions Control Regulations, Air Pollution Control Regulation No. 17, Amended 1977
- Rhode Island Air Pollutions Control Regulations, Air Pollution Control Regulation No. 22, Amended 1992
- Rhode Island Rules and Regulations for Solid Waste Management Facilities (June 1992)
- Rhode Island Hazardous Waste Rules and Regulations, Section 8
- Rhode Island Hazardous Waste Rules and Regulations, Section 9

Chemical-Specific "To-Be Considered" (TBC) criteria:

- EPA Health Assessment Documents, Acceptable Intake, Chronic and Sub-chronic
- EPA Health Assessment Cancer Slope Factors
- EPA Health Assessment Reference Doses
- EPA Office of Drinking Water Health Advisories

Location-Specific TBC

- None

Action-Specific TBC

- Control of Air Emissions from Superfund Air Strippers at Superfund Groundwater Sites (OSWER Directive 9355 0-28)
- EPA Region 1 Memorandum from Louis Gitto to Merrill Hohman (July 12, 1989)
- RCRA Air Emissions Standards (40 CFR Part 264, Subpart CC)

On January 22, 2001 EPA adopted a new standard for arsenic in drinking water of 10 parts per billion (ppb), replacing the old standard of 50 ppb. That rule became effective on February 22, 2002. The date by which public water systems had to comply with the updated standard was January 23, 2006, five years after the rule was established.

In addition, RIDEM has notified EPA of two significant changes in State regulations since the ROD which are acknowledged and referenced here: (1) Rules and Regulations for the Investigation and Remediation of Hazardous Material Releases," RIDEM Nov. 2011; and (2) Rhode Island Target Indoor Air Levels (TIALs), developed by the Rhode Island Department of Environmental Management and the Rhode Island Department of Health. Finalized on February 11, 2010. Not yet promulgated, these TIALs are "to be considered" guidance for reviewing VI data results.

6.5 Toxicity and Chemical Characteristics Review

Based on examination of the EPA Integrated Risk Information System (www.epa.gov/iris) and related sources, during the last five years, changes have occurred to some of key site COCs toxicity values, notably, TCE and PCE. The changes do not affect the protectiveness of the current OU-1 remedy. (A discussion of the changed toxicity values, and other changes that may be expected in the near future is provided in Section 7.2.) Note, however, that upon attainment of the cleanup goals (i.e., drinking water standards) a risk assessment will be conducted for OU-1 to confirm that residual conditions are protective of human health and environment. Currently, vapor intrusion in the CCL Source Area is being evaluated.

6.6 Data Review

The following provides a summary of the OU-1 data for each media reviewed for this third five-year review.

6.6.1 Soils at OU-1

No additional soils were sampled and analyzed in OU-1 during the review period because soils were fully addressed earlier in the investigation phase and remedial actions for soil have been undertaken as described in Section 3.

6.6.2 Surface Water at OU-1

No additional surface water sampling occurred since the last review. In the ROD published in 1993 and the Ecological Assessment, Final Report, also published in 1993, there were reports of at least six surface water collecting station (SW 1-6) at various points along the Blackstone River that were investigated.

In the previous Five-Year Review Reports, the groundwater monitoring wells in closest proximity to the Blackstone River were sampled and the data used to project the chemical concentrations of VOC, PAH, metals, PCB's and pesticides in the Blackstone River. The logic for the replacement of chemical data from surface water stations with the groundwater wells is that they provide a "worst case scenario". In the Second Five-Year Review report, concern was expressed about significant concentrations of COCs migrating from the deep groundwater plume up and into the river. The SD's had been assuming that these COCs would be below levels of concern for the river when accounting for dilution is by river water, though this had not been demonstrated. During this Third Five-Year Review Period, the concentrations of COCs (except arsenic) measured in the shallow aquifer adjacent to the river were below ICLs or MCLs, and also below RIDEM ambient water quality criteria and guidelines, indicating that the plume is dissipating in surface water and not migrating further down river or to OU-2. These low shallow groundwater concentrations further indicate that the deep CVOC groundwater plume in the CCL Remediation Area attenuates as it discharges to the river. If dilution is

taken into account, then the arsenic concentrations are also below the RIDEM ambient water quality criteria.

Brook A was mentioned in the Ecological Assessment as a source of contaminants and was widely sampled in 1993. Brook A was composed of storm water drainage from above Mendon Road and cooling water from the PAC facility. With the closure of the PAC facility in 2000, Brook A became just one of many storm water inflows into the Blackstone River and is no longer recognized as a constant surface water inflow or major carrier for OU-1 source area contaminants.

6.6.3 Groundwater at OU-1

This section reviews the distribution of contaminants in OU-1 groundwater and discusses their distribution in the context of groundwater flow patterns.

OU-1 includes the PAC Remediation Area, consisting of the PAC Source Area and the PAC Downgradient Area, and the CCL Remediation Area, consisting of the CCL Source Area and CCL Downgradient Area. Background water level and water quality data also are available for the adjacent Owens Corning Property and a triangular parcel to the north, which are extensions of the PAC Remediation Area for purposes of groundwater monitoring and institutional controls.

Arsenic is the principal contaminant of concern in the PAC Source Area, but BTEX compounds and MTBE also have been detected in the southwest corner of the Downgradient Area. In addition, CVOCs also are present in various PAC Downgradient Area wells at relatively low concentrations.

6.6.3.1 CVOCs in the PAC Remediation Area

Consistent with the findings of the previous Five-Year Reviews, concentrations of CVOCs are in the PAC Downgradient Area are generally low and stable. There are three wells (MW-403D, MW-404D, P-1) where TCE and/or VC exceeded MCL/ICLs (Interim Cleanup Levels) at the time of the Second Five-Year Review (2007), but concentrations have since decreased.

- At the time of the last Five-Year Review, VC concentrations exceeded the ICL at only a few monitoring wells, and trend analyses conducted on these wells suggested upward trends in some of them at the time. Since then, VC concentrations have decreased in these wells to levels below the ICL; VC concentrations have not exceeded ICLs in the last two or three sampling rounds (2009, 2010, and 2011).
- Concentrations of TCE have decreased in several wells to levels below the ICL, although some wells continue to report concentrations above the ICL. The following Table 6 provides a list of monitoring wells where concentrations of TCE remain about the ICL.

Table 6. Recent TCE Detections at PAC Downgradient Area, Operable Unit 1, Peterson/Puritan Superfund Site, RI (AECOM, 2011c)

Location	Concentration (µg/l) in March 2007	Most Recent Sampling Date	Concentration (µg/l)	ICL (µg/l)
MW-305A	15.5	4/25/2011	15	5
MW-305B	18	5/4/2010	9.77	5
MW-305C	23	4/25/2011	23	5
MW-306A	2.4	4/25/2011	5.9	5
MW-306B	13	4/23/2008	11.5	5
MW-306C	17	4/25/2011	16	5
MW-405D	~4.6	4/27/2011	12	5

Consistent with the findings of the previous Five-Year Reviews, concentration trends, aquifer geochemistry and the presence of daughter products suggest that degradation of CVOCs by reductive dechlorination is continuing in the PAC Downgradient Area. The weight of evidence indicates that natural attenuation of the CVOCs is continuing in the PAC Downgradient Area, as summarized below:

- CVOC concentrations have decreased significantly since the 1990s, and have dropped in many wells since the last Five-Year Review. CVOCs in three wells (MW-403D, MW-404D, and P-1) have dropped below ICLs and remained below ICLs for two or three sampling rounds (2009, 2010, 2011). The maximum CVOC concentration in any well is 23 µg/l of TCE in MW-305C.
- The geochemical conditions in the deep wells and one of the shallow wells indicate that conditions are favorable (anaerobic or reducing) for reductive dechlorination to take place. The presence of daughter products in groundwater in the area demonstrates that degradation is taking place; however, no significant accumulation of daughter products is occurring.
- CVOC concentrations in many wells are decreasing or stable over time. Some of the increasing trends that were observed previously have not continued.

There are a few monitoring wells where stable or decreasing concentrations and trends were noted for the last Five-Year Review, which now, with recent data, show potentially increasing trends. Examples include MW-306C and MW-405D, where concentrations of TCE were previously below the ICL, but have increased above the ICL. The TCE concentrations in MW-306C, though higher than the ICL, have remained fairly constant over the last five monitoring rounds. The TCE concentrations in MW-405D have risen steadily over the last five rounds, but are still at a fairly low level (12 µg/l). These trends are not easily explained. However, since no source of the CVOCs has been determined in the PAC Remediation Area, these changes may be due to changes in conditions outside the PAC Remediation Area. For example, differing rates of dechlorination or continuing contributions of CVOCs from the source(s) may be causing different rates of change in the PAC Downgradient Area. Based on the data collected over more than 15 years of the JGWMP, these recent increasing trends could represent a short-term condition that will reverse itself over time.

6.6.3.2 BTEX in the PAC Remediation Area

Recent BTEX concentrations at MW-306A in the vicinity of former USTs are consistent with the findings of the previous Five-Year Reviews; specifically, BTEX have been successfully cleaned up through MNA. In 1992, the USTs were removed along with 50 cubic yards of surrounding impacted soils. A maximum benzene concentration of 200 µg/l was detected in MW-306A in 1997. Benzene concentrations dropped below the ICL of 5 µg/l in 1999, and have not been detected since October 2002. Ethylbenzene, toluene, and xylene concentrations, which were present in groundwater, but at concentrations below their ICLs/MCLs, have also decreased and have not been detected since the late 1990s.

6.6.3.3 Arsenic in the PAC Remediation Area

Arsenic concentrations in water from numerous monitoring wells in the PAC Remediation Area continue to exceed the drinking water standard of 10 µg/L. The conceptual model that has been presented for arsenic in groundwater involves local geochemical processes that cause chemically reducing conditions. The reducing conditions are the result of biodegradation of organic carbon present throughout the site. The reducing conditions cause the dissolution of iron and arsenic that is present naturally in the rock and sediments.

The occurrence and fate of arsenic in groundwater are difficult to predict precisely within OU-1. However, data trends generally indicate that the concentration of dissolved arsenic is steadily decreasing within both the PAC Source and PAC Downgradient Areas. At the request of EPA, the SDs performed an evaluation of the natural attenuation and expected persistence of dissolved arsenic in the PAC Remediation Area. Using data available through past monitoring, the SDs provided an evaluation report on March 29, 2011 (AECOM, 2011c) and then updated that evaluation in another report on April 24, 2012 (AECOM, 2012c). The conclusions of these evaluations were that concentrations of organic carbon and arsenic are both generally declining within the PAC Remediation Area, consistent with the site conceptual model of arsenic mobility. The average rate of decline (as expressed as a "decay" coefficient) was applied to the most recent groundwater data collected at each of several wells to predict future arsenic concentrations. The SDs used this decay coefficient to predict the timeframe for the groundwater at each well to predict future arsenic concentrations. The year at which groundwater at the well would reach the MCL (10 µg/l for arsenic) was predicted. In their updated (2012) evaluation, the SDs predicted that, for the average well, the date to reach the MCL is 2034 (22 years in the future). The predicted date for the various wells ranges from 2027 to 2041.

The results of the 2012 analysis are consistent with the site conceptual model of arsenic mobilization in the sub-surface and the estimated timeframes are reasonable estimates of the persistence of dissolved arsenic at OU-1 and the timeframe over which MNA will be in effect. However, the average decay coefficient determined by the SDs is very sensitive to changes in measured groundwater TOC and arsenic concentrations. For example, the concentrations of dissolved arsenic increased in a number of PAC Remediation Area wells in the April 2011 JGWMP monitoring round. These increases caused the SDs predicted average MNA cleanup timeframe to increase by seven years. It will be important to re-evaluate these trends and timeframes on a periodic basis to ensure that the conceptual model continues to accurately reflect the processes observed at the site.

As a check on the SDs' first-order decay-based prediction, USACE (in its role as the oversight contractor for the Site) performed trend analyses using the Mann-Kendall and Theil-Sen statistical procedures for evaluating trends in environmental data. These statistical analyses provide an indication of whether the data from a given well are trending upwards, downwards, or exhibit no trend at all[3]. The dissolved arsenic data for a selection of wells within the PAC Source and Downgradient Areas are presented in Table 7. At a confidence interval of 95%, the wells almost all exhibit either a downward trend or no trend at all. These results fit the conceptual model that dissolved arsenic will remain stable or decrease as the reducing conditions at the Site become ameliorated (i.e., as dissolved oxygen flows into the Site) so long as the geochemistry of the groundwater remains constant or improving (sources of organic carbon continue to diminish while concentrations of dissolved oxygen increase).

Table 7. Mann-Kendall and Theil-Sen results for Arsenic in Select Wells in the PAC Remediation Area

Well ID	Chemical and Trend at 95% Confidence	
	Mann-Kendall	Theil-Sen Test Results
AD-1	No Trend	No Trend
AD-2	No Trend	No Trend
AW-1RR	Upward	No Trend
AW-3	No Trend	No Trend
DW-1	Downward	Downward
DW-2	No Trend	No Trend
MW-302A	No Trend	No Trend
MW-302B	Downward	Downward
MW-303	No Trend	No Trend
MW-304	Downward	Downward
MW-308	Downward	Downward
MP-2	Downward	Downward

Based on the observed data trends, and this MNA evaluation, the SDs and EPA are evaluating the potential preparation of a modified decision document regarding the long-term remedy of arsenic in

[3] The Theil-Sen test is used in conjunction with the Mann-Kendall test for trend. The latter test offers information about whether a trend exists, but does not estimate the trend line itself. Once a trend is identified, the Theil-Sen procedure indicates how quickly the concentration level is changing with time. The Mann-Kendall procedure is a non-parametric test for a significant slope in a linear regression of the concentration values plotted against time of sampling. The Theil-Sen trend line (Helsel, 2005) is a non-parametric alternative to linear regression which can be used in conjunction with the Mann-Kendall test (EPA, 2009).

the PAC Source Area. This modified decision document would modify the PAC Source Area remedy for arsenic to exclude the active source control oxidation system, leaving just the excavation and removal source control with MNA; the same remedy that is stipulated in the ROD for the PAC Downgradient Area.

6.6.3.4 CVOCs in the CCL Source Area

The CCL Remediation Area includes a Source Area and CCL Downgradient Area. The ROD objectives for the CCL Source Area groundwater extraction and treatment system are to capture and treat groundwater within and immediately downgradient of the CCL Source Area and to prevent migration of contaminated groundwater from the CCL Source Area. A second objective for three of the 6 extraction wells (EW-4, EW-5, and EW-6) is to lower the water table and expose more vadose zone soil to the vapor extraction wells.

During this five-year review period, the six groundwater extraction wells at the CCL Source Area have been removing contaminants at a nearly steady rate of 2-8 lbs/day (Figure 9, Appendix A), but concentrations of PCE still exceed 10,000 µg/L after 10 years of pumping. During this period, the pumping rate has averaged approximately 58 gallons per minute (Figure 6, Appendix A). The cone of depression caused by pumping (Figure 10, Appendix A) has contributed to effective operation of the SVE system and also appears to be containing the plume in the overburden at the CCL Source Area. A mass balance calculation of possible ground-water flow into the pumped area from the upgradient contributing area, yielded a maximum inflow rate of about 59 gpm. For this calculation, a recharge rate of 26 in/yr (Randall, 1996), and a contributing area of about 0.07 square miles, which was determined from the width of the plume and distance to the topographic divide, were assumed. This generalized inflow analysis supports the concept that pumping is containing the plume. A similar flow rate of 55 gallons per minute through the CCL Source Area was reported (ENSR, 1997, Appendix B).

Experience for many Superfund sites in New England and elsewhere indicates that VOCs in the CCL Source Area are likely to have entered fractured bedrock underlying the release area. Limited data for bedrock at wells MW-103 and MW-105C, where contaminants have been detected, support this concept. It cannot be determined based on limited water-level data that pumping from the overburden hydraulically contains contaminants in bedrock. In addition, the nature of the release(s) at the CCL Source Area indicates that DNAPL (i.e., residual DNAPL) may reside in the saturated overburden and possibly the shallow bedrock beneath the tank farm.

The likelihood of DNAPL is supported by the fact that more mass has been extracted from the CCL Source Area than originally anticipated and the current rate of CVOC mass removal indicates that there is still significant mass remaining in the subsurface. Consequently, the system has already operated beyond the 12 years estimated in the ROD. The persistence of relatively high VOC concentrations in extracted groundwater after more than 15 years of groundwater extraction suggests that continued operation of the CCL Source Area extraction system may not achieve the ROD cleanup levels of MCLs within the foreseeable future. No revised projection of time to achieve cleanup has been developed at this time. However, additional evaluations may be performed during the next review period in order to provide supporting evidence for potentially instituting contingency measures as a modification to the selected remedy as indicated in the ROD.

6.6.3.5 CVOCs in the CCL Downgradient Area

The primary objective for the CCL downgradient extraction wells, as stated in the ROD, is to reduce the time required to meet groundwater standards by supplementary mass removal. The downgradient extraction system is also expected to recover the contaminant plume that migrated from the CCL Source Area toward the Blackstone River. Pumping from seven downgradient wells (wells EW-7 through EW-13) began in 1997, and the untreated water is discharged to the NBC sewer system. Flow rates are maintained within the limits of the NBC permit to maximize the mass removal of VOCs (AECOM, 2011c). The pumping rate averaged approximately 109 gpm during this reporting period, and the flow was always less than the NBC permitted limit of 200 gal/min. VOCs were removed at an average rate of approximately 17 lbs/year during this period, down from about 50 lbs/year during the last five-year review and 450 lbs/yr in 1999 (ENSR, 2007). However, the groundwater extraction rate from the CCL downgradient wells increased in 2010 from less than 100 gpm to greater than approximately 160 gpm through 2010 and 2011. During that time, the VOC mass removal rate increase to approximately 27 lbs/year.

The ROD indicated a cleanup time of 6 years in the CCL Downgradient Area with source control. An analysis (ENSR, 2007) extended the cleanup time to 26 years from 2007. A hypothesized reason for this increased cleanup timeframe was a larger plume area than originally assumed. A similar analysis performed in 2011 (AECOM, 2011c) projected a cleanup time of 24 years from 2011 for the Downgradient Area, meeting ICLs by 2035.

Natural attenuation was specified in the OU-1 ROD for the Quinnville Wellfield (see Figures 1 and 4, Appendix A). Also, the ROD states that, plume concentrations downgradient of the CCL Source Area are expected to decrease with time by natural attenuation with aggressive source removal and control. Concentrations of total VOCs (TVOCs) in water from wells in the Quinnville Wellfield have decreased appreciably from more than 100 µg/L in 1979 to below detection limits since 2000.

Groundwater quality in the CCL Downgradient Area has improved dramatically since the initiation of the downgradient extraction system in 1998, and has improved substantially since the second five-year review period, as is apparent in Figure 11. This figure shows time series plots of total VOC concentration data for six CCL Downgradient Area monitoring wells sampled in the JGWMP during the period of this Third Five-Year Review. Downgradient area groundwater quality is affected by several components of the CCL Remediation Area remedy: source removal and groundwater capture by the CCL Source Area SVE and groundwater extraction systems, downgradient groundwater extraction, and NA mechanisms. The improvement in the CCL downgradient groundwater quality is also supported by the decline in the TTO concentrations discharged to the NBC from the downgradient extraction system. These concentrations were as high as 500 µg/L in 2000, and averaged well below 100 µg/L during this reporting period, as shown in Figure 8. These lower concentrations are the reason that the mass removal rates for the downgradient system have declined from 50 lbs/year to 19 lbs/year (AECOM, 2011c).

Natural Attenuation

To evaluate changes in groundwater quality since the Source Area remedies began operation, CVOC concentration trends were analyzed statistically. Analysis of trends was performed using Mann-Kendall and Theil-Sen analyses, which are non-parametric methods that allow statistical analysis of irregularly distributed data. Trends were analyzed for nine Downgradient Area wells where one or more COCs have been detected above ICLs or MCLs and where sufficient data exists to perform the statistical analysis. Table 8 presents the results of these analyses. When these analyses indicate a

Downward Trend, then often *natural attenuation* is considered to potentially be responsible. Natural attenuation (NA) mechanisms include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil and groundwater. These in-situ processes include biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biological stabilization, transformation, or destruction of contaminants (EPA, 1998). Evaluation of NA is typically based on analysis of multiple lines of evidence, including the trends in VOC concentrations over time presented in Table 8, as well as geochemical data that indicate that degradation of the VOCs is occurring.

CVOC concentrations appear to be declining in all of the listed wells that had exceeded an ICL, except for well MP-11C, which had No Trend or an Upward Trend. Well MP-11C is screened in an isolated point at the deepest portion of the aquifer, downgradient of which concentrations are stable or declining. Concentrations of PCE daughter products (e.g., DCE and VC) from reductive dechlorination are also present in this well at increasing concentrations indicating that NA is occurring at this location. At MP-11C, the only CVOC detected above an ICL was VC at a concentration of 2.2 µg/l, slightly above the ICL of 2 µg/l. Other parameters (D.O. and Redox potential) were 0.12 and -123, which indicate that the aquifer geochemical conditions are conducive to natural degradation of the CVOCs.

Since the remedy was implemented, CVOC concentrations in groundwater have declined such that no VOC have been detected in wells monitored at the former Quinnville Wellfield above method detection limits (MDLs) since 2000. At the downgradient edge of OU-1 (i.e., along the Blackstone River from wells MW-102 to MW-106), concentrations are generally below ICLs or MCLs (except at wells MP-10C, MP-11C and MW-501C, which are screened in the deepest part of the aquifer). Where concentrations are greatest in the deeper portions of the aquifer, chemically reducing conditions are present which are generally conducive to the degradation of CVOCs. Evidence of biological reductive dechlorination has been observed at a number of downgradient monitoring wells (e.g., MW-501C, MP-10C and MP-11C are consistent with reducing conditions).

In summary, there is evidence that reductive dechlorination is occurring where concentrations are above ICLs in the CCL Downgradient Area and that downgradient groundwater quality is improving as a result of source control measures and NA processes. CVOC concentrations are declining in the CCL Downgradient Area. Concentrations are below ICLs or MCLs immediately upgradient of OU-2 and in the former Quinnville Wellfield, indicating that the remedy is meeting the objectives for the CCL Downgradient Area and that COCs are not currently migrating from OU1- to OU-2.

Table 8. Summary of Mann-Kendall and Theil-Sen Trend Analyses for CCL Downgradient Area, Peterson/Puritan Superfund Site, RI

Well ID	Chemical and Trend at 95% Confidence for Mann-Kendall and Theil-Sen Analyses						
	PCE	TCE	1,1,1-TCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride
CCL Downgradient Area Wells (downgradient of the Source Area extraction wells)							
MW-103	Downward	Downward	Downward	NA	Downward	Downward	Downward
MP-10B	No Trend	Downward	No Trend	Downward	Downward	Downward	Downward
MP-10C	Downward	Downward	NA	Downward	Downward	Downward	Downward
MP-11C	No Trend*	Upward	NA	NA	Upward	Downward	Upward
MW-105C	Downward	Downward	Downward	Downward	No Trend	No Trend	NA
MW-106C	Downward	Downward	Downward	Downward	Downward	NA	NA
MW-501B	Downward	Downward	Downward	Downward	Downward	Downward	Downward
MW-501C	Downward	Downward	Downward	Downward	Downward	Downward	Downward
Well 442	Downward	Downward	Downward	Downward	Downward	No Trend	Downward

Notes:

Trends given above are not indicative of magnitude of change.

Trend noted in **bold text,** if 2011 concentration was above the ICL. Otherwise, trend given in plain text.

NA = Most results non-detect; trend cannot be determined statistically.

All results for Mann-Kendall and Theil-Sen analyses agree at the indicated confidence level, except where noted.

* Mann-Kendall results differ from Upward Trend result calculated by Settling Defendants using 90% Confidence Coefficient (AECOM, 2011c).

6.7 Local Interviews and Site Inspection

The following local interviews and site inspections occurred as part of the Five-Year Review. Further information concerning these activities can be found in Appendix C.

6.7.1 Interview with the Town of Lincoln and Lincoln Water Commission, 4/4/2012

On April 4, representatives from the EPA, RIDEM, and USACE met with the Town of Lincoln representatives and the Lincoln Water Commission to conduct interviews supporting the five-year review of the site. Among other topics of discussion, the Quinnville Wellfield was of keen interest. The town has no current interest in reopening the wells at the present time due to costs, regulatory issues, permitting, operating costs, and additional labor. The Lincoln Water Commission no longer operates municipal wells for the Town but acts as the purveyor of water services and billing with their source of municipal water being primarily from the Scituate Reservoir (through the Providence system). Currently, the town plans to leave the wells intact but out of service. Recent vandalism and counter measures taken by the Commission to thwart these actions at the well house buildings at Quinnville was also discussed.

Wellheads need to remain secure and be protected from potential contamination entering into the borehole. Demolition debris within the wellfield and continued vandalism of the remaining well house structures remain a concern for the long term protection of the groundwater. Further communication with the town, and ultimately the completion of ICs for the Quinnville Wellfield, will help to ease these concerns.

6.7.2 Interview with Town of Cumberland, RI, 4/4/2012

EPA, RIDEM and USACE met with representatives of the Town of Cumberland. Discussions and questions concerning both OU-1 and OU-2 were raised. Among the topics of discussion, the Town interjected that it has lost the use of the Martin Street and Lenox Street wells as a result of contamination from the Site and what could be done to restore this loss of a resource for the town. Currently, the town purchases water from the Pawtucket Water Supply Board and has an emergency water connection to the Woonsocket water distribution system. Currently, the Town of Cumberland extracts groundwater from Manville Wells #1 and #2, which are up river and each provide approximately 1,500 gpm. The town was also very interested in the ongoing flood control project and the need to protect the industries if at all possible given the situation at the Site. Flood storage and capacity was discussed as well as the progress at OU-2.

6.7.3 Peterson/Puritan Interview with Interest Groups, 2/12/2012

EPA, USACE and RIDEM met with representatives from Mass Audubon Society, Blackstone River Coalition, Blackstone River Watershed Council/Friends of the Blackstone (as the TAG recipient), members of Stop Trashing Our Places (STOP), Blackstone River Valley National Heritage Corridor (NPS), and Trout Unlimited. Issues included the concerns for ongoing environmental issues at certain industries operating in the industrial park whether the solvent plume from OU-1 is entering the Blackstone River and results of fish sampling in the Blackstone River as part of the draft OU-2 RI. The participants were interested in focusing on River corridor protection for habitat and outdoor recreation activities associated with the Blackstone River.

6.7.4 PAC Site Inspection, 4/12/2012

EPA, and the USACE inspected the three former leach field locations at the former PAC Source Area. The team inspected monitoring wells on the PAC site and former Owens Corning property. The team noted that some well covers needed maintenance and that there is a need to maintain access to all wells. The former PAC facility houses several small businesses including a used book recycler and a truck maintenance facility (Danis Transportation). Of note was the fact that the property grounds were not well kept (at the time of inspection). Danis' operations, are apparently conducted inside a portion of the facility. Maintenance facilities included a room where both waste oils and product supplies were stored together on plastic pallets which also appear to act as spill containment. While housekeeping practices could be improved, no waste product or staining was observed to reach the facility outer wall or contact the ground. Thus, from a soil and groundwater perspective, the operations within the facility were not observed to be impacting the Site.

The team inspected the Dean Warehouse property and complex. Stains and small oil spills were noted on the pavement. The storm water pumps, which are manually operated to pump flood waters directly back to the Blackstone River, were observed and noted. Upon further discussion with Mr. Dean, EPA was informed that the storm water discharge system was permitted under the Rhode Island Pollutant Elimination System (RIPDES) regulations. In review of the permit on file at RIDEM, Office of Water Resources (OWR), it was further noted that on May 14, 2008 Dean Warehouse Services, Inc. was notified of its obligation to obtain a permit and to submit an application covering the system under the Rhode Island Multi-Sector General Permit (MSGP). In December 2008, GZA GeoEnvironmental, Inc. (representing Dean Warehouse Services, Inc.) submitted a Storm Water Pollution Prevention Plan (SWPPP) to RIDEM –OWM and on August 4, 2009 final authorization to discharge storm water to the Blackstone River under RIPDES was granted. The permit number is RIR50P27 and can be reviewed by appointment at RIDEM. The significance of this permit review was to acquire any knowledge of the "as built" system with respect to flood control and potential groundwater interactions. Unfortunately, the storm water pipe network, and ejector pipes were previously constructed and the SWPPP did not contain any verifiable data on the construction of the system, oil/water separation, culvert and basin construction, or groundwater communication (especially during the operation of the ejector pumps). No further information could be obtained with respect to the system, however it is theorized that the limited and only periodic operation of the system may not severely interfere with Site groundwater flow.

6.7.5 CCL Treatment Facilities Inspection, 4/12/2012

The CCL building (former Peterson/Puritan building) is now owned by Berkeley Acquisition Corp. and leased to multiple tenants, including Portola Tech, Inc. Vapor intrusion monitoring locations within the building were inspected and discussed. The SVE/GWTS was inspected, including the newly installed carbon polishing tanks for the CAS. Monitoring wells were inspected and maintenance needs documented.

6.8 Review of Current Access Agreements and Institutional Controls for OU-1

As a component of the Third Five-Year Review for the Site, EPA reviewed its files concerning the status of access agreements with property owners, and assessed the OU-1 SDs' progress in implementing Institutional Controls (ICs) in the form of deed restrictions throughout OU-1.

On the whole, EPA and the SDs have had adequate access to the Site. (EPA and the CCL SDs, however, do not currently have access to a Town of Lincoln property, located outside the boundaries

of the Site near the canal and bikepath, and from which the CCL SDs have agreed to abandon some unutilized wells.) The SDs' consultant, AECOM, sends letters to parcel owners on a yearly basis to remind the owners of their access obligations, and AECOM's need to enter the properties for annual sampling. Access agreements are in place, although some may have lapsed in terms of duration. An accounting of access agreements should be conducted before the next Five-Year Review.

Progress on obtaining the necessary deed restrictions in OU-1 has been slow, but generally forward moving. Deed restrictions, which limit property owners' land use activities in order to protect human health, the environment and EPA's remedial activities, were secured on three parcels (Plat 58, Lot 56, Plat 58, Lot 57 and Plat 58, Lot 116) within the PAC Source Area during the Second Five-Year Review period. During the current Five-Year Review period, the SDs made substantial progress in the multiple step process of obtaining deed restrictions on a number of additional parcels, but have not completed and recorded any new deed restriction instruments.

During the Second Five-Year Review period, Lonza retained the Guardian Trust (GT) to assume responsibility for the long-term stewardship of its IC obligations in the PAC Source Area In this role, GT checks whether deed restrictions remain in place and are effective, thereby helping to ensure that current and future land use activities do not threaten human health and the environment or interfere with the cleanup of the Site. Pursuant to its contract with Lonza, GT conducts annual inspections of the deed restrictions and current and planned land use activities at the PAC Source Area parcels, and provides a "first alert" to EPA and Lonza of any potential problems with the controls and activities that are contrary to the deed restriction land use limitations. During the Third Five-Year Review period, GT conducted these inspections and prepared annual reports, including recommendations to help ensure the short- and long-term effectiveness of the land use controls. GT provided draft reports to EPA for comment before finalizing the reports. No drafts have been submitted for 2011 to date.

During the Second Five-Year Review period, Unilever retained the GT to assume its responsibility for the acquisition of deed restrictions on all parcels within the CCL Remediation Area. EPA, Unilever, the State of Rhode Island and GT agreed in a memorandum entitled, Roles and Responsibilities in the Guardian Trust Pilot Project, dated March 26, 2007 (Roles Memo), on the method by which GT would acquire the deed restrictions.

To date, GT has obtained surveys for the vast majority of parcels within the CCL Remediation Area. GT has completed significant progress toward the completion of deed restrictions for many parcels, particularly the priority properties identified in the Roles Memo:

(a) KIK Custom Products, Inc. Property, (now owned by Berkeley Acquisition Corporation) (Plat 34, Lots 100, 190, 256, and 235);
(b) Town of Cumberland Property (Plat 34, Lot 221);
(c) Rhode Island Industrial Facilities Corporation Property (Plat 34, Lots 248, 139); and
(d) Capital Investment Group LLC Property (Plat 34, Lot 220).

During much of the Five-Year Review period, GT conducted monthly meetings with EPA and the State to inform them of GT's progress, and to request help as needed with administrative, process and priority questions, as well as communications with some property owners and property interest encumbrancers. EPA on numerous occasions provided support in obtaining abandonment and/or subordination agreements for property interests/easements encumbering certain parcels.

In July 2011, GT submitted its first title packages for Lots 220 and 221 of Plat 34 to EPA for review and approval. In November 2011, EPA provided required edits in accordance with the Roles Memo and DOJ Title Standards to one of the title packages and requested GT to resubmit the title package for final approval before GT could take the final steps toward recording. Since this time, GT has not resubmitted a revised title package, and work has stalled due to contractual issues between GT and Unilever. In June 2012, Unilever informed EPA that GT will likely be starting up work again to finalize the acquisition and recording of deed restrictions for the above-described priority parcels, as well as (a) the Providence and Worcester Railroad Property (Plat 58, Lot 111), and (2) other Berkeley Acquisition Corporation Properties (Plat 34, Lots 193 and 194). As of August 2012, Unilever informed EPA that it had authorized GT to restart its IC work.

SuperValu, responsible for acquiring deed restrictions for the four parcels within the PAC Downgradient Area elected not to contract with GT, but to obtain the necessary deed restrictions independently. SuperValu counsel provided EPA with survey maps and other information in response to a DOJ preliminary opinion of title, and in August 2008, EPA requested DOJ to provide a supplementary preliminary opinion of title. In May 2009, DOJ issued a supplementary preliminary opinion of title describing multiple ways in which the title package still failed to meet the DOJ title standards. Since that time, EPA has worked more closely with SuperValu counsel and its surveyor and title attorney to ensure that its title work is completed in accordance with DOJ title standards. As of July 2012, deed restriction instruments and subordination agreements had been distributed to the Town of Cumberland and Berkeley Acquisition Corporation and its tenants for review and signature.

In sum, Lonza has completed deed restrictions on three parcels in the PAC Source Area. If Unilever/GT contractual issues are resolved, GT may soon be closing in on the completion of deed restrictions on 11 lots within the CCL Remediation Area. SuperValu may also be closing in on the completion of deed restrictions on four lots in the PAC Downgradient Area. In other words, only three properties out of a total of 28 identified lots within OU-1 which require ICs have been fully executed.

7.0 TECHNICAL ASSESSMENT OF REMEDIAL ACTIONS

The purpose of this third five-year review is to evaluate whether the remedy at a site is protective of human health and the environment. In accordance with EPA's Comprehensive Five-Year Review Guidance (EPA, 2001), protectiveness is largely determined through analysis of three questions:

Question A: *Is the remedy functioning as intended by the decision documents?*

Question B: *Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of remedy selection still valid?*

Question C: *Has any other information come to light that could call into question the protectiveness of the remedy?*

Sections 7.1 though 7.3 provide an analysis of these questions, respectively, for OU-1, thus also providing a comprehensive assessment for all remediation areas within OU-1. Section 7.4 provides the protectiveness statement for OU-1.

7.1 Question A: Is the remedy functioning as intended by the decision documents?

Yes. The selected remedy is underway and generally functioning as intended by the decision documents. As was the case during the second review period, however, the projected cleanup times are taking longer than originally estimated in the ROD. The ROD projections were 12 years in the CCL Source Area, six years for the CCL Downgradient Area, six years for natural attenuation of chemicals at the PAC Downgradient Area, and one year for source control measures at the PAC Source Area. Ongoing monitoring of the groundwater indicates that conditions are stable, but after fifteen years of Site remediation operations significant amounts of contamination remain. In addition, ICs, which include formal access agreements, are not yet fully implemented at OU-1.

7.1.1 PAC Source Area and Downgradient Area (Collectively the PAC Remediation Area)

Active cleanup efforts through the use of an oxidation system in the PAC Source Area ceased in 2000. With subsequent limited improvements observed for groundwater arsenic concentrations, the SDs submitted a Technical Impracticability (TI) Waiver request to EPA. EPA reviewed the request, met with SDs to discuss technical issues and implementation strategies, and communicated necessary next steps for a waiver. This TI Waiver request was then withdrawn by the SDs in 2009, and the SDs and EPA are currently examining a revised decision document which would modify the originally selected remedy for arsenic in the PAC Source Area to exclude the further use of active oxidation source control, and couple the excavation source control with MNA. This potential remedy modification is currently being evaluated for issuance in the next review period.

The MNA remedy was selected for BTEX compounds and CVOCs in the PAC Source and PAC Downgradient Areas. The remedy appears to function as intended, but monitoring should continue to confirm trends. Arsenic concentrations are likely to remain above the drinking water standard of 10 µg/L in much of the PAC Remediation Area into the foreseeable future (projected by the SD to be between 2027 to 2041).

ICs were implemented at only 3 out of a total of 7 parcels within the PAC Remediation Area. Lonza has hired The Guardian Trust to maintain the ICs currently in place throughout the PAC Source Area

EPA has generally had access to the PAC Remediation Area parcels, but signed access agreements may have lapsed for some of the PAC Downgradient Area parcels.

7.1.2 CCL Remediation Area

For the CCL area, the remedy is functioning as designed. However, the projected cleanup times are estimated to be significantly longer than were anticipated in the ROD. As stated earlier, the ROD indicated a cleanup time of six years in the CCL Downgradient Area with source control. A new analysis (AECOM, 2011) indicates that the cleanup time will be 24 years from 2011, or 2035. The likely presence of residual DNAPL as a continuing source in the CCL Source Area and contaminants that may have migrated into the bedrock may continue to impact the valley groundwater for an unspecified period of time, and further extend the cleanup time within both the Source and Downgradient areas. Implementation of ICs in the CCL Remediation Area has not been completed for any of the affected parcels (21 in total). EPA approved a project memorandum and schedule for completing the required ICs in 2007. This schedule will require reassessment and a renewed commitment to complete ICs throughout the CCL remediation Area needs to be imposed.

Emissions from the Carbon Adsorption System

In response to EPA's request based on the second five-year review recommendations (EPA, 2007), the SDs measured influent and effluent concentrations of VOCs in the vapor stream of the treatment system to insure compliance with applicable air quality standards. Air sample results collected from the carbon adsorption system (CAS) on August 26, 2009 were reported in a March 16, 2010 letter from AECOM to the EPA. Air stream samples were collected from the two carbon tanks over the course of a single normal operating cycle (4 hrs). Sampling and analysis was conducted according to EPA method TO-15. Those results indicated that the time-weighted system RE did not achieve the target of 95%, and that the tetrachloroethylene emissions exceeded the not-to-exceed requirement of 20 pounds per year "minimum quantity" per applicable provisions of the *State of Rhode Island Air Pollution Control Regulations*. A second set of air samples was collected and analyzed in December 2009.

The SDs submitted a work plan to the EPA in March 2010 that was updated at EPA's request in October 2010, and subsequently approved by EPA in December 2010. Between January 2010 and May 2011, the SDs performed tests and system adjustments in order to improve the performance of the system. However, sample results from September 2010 and December 2010 indicated no improvement over prior results. Therefore, the SDs proposed: 1) replacing the activated carbon in the existing vessels; 2) installing two additional 1,000-pound vapor phase polishing carbon vessels at the effluent of each existing carbon vessel, and; 3) dividing the influent airstream between the two treatment trains to operate in parallel.

In March 2012, a report submitted by the SDs summarized the results of the October 2011 and February 2012 emissions sampling and analyses. The report indicated that with the noted treatment process changes to the airstream, in each case the target RE of 95% was achieved with no compounds exceeding the RIDEM minimum quantities. In a letter dated March 16, 2012, EPA conditionally approved CAS modifications and future worked planned to verify the improvements. In August, the SDs conducted another Summa can sampling event, and upon applying laboratory method TO-15 on the samples, will report the results to the EPA in September 2012.

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. The conclusions at the time of remedy selection are valid. At OU-1, the exposure routes and receptors considered in the ROD are still valid since physical conditions and operations have not changed significantly, with the exception of potential vapor intrusion in the CCL Source Area. Vapor intrusion in the CCL Source Area is currently being assessed to determine whether there is a completed exposure pathway there. If there is a completed exposure pathway to vapors then the selected remedy will be modified to address these risks. Finally, there are no new contaminants identified at OU-1 that would adversely affect the remedy.

Interim cleanup levels selected in the ROD were based on attaining maximum contaminant levels in groundwater, and concentrations in soil that are protective of leaching to the groundwater. As such, the intent of the remedy was to remediate the groundwater as a potential drinking water resource. During the first review period, EPA promulgated an MCL for arsenic that became effective during the second review period (i.e., 10 µg/L effective as of January 2006). As stated in the second five-year review, this change did not affect protectiveness in the short term because of the current lack of exposure due to public water use by all of the affected properties within the operable unit. No other MCLs have changed.

The baseline risk assessment for OU-1 was conducted during the RI in 1993 (CDM, 1993). During the last five years, several changes have occurred to some of the EPA toxicity values maintained on the Integrated Risk Information System (IRIS) for the COCs identified in the ROD. Those changed values, and changes that may be expected in the near future are noted in Table 9. Also shown in Table 9 are anticipated dates for upcoming substance reports, which may affect toxicological evaluations for some of the contaminants of concern during the ongoing review period.

Most notably, on September 28, 2011, EPA released the TCE assessment with new cancer and non-cancer toxicity values. EPA now formally characterizes TCE as carcinogenic to humans by all routes of exposure and a non-carcinogenic health hazard. Although these toxicity values are more stringent than those used in the 1993 human health risk assessment conducted for the Site and would result in higher TCE risks from exposure to TCE at the Site, this would not affect the remedy selected for the Site because there is no change to the TCE MCL, which was selected for the interim groundwater cleanup level and soil cleanup level due to leachability.

Also, on February 10, 2012, EPA released the PCE assessment with new cancer and non-cancer toxicity values. EPA now formally characterizes PCE as likely to be carcinogenic in humans by all routes of exposure and a non-carcinogenic health hazard. Comparing to the toxicity values used in the 1993 human health risk assessment conducted for the Site, the current PCE non-cancer toxicity values are more stringent and would result in higher PCE hazards and the current PCE cancer toxicity values are less stringent and would result in lower PCE cancer risks from exposure to PCE at the Site. However, this would not affect the remedy selected for the Site because there is no change to PCE MCL, which was selected for interim groundwater cleanup level and soil cleanup level due to leachability.

In sum, none of the changes in toxicity values call into question the determinations made in the ROD. Protectiveness as intended by the remedy was maintained during the third review period. There are no known exposures related to the use of the groundwater at OU-1 because drinking water since the area is serviced by a public water supply that is regulated in accordance with the Safe Drinking Water Act. Changes in toxicity values will continue to accumulate over time, and it appears that the course of the

remedy will be longer than originally expected. However, to resolve the matter prior to site closeout, the ROD specifies that upon attainment of the interim cleanup goals (i.e., drinking water standards) for three consecutive years, a risk assessment on the residual groundwater contamination will be conducted to confirm that the remedial action is protective. This new risk assessment will be performed using the current risk values provided by EPA at that time of this assessment.

One of the recommendations of the second five-year review was to evaluate additional exposure pathways such as intrusive vapors into indoor spaces, which is discussed further below under Question C.

Table 9. Changes to EPA Toxicity Values during the Third Five-Year Review Period

Chemical of Concern	Medium of Concern	Cancer Effects by Area	Non-cancer Effects by Area	IRIS Changes During Review Period versus ROD				IRIS Substance Report Status	
				Date	What Changed	Non-cancer	Cancer	Document	Schedule
Acetone	Groundwater	CCL, PAC, PACDG	CCL, PAC	7/31/2003	NA	NA	NA	NA	NA
Arsenic	Groundwater	CCL, PAC, CCLDG, PACDG	CCL, PAC, CCLDG, PACDG	6/1/1995	NA	NA	NA	Cancer External Peer Review and Public Availability	
								Non-cancer Draft Development	TBD
Benzene	Groundwater	CCL, CCLDG, PACDG	NA	4/17/2003	NA	NA	NA	NA	NA
Bis(2-ethylhexyl)Phthalate	Groundwater	CCL, CCLDG	NA	9/7/1988	NA	NA	NA	NA	NA
Cadmium	Groundwater	NA	CCL	1/1/1991	NA	NA	NA	Draft Development	TBD
Chlordane	Groundwater	CCL	CCL	2/7/1998	NA	NA	NA	NA	NA
Copper	Groundwater	NA	CCLDG	9/7/1988	NA	NA	NA	Draft Development	FY13/3rd Quarter
1,1-Dichloroethene	Groundwater	CCL	CCL	8/13/2002	NA	NA	NA	NA	NA
	Soil Leaching	CCL	CCL	8/13/2002	NA	NA	NA	NA	NA
1,2-Dichloroethane	Groundwater	CCL, CCLDG	CCL	1/1/1991	NA	NA	NA	NA	NA
	Soil Leaching	NA	CCL	1/1/1991	NA	NA	NA	NA	NA
Ethylbenzene	Soil Leaching	NA	PAC	3/1/1991	NA	NA	NA	Draft Development	TBD
Methylene Chloride	Groundwater	CCL	CCL	11/18/2011	RfD, CSF	More stringent	Less stringent	NA	NA
	Soil Leaching	CCL	CCL	11/18/2011	RfD, CSF	More stringent	Less stringent	NA	NA
Styrene	Soil Leaching	NA	PAC	11/1/1992	NA	NA	NA	Draft Development	FY13/4th Quarter
Tetrachloroethene	Groundwater	CCL, PAC, CCLDG	CCL	2/10/2012	RfD, CSF	More stringent	Less stringent	NA	NA
	Soil Leaching	CCL, PAC	CCL, PAC	2/10/2012	RfD, CSF	More stringent	Less stringent	NA	NA
Toluene	Soil Leaching	NA	PAC	9/23/2005	NA	NA	NA	NA	NA
Trichloroethene	Groundwater	CCL, CCLDG, PACDG	NA	9/28/2011	RfD, CSF	More stringent	More stringent	NA	NA
	Soil Leaching	CCL	NA	9/28/2011	RfD, CSF	More stringent	More stringent	NA	NA
1,1,1-Trichloroethane	Groundwater	NA	CCL	9/28/2007	RfD	NA	Less stringent	NA	NA
1,1,2-Trichloroethane	Groundwater	CCL	NA	1/1/1991	NA	NA	NA	NA	NA
Vinyl Chloride	Groundwater	CCL, CCLDG	NA	8/7/2000	NA	NA	NA	NA	NA
Xylenes	Soil Leaching	NA	PAC	2/21/2003	NA	NA	NA	NA	NA

NA – Not applicable
Changes indicated by shaded cell with date.
CCLDG – CCL Downgradient Area.
PACDG – PAC Downgradient Area.

7.3 Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

Yes. EPA has obtained recent information over the last five years that questions the protectiveness of the remedy.

Source of VOCs

The continued presence of VOCs in the shallow aquifer and at depth, the persistence of VOCs in bedrock wells near the CCL Source Area, and experience at numerous Superfund Sites in New England indicate the likely presence of residual DNAPL in the saturated zone acting as a continuing source of contaminants in valley fill. Remediation of the overburden may be prolonged for an unknown period of time due to the presence of the overburden DNAPL. In addition, bedrock could continue to serve as a secondary source of contaminants after the remedy in the surficial materials within the CCL Source Area is complete. Thus, the long-term protectiveness of the current remedy could be compromised by the potential DNAPL source. Thus, achievement of the ROD specified cleanup criteria or drinking water MCLs may not be achievable with the current remedy. These considerations do not affect the current protectiveness of the existing remedy, which appears to be containing the CCL Source Area plume and promoting attenuation of the downgradient plume. Analysis of the duration of the current remedy for achieving the ROD specified cleanup goals, including predictive modeling, should be performed to establish whether remedy enhancements, modifications or contingency measures are necessary to achieve these goals.

Vapor Intrusion Study Summary

In response to EPA's request based on the second five-year review recommendations (EPA, 2007), the SDs have undertaken a vapor intrusion data collection effort at the industrial building at 35 Martin Street within the CCL Remediation Area. In June 2010, the EPA sent the CCL SDs a scope of work, requesting them to submit a work plan and conduct a VI study of the building. In August 2010, the CCL SDs submitted a work plan for EPA review. EPA modified the work plan to conform to the scope of work, but allowed the CCL SDs to choose from one of two options: Option A, which required the immediate implementation of a full VI assessment based on two seasonal rounds of data collection from subslab, indoor, and ambient locations; and Option B, which allowed the SDs to conduct a preliminary screening event without subslab sampling before the full VI assessment as described in Option A. The SDs elected to implement Option B, which required the SDs to submit the preliminary screening data to EPA for its determination of whether a full VI study was required. Under Option B, any detection of targeted VOCs at or above EPA's risk-based screening levels in the Building triggered the full VI study as described in Option A. The CCL SDs committed to the Option B work plan in December 2010 and performed a preliminary screening event in May 2011 at 16 indoor and 3 outdoor locations. Data from the preliminary screening event, reported to EPA and RIDEM in July 2011, indicated that some targeted volatile organic compounds were above screening thresholds. Based on the submitted data, EPA requested a full VI study, per the requirements of the approved work plan, which included subslab, indoor air, and ambient air sampling within two rounds of data collection in December 2011 and June 2012.

The SDs proceeded with a winter sampling event in December 2011 with results reported in March 2012 (AECOM, 2012b). The December 2011 sampling program included the collection of 44 air samples from 39 locations in and around the building. A second sampling event was performed in July 2012 under summer conditions at the same locations. EPA will conduct a risk evaluation of vapor intrusion into the building after it receives the second, July 2012 round of sampling data. Therefore,

due to the implications of VI, a statement on protectiveness is deferred until the assessment is complete and addressed in an addendum to this five-year review report.

7.4 Summary of the Technical Assessment

The remedy is functioning as designed but the projected cleanup times are much longer than those that those estimated in the ROD. Institutional Controls in the form of deed restrictions throughout the CCL Remediation Area and the PAC Downgradient Area have not been completed.

The exposure assumptions remain valid for all contaminants except arsenic.

In the CCL Remediation Area, the continued presence of VOCs in the overburden aquifer at depth, the presence of VOCs in bedrock wells near the source, and experience at numerous Superfund Sites in New England indicate the presence of residual DNAPL in the saturated overburden and a potential source of bedrock contamination. These residuals may require enhancements/modications to the existing CCL Source Area remediation system to achieve the ROD specified goals.

Vapor intrusion continues to be an issue of concern in/near the CCL Source Area. Completion of the VI assessment, as described above, will help determine whether there are unacceptable risks from VI, and if so, what measures will be needed to mitigate those risks and what additional monitoring will be required.

8.0 ISSUES

This Five-Year Review has identified several issues listed in Table 10. These are the basis of the recommendations subsequently made in Section 9.

Table 10. Issues at the Peterson/Puritan, Inc. Superfund Site, OU-1, Cumberland and Lincoln, RI.

Issues		Affects Current Protectiveness	Affects Future Protectiveness
1	Arsenic in groundwater of the PAC area remains above the drinking water standard.	No; because groundwater is not currently used or consumed within OU-1. ICs in PAC Source Area are complete and being monitored annually.	Yes; data indicate a downward trend, but an inability to meet groundwater cleanup standards in the time frame specified in the ROD, which assumed success of active oxidation control system; also, ICs are not implemented in PAC Downgradient Area.
2	CVOCs remain above drinking water standards at the CCL Remediation Area and, using the current CCL Source Area remedy, will not meet remediation goals within an acceptable timeframe as described in the ROD.	No; so long as groundwater is not used or consumed.	Yes; the likely presence of residual DNAPL in the saturated overburden and/or shallow bedrock raises questions to protectiveness long term without remediation enhancements/modifications as described in the ROD.
3	Institutional controls are not fully implemented, access agreements to many affected properties are not documented, lapsed, or have not been obtained.	No; all OU-1 property owners who will be subject to institutional controls have received information about the institutional controls.	Yes; effectiveness of remedy is in question until the ICs are permanently in place such that changes in land use or ownership will not jeopardize the ongoing cleanup.
4	Vapor intrusion to occupied structures is a potential concern near the CCL Source Area.	Yes; due to the uncertainty of current contaminant fate and transport. Protectiveness is deferred until ongoing assessment is complete.	Yes; due to the uncertainty of current contaminant fate and transport. Protectiveness is deferred until ongoing assessment is complete.
5	The Quinnville wellheads are not properly secured and are vulnerable to further vandalism and the potential for groundwater contamination.	No; at the present time, while vandalism of the well house structures is apparent, there is no indication of current groundwater impact.	Yes; if land use changes go unmonitored or if ICs are not permanently placed, protectiveness of the groundwater remedy may be jeopardy.
6	CCL SDs considering modification of the downgradient groundwater extraction system to remove some groundwater extraction wells and install a new extraction well near the MW-501 well cluster. (Based upon SD report, AECOM, 2011c).	No; currently, there is no formal proposal for this modification; OU-1 groundwater is not currently used or consumed.	Yes; Changes to the pumping regime may impact protectiveness unless supported by further evaluation.

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

In response to the issues noted above, recommended actions for each of the issues raised in the previous section are listed in Table 11.

Table 11. Recommendations and Follow-up Actions for the Peterson/Puritan Superfund Site, Cumberland and Lincoln, Rhode Island.

	Issues	Recommendations and Follow-up Actions	Responsible Party	Oversight Agency	Milestone Date
1	Arsenic in groundwater of the PAC area remains above the drinking water standard.	Pursue potential decision document modification for PAC Source Area to exclude further active source control (oxidation system), leaving just the excavation source control and MNA as the remedy for that area. Perform the necessary monitoring to ensure that MNA is achieving the goals for the site and ensure that ICs are in place.	SD (PAC)	EPA/RIDEM	4th fiscal quarter 2013
2	CVOC's remain above drinking water standards at the CCL Remediation Area and, using the current CCL Source Area remedy, will not meet remediation goals within an acceptable timeframe as described in the ROD.	Develop revised estimate of remediation timeframe for the CCL Source Area to achieve ROD specified treatment goals. Evaluate potential presence of residual DNAPL in the CCL Source Area. Develop a plan to enhance/modify the remediation system to achieve the treatment goals in a reasonable timeframe.	SD (CCL)	EPA/RIDEM	3rd fiscal quarter 2016
3	Institutional controls are not fully implemented, access agreements to many affected properties are not documented, lapsed, or have not been obtained.	Develop a schedule for establishing and implementing ICs. Implement and maintain all IC agreements on all appropriate parcels, and secure access for all OU-1 parcels.	SDs / Guardian Trust	EPA/RIDEM	2nd fiscal quarter 2015
4	Vapor intrusion to occupied structures is a potential concern near the CCL Source Area.	Complete vapor intrusion pathway assessment, and develop ongoing VI monitoring or action as warranted by the results of the assessment.	SD (CCL)	EPA/RIDEM	3rd fiscal quarter 2013
5	The Quinnville wellheads are not properly secured and are vulnerable to vandalism and contamination.	Work with water commission to approve a plan to assure effective security of the wellheads. Complete ICs for the property.	Lincoln Water Department	RIDEM/EPA	2nd fiscal quarter 2014
6	CCL SD is considering modifying the downgradient groundwater extraction system to remove some groundwater extraction wells and install a new extraction well near the MW-501 well cluster.	Changes to the pumping regime should be supported by further evaluation including groundwater modeling (including consideration for flood mitigation measure being developed by USACE). Develop a plan for modifying the downgradient groundwater extraction system.	SD (CCL)	EPA/RIDEM	2nd fiscal quarter 2015

9.1 Other Considerations

The following considerations, while not issues related to the protectiveness of the remedy, are pertinent to environmental management decisions.

The SDs have asserted, based on interpretation of the JGWMP results, that the groundwater remediation extraction well network in the CCL Downgradient Area could be optimized by shutting down the extraction wells closest to the Blackstone, focusing pumping on the deepest part of the aquifer in the center of the valley, and modified by installing a new extraction well near the MW-501 well cluster. By enhancing the remediation system and re-focusing the pumping, it may be possible to reduce the mass of CVOCs in the Downgradient Area to a low enough level that, at an appropriate point in the future, the downgradient pumping system can be decommissioned and employ MNA as a final remedy for the CCL Downgradient Area. This assertion is based on significant decreases in the mass removal from the downgradient wells (i.e., decreased by an order of magnitude during the period of this Third Five-Year Review) (AECOM, 2011c). Downward trends in the groundwater data in the CCL Downgradient Area indicate that MNA is contributing to the control of the concentrations in the CCL Downgradient Area. For EPA to consider this scenario further, the SD's should evaluate this scenario using the current (May 2009) groundwater model for the site, and demonstrate, using the model, the optimal location of the new extraction well. Ongoing groundwater monitoring will provide the data to evaluate if the groundwater conditions change in response to the proposed focused pumping and if potential changes decrease or extend the calculated timeframe to meet ICLs. Lastly, the SDs should also consider the effects of any flood control structures built as a result of/in accordance with the Flood Mitigation Feasibility Study on the remediation at the Site and whether such flood control structures would be allowable under IC deed restrictions. For example, numerical groundwater modeling should be using an existing flow model to evaluate the effect of any proposed flood mitigation measure on existing contaminant capture in the CCL Downgradient Area.

Flood mitigation control measures proposed near Hope Global may change the groundwater flow regime and the progress of remediation in the CCL Downgradient Area. Consideration and design of these flood mitigation measures should include an assessment of how the measures may affect current site conditions, the current CCL Downgradient Area pumping, and future changes to the CCL Downgradient Area pumping regime.

10.0 PROTECTIVENESS STATEMENT

The EPA Comprehensive Five-Year Review Guidance requires that the Five-Year Review include a statement on the protectiveness of the remedy (EPA, 2001). A statement regarding the protectiveness of the remedial actions that have been implemented at OU-1 is presented below:

A protectiveness determination for the remedy at OU-1 cannot be made at this time until further information is obtained. Further information will be obtained to determine protectiveness in the short term by completing the ongoing vapor intrusion assessment at the CCL Source Area and determining whether or not potential risk due to VI exists. It is expected that these actions will take approximately six months to complete, at which time a protectiveness determination will be made.

For other elements of the groundwater component of the remedy at OU-1, the following facts should be noted for protectiveness in the short term:

- alternative water supplies are available to meet current demand, and
- some ICs have been formally implemented.

However, in order for the groundwater component of the remedy to be protective in the long term, the following issues need to be addressed: a) arsenic concentrations above the MCL of 10 µg/L , b) the potential persistence of residual DNAPL at the CCL Source Area further extending the cleanup time frame, c) evaluate extraction/treatment systems, and d) ICs, which are not fully implemented throughout OU-1, need to be completed.

11.0 NEXT REVIEW

Five-year reviews are conducted every five years at sites where contaminant levels remain at concentrations that prevent unlimited, unrestricted use of the site. The next five-year review should be completed by September 30, 2017. By that time, more will be known of the progress of the groundwater cleanup at OU-1, and the nature and extent of contamination regarding other areas of concern within the boundary of the Site.

For OU-1, the next review should include a complete review of data generated under the long-term monitoring program to determine if contaminant concentration trends are consistent with those projected in the ROD. The next review should also include an evaluation of the effectiveness of institutional controls and access agreements for the Site once they are finalized.

12.0 REFERENCES

ABB-ES, 1993. Remedial Investigation and Feasibility Study Report, Peterson/Puritan Superfund Site, Operable Unit 1.

ARCADIS, 2007, Remedial Investigation Report, Peterson Puritan Superfund Site-Operable Unit 2.

AECOM, 2011a. Letter from: Mark Gerath and Carolyn Scott. To: Larry Brill, EPA. Re: Prediction of MNA Effectiveness at the PAC Source Area of the Peterson-Puritan Superfund Site to Support Potential Remedy of Monitored Natural Attenuation, Peterson/Puritan Superfund Site, OU-1, Cumberland and Lincoln, Rhode Island. March 29.

AECOM, 2011b. Vapor Intrusion Investigation Preliminary Screening Data Report, 35 Martin Street, Cumberland, Rhode Island, Peterson/Puritan, Inc. Superfund Site. July 15.

AECOM, 2011c. Settling Defendants' Third Five-Year Review Report, Peterson/Puritan, Inc. Superfund Site, Operable Unit 1, Cumberland and Lincoln, Rhode Island. October 7, 2011.

AECOM, 2012a, Carbon Adsorption System Status Report, CCL Remediation Area, Operable Unit 1, Peterson/Puritan, Inc. Superfund Site, Cumberland, Rhode Island. March 2012.

AECOM, 2012b. Vapor Intrusion Investigation Data Report– Winter 2011, 35 Martin Street, Cumberland, Rhode Island, Peterson/Puritan, Inc. Superfund Site. March 2012.

AECOM, 2012c. Letter from: Mark Gerath and Carolyn Scott. To: Larry Brill, EPA. Re: Monitored Natural Attenuation Assessment for PAC Source Area of the Peterson-Puritan Superfund, Peterson/Puritan Superfund Site, OU-1, Cumberland and Lincoln, Rhode Island. April, 24.

CDM, 1993. Baseline Risk Assessment, Final Report, Peterson/Puritan, Heath and Endangerment Assessment, Cumberland, Rhode Island. June.

ENSR, 1997. Remedial Action Report, Peterson/Puritan Superfund Site, Cumberland, RI, First Operable Unit, PAC Remediation Area: ENSR Document No. 4330-012-613.

ENSR, 1998. Remedial Action Report, Peterson/Puritan, Inc. Site Operable Unit 1, Cumberland and Lincoln, RI.

ENSR, 2000. Evaluation of Oxidant Delivery System Performance and Efficacy in Remediating Arsenic. Peterson/Puritan Superfund Site, Cumberland, RI, First Operable Unit, PAC Remediation Area. ENSR Document No. 4330-018-626.

ENSR, 2001. Monitored Natural Attenuation Report, Five-Year Review Evaluation, October 1995 to October 1999. Peterson/Puritan Superfund Site, Cumberland, RI, First Operable Unit, PAC Remediation Area. ENSR Document No. 4330-018-142b. January.

ENSR, 2003a. Evaluation of Technical Impracticability of Groundwater Restoration for Arsenic. PAC Remediation Area, Peterson/Puritan Superfund Site, Operable Unit 1, Cumberland, Rhode Island. ENSR Document Number 04330-024-100. May.

ENSR, 2003b. Request for Residual Zone for Arsenic in Groundwater. PAC Remediation Area, Peterson/Puritan Superfund Site, Operable Unit 1, Cumberland, Rhode Island. ENSR Document Number 04330-024-150. July.

ENSR, 2007. Second Five Year Review Data Summary Report, Peterson/Puritan Superfund Site, Operable Unit 1, Cumberland, Rhode Island. Prepared by ENSR|AECOM for Conopco, Inc., as successor to Bestfoods, Lonza, Inc., and SuperValu Operations, Inc.

ENSR/ABB-ES, 1995. Joint Groundwater Monitoring Program Plan and Project Operations Plan.

EPA, 1993. Record of Decision, Peterson/Puritan, Inc. Site, and Operable Unit #1. US Environmental Protection Agency. September 30.

EPA, 1995. Remedial Design/Remedial Action (RD/RA) Statement of Work (SOW), Peterson/Puritan, Inc. Site, Operable Unit #1. March 13.

EPA, 1998. Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Ground Water. National Risk Management Research Laboratory (NRMRL), Ada, Oklahoma, Publication EPA/600/R-98/128, NTIS Order Number PB99-130023. October.

EPA, 2001. Comprehensive Five-Year Review Guidance. EPA-540-R-01-007, prepared by the Office of Emergency and Remedial Response (5204G), EPA, Washington DC, June 2001.

EPA, 2002. Five-Year Review Report. Peterson/Puritan, Inc. Superfund Site, Cumberland and Lincoln, Rhode Island. United States Environmental Protection Agency, Region 1-New England, Boston, MA. September.

EPA, 2007. Second Five-Year Review Report. Peterson/Puritan, Inc. Superfund Site, Cumberland and Lincoln, Rhode Island. US EPA, Region 1-New England, Boston, MA. September.

EPA. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530-R-09-007, 2009.

EPA, 2012a. EPA Response to Carbon Adsorption System Status Report, AECOM, March 29, 2012. Operable Unit 1, Peterson/Puritan Superfund Site, Cumberland, Rhode Island. May 16, 2012.

Helsel, D.R., 2005. Nondetects And Data Analysis: Statistics for censored environmental data. John Wily and Sons, New York. 250 p.

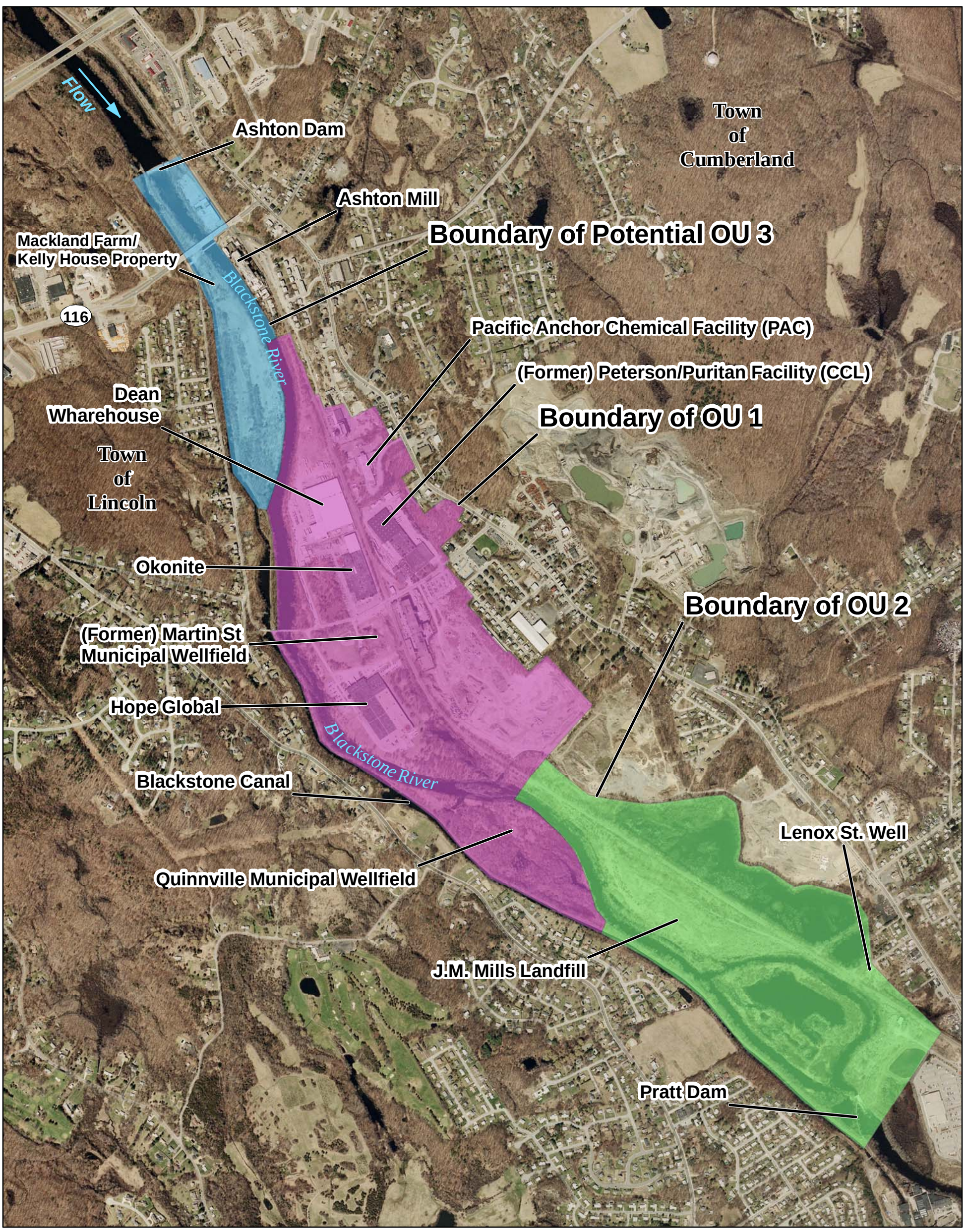
Randall, 1996. Mean annual runoff, precipitation, and evapotranspiration in the glaciated northeastern United States, 1951-80: U. S. Geological Survey Open-File Report 96-395, 2 plates.

RIDEM, 2005. Rules and Regulations for Groundwater Quality. Regulation 12-100-006. Promulgated May 1992, amended July 1993, May 1995, August 1996, and March 2005.

U.S. Army Corps of Engineers (USACE), 2002. Engineering and Design - Soil Vapor Extraction and Bioventing Engineer Manual. EM 1110-1-4001.

USACE, 2009. Technical Memorandum: Groundwater Modeling Status Report, Peterson/Puritan Superfund Site, Cumberland and Lincoln RI, USACE, New England District, May 2009.

APPENDIX A – FIGURES



Notes:
1. Boundaries depicted are estimated and are for general descriptive purposes only.
2. OU1 includes the Quinnville wellfield as a receptor of OU1 groundwater contaminants.
3. For OU-1, this map depicts an estimated site boundary configuration indicating extent of future Institutional Controls (deed restrictions) to be implemented.

Aerial Photo Date 4/14/03 from RIGIS

N

0 1,000 Feet

US Army Corps of Engineers®
New England District

Figure 1
Location Map with Aerial Photo
Peterson/Puritan Superfund Site
Cumberland, RI

M:\Projects\Superfund\PetersonPuritan\Figures\PetersonPuritanLocationMapAerial091912.pdf
M:\Projects\Superfund\PetersonPuritan\MXDs\PetersonPuritanLocationMapAerial062112.mxd
September 19, 2012 DWN: MTW CHKD: KJH

Boundary of Potential OU-3

Boundary of OU-1

Boundary of OU-2

Pacific Anchor Chemical Facility (PAC)

(Former) Peterson/Puritan Facility (CCL)

Ashton Dam

Ashton Mill

Mackland Farm/
Kelly House Property

(Former) Martin St
Municipal Wellfield

Quinnville Municipal Wellfield

Blackstone Canal

J.M. Mills Landfill

Pratt Dam

Town of Cumberland

Town of Lincoln

Quinnville

Berkeley

Molasses Hill

Blackstone River

Monastery Brook

Water Tank

Fire Sta

Quarry

Gravel Pit

Gravel Pits

Golf Course

Cem

116

Extent of Location Map

CT

RI

Notes:
1. Boundaries depicted are estimated and are for general descriptive purposes only.
2. OU1 includes the Quinnville wellfield as a receptor of OU1 groundwater contaminants.

USGS Topographic Map Pawtucket RI-MA 1949 (Photorevised 1970 and 1979)

N

0 1,000 Feet

US Army Corps of Engineers
New England District

Figure 2
Location Map with Topographic Map
Peterson/Puritan Superfund Site
Cumberland, RI

M:\Projects\Superfund\PetersonPuritan\Figures\PetersonPuritanLocationMapTopo091907.pdf
M:\Projects\Superfund\PetersonPuritan\MXDs\PetersonPuritanLocationMapTopo081407.mxd
September 19, 2007 DWN: MTW CHKD: AWB

Triangular Parcel

Former Owens Corning Property

PAC Source Area

PAC Downgradient Area

CCL Source Area

CCL Downgradient Area

Quinnville Wellfield

Notes:
1. Areas depicted are estimated and are for general descriptive purposes only.
2. OU1 includes the Quinnville wellfield as a receptor of OU1 groundwater contaminants.

Aerial Photo Date 4/14/03 from RIGIS

N

0 500 Feet

US Army Corps of Engineers®
New England District

Figure 3
Operational Unit 1
Remediation Area Detail
Peterson/Puritan Superfund Site
Cumberland, RI

M:\Projects\Superfund\PetersonPuritan\2012\Figures\PetersonPuritanOU1Aerial062112.pdf
M:\Projects\Superfund\PetersonPuritan\2012\MXDs\PetersonPuritanOU1Aerial062012.mxd
June 21, 2012 DWN: MTW CHKD: KJH

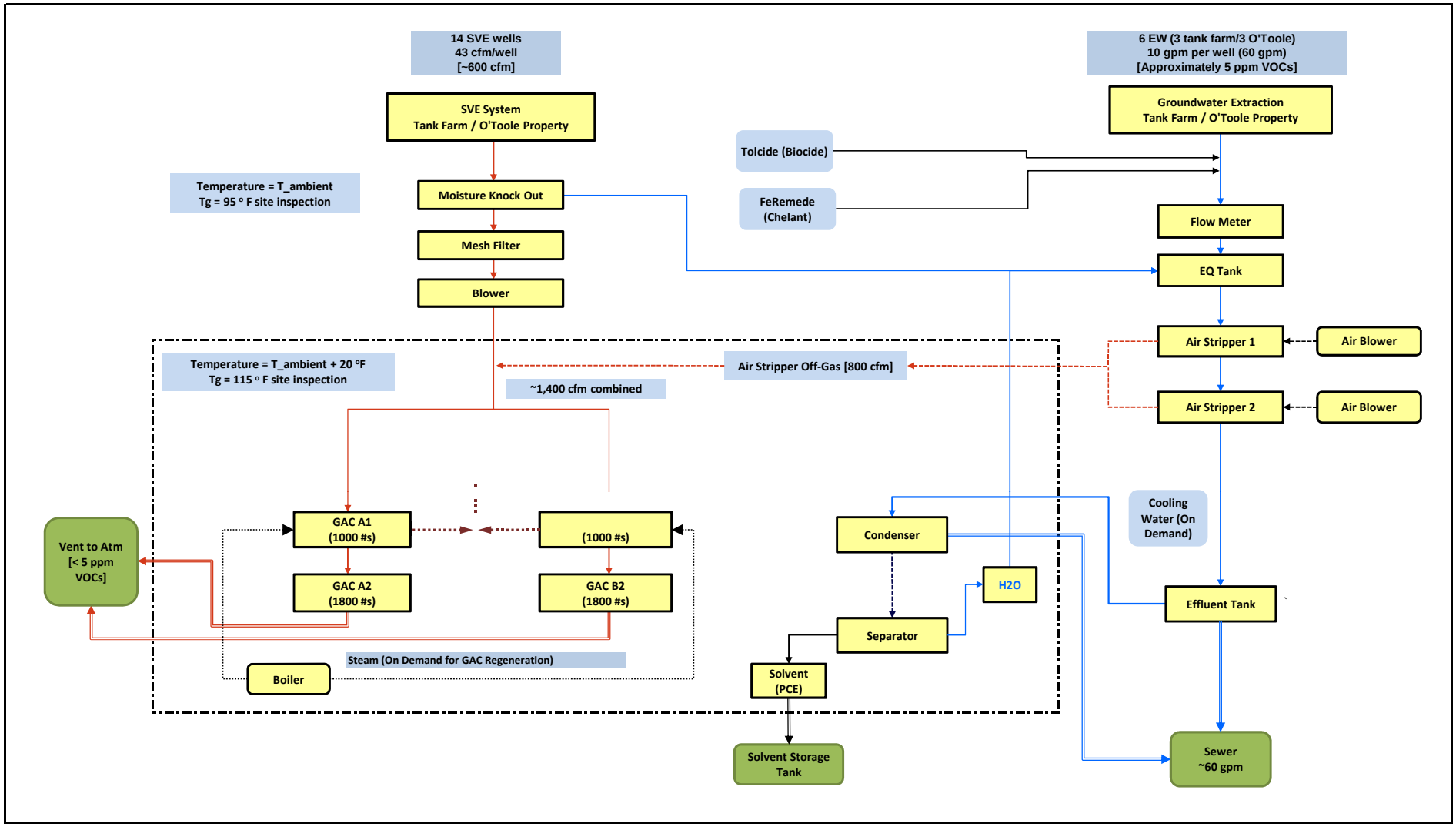


Figure 4. Peterson/Puritan Ground Water Treatment System (GWTS) Process Flow Sheet
Peterson-Puritan Superfund Site, OU-1, Cumberland, RI

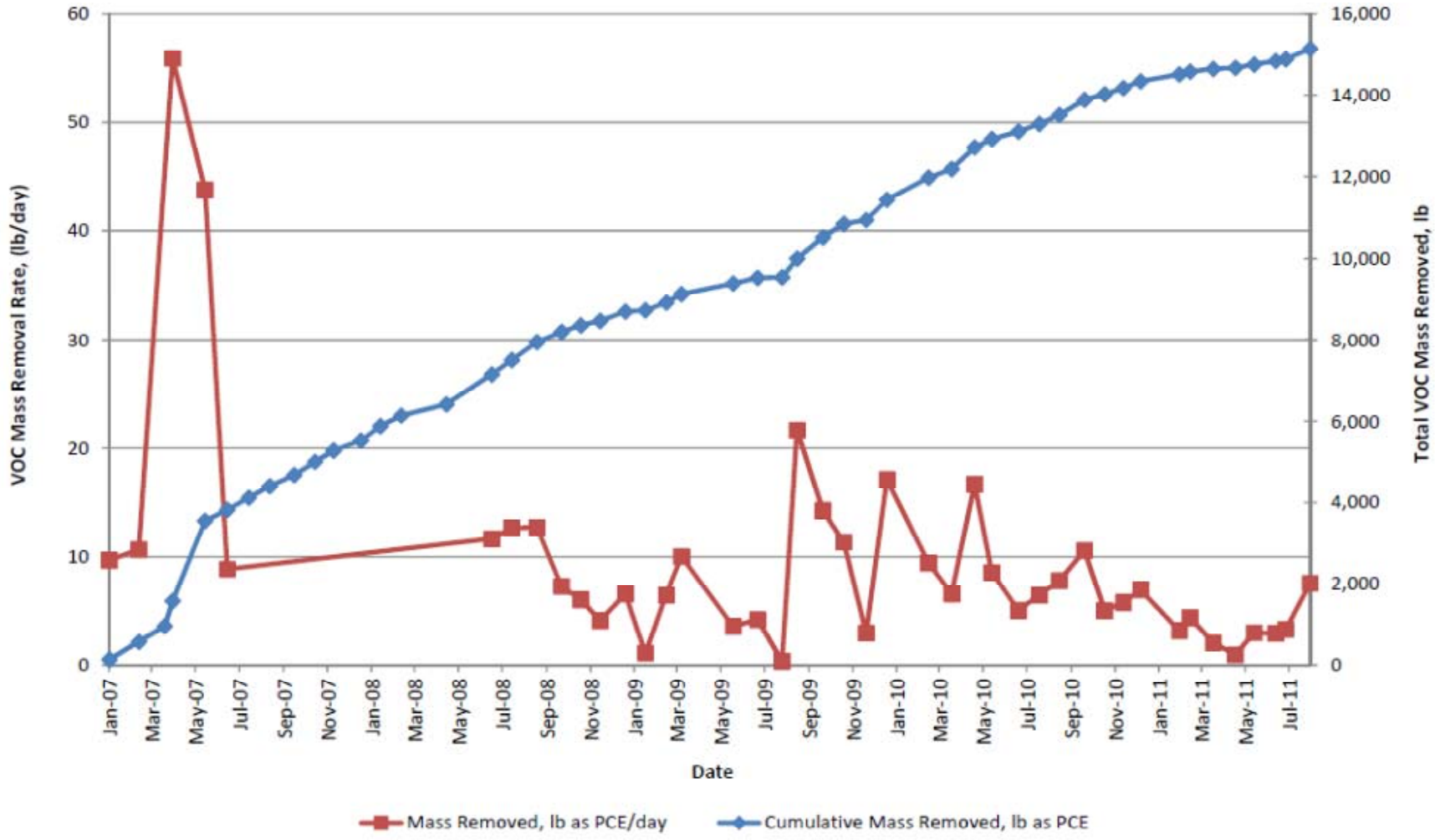


Figure 5. SVE System Mass Removal Rates CCL Remediation Area
Peterson-Puritan Superfund Site, OU-1, Cumberland, RI (AECOM 2011c)

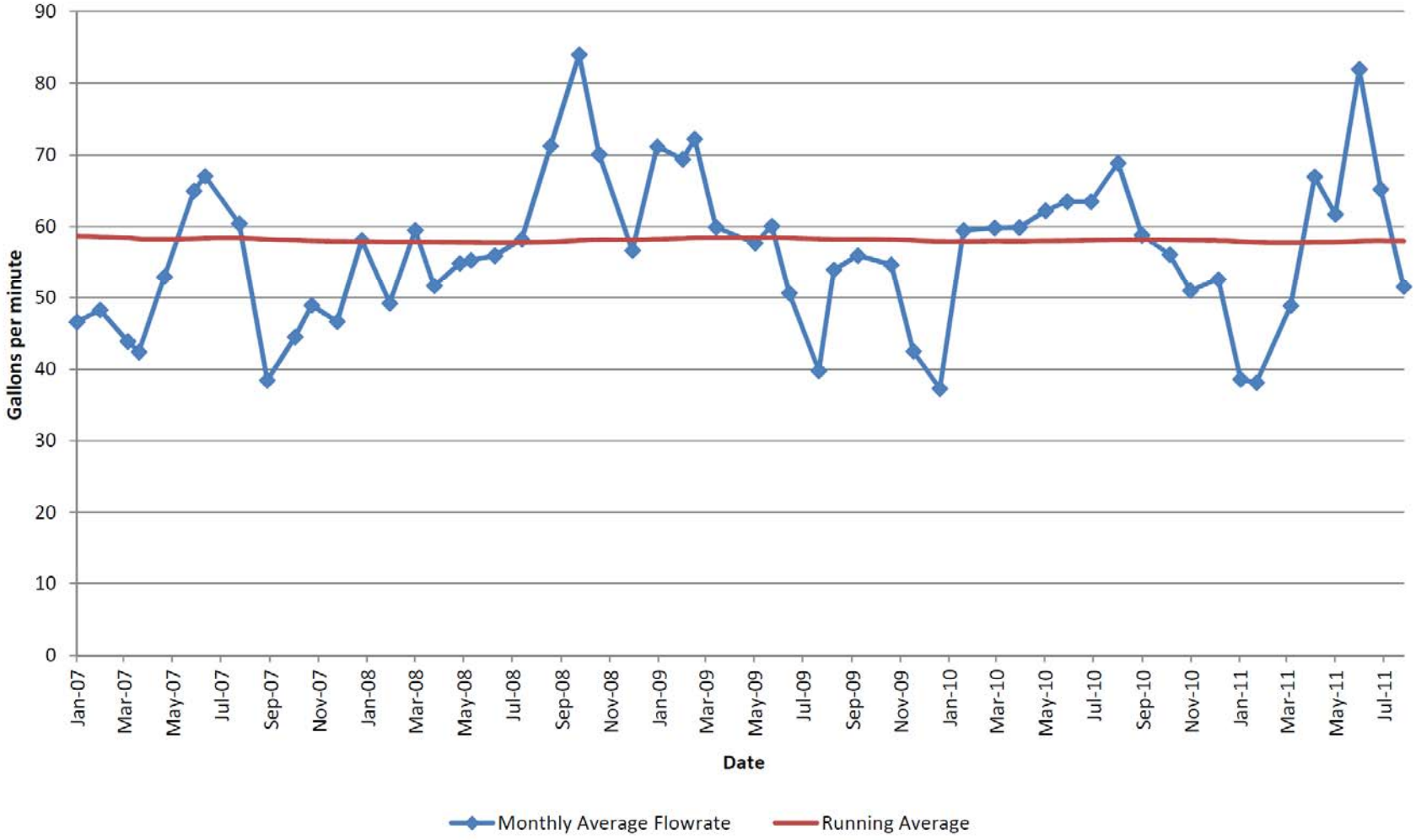


Figure 6. Groundwater Treatment System Average Monthly Flow Rates (2007 – 2011), CCL Remediation Area Peterson-Puritan Superfund Site, OU-1, Cumberland, RI (AECOM 2011c)

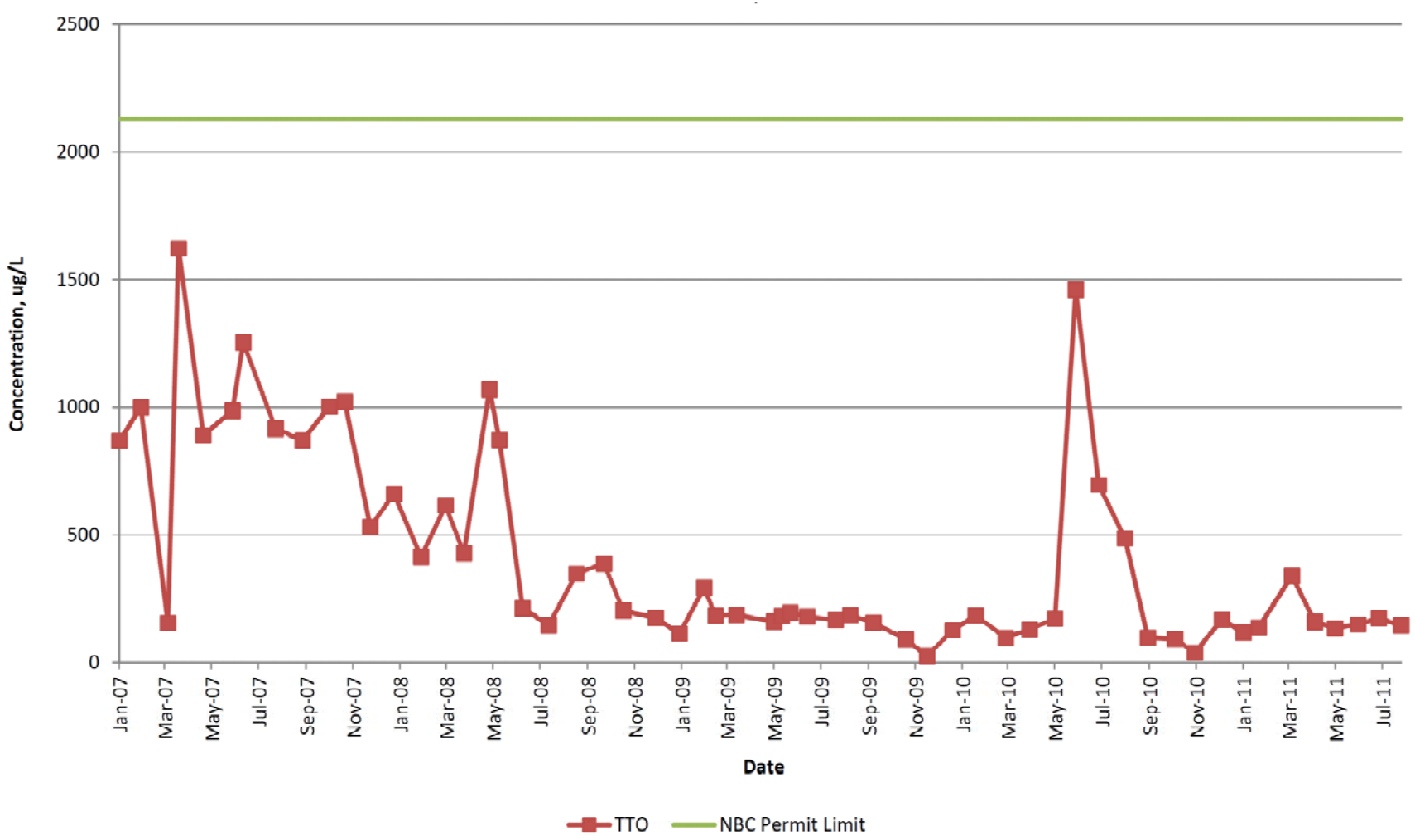


Figure 7. Groundwater Treatment System Effluent TTO Concentrations (2007 – 2011), CCL Remediation Area Peterson-Puritan Superfund Site, OU-1, Cumberland, RI (AECOM 2011c)

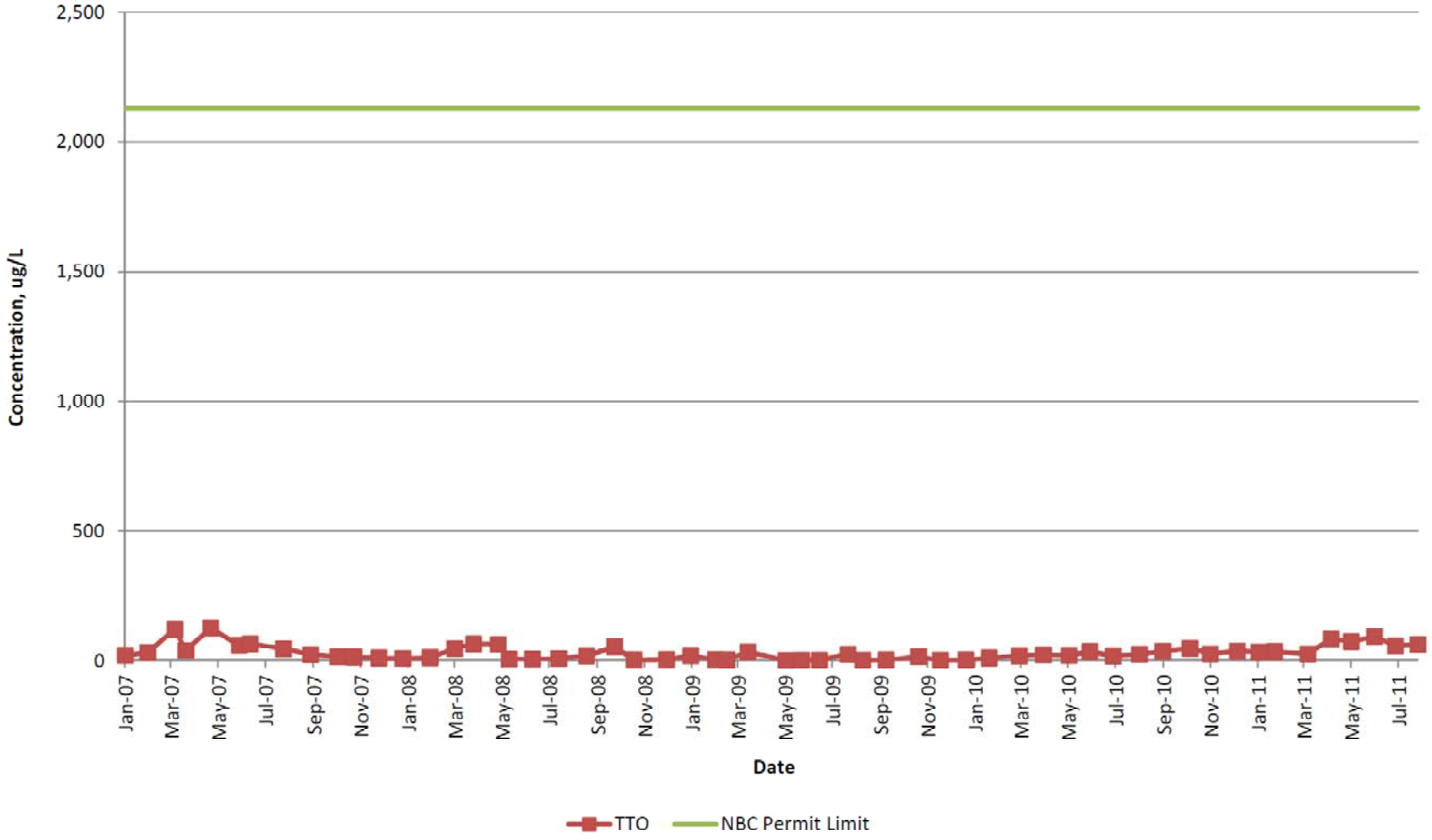


Figure 8. Downgradient Wells Discharge TTO Concentrations (2007 – 2011), CCL Remediation Area Peterson-Puritan Superfund Site, OU-1, Cumberland, RI (AECOM 2011c)

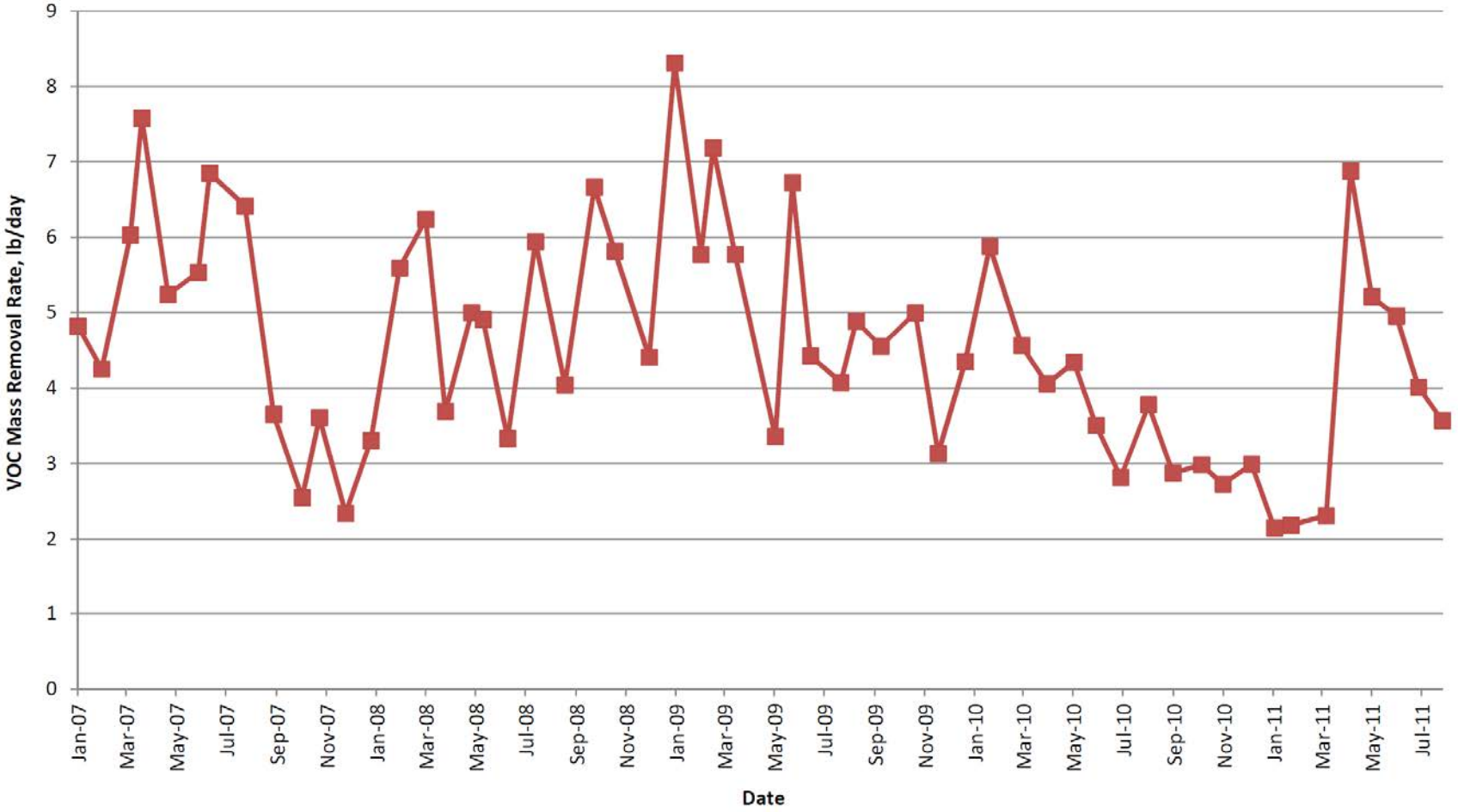


Figure 9. Dissolved phase mass removal of TTO by Source Area extraction system (2007 – 2011), CCL Remediation Area, OU-1 Peterson-Puritan Superfund Site, OU-1, Cumberland, RI (AECOM 2011c)

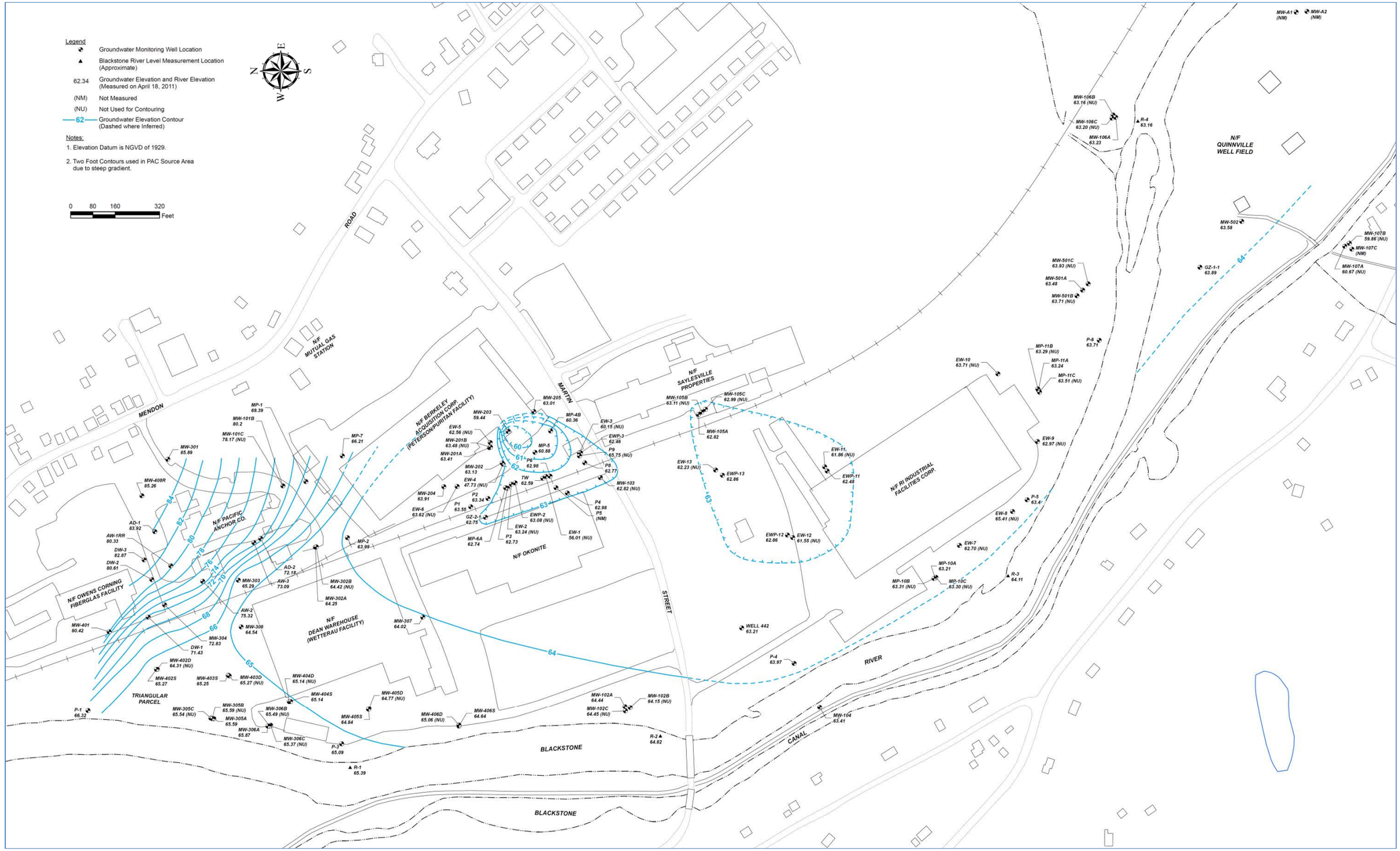


Figure 10. Water Table Contour Map, 22nd Round, OU-1, Peterson-Puritan Superfund Site
Peterson-Puritan Superfund Site, OU-1, Cumberland, RI (AECOM 2011c)

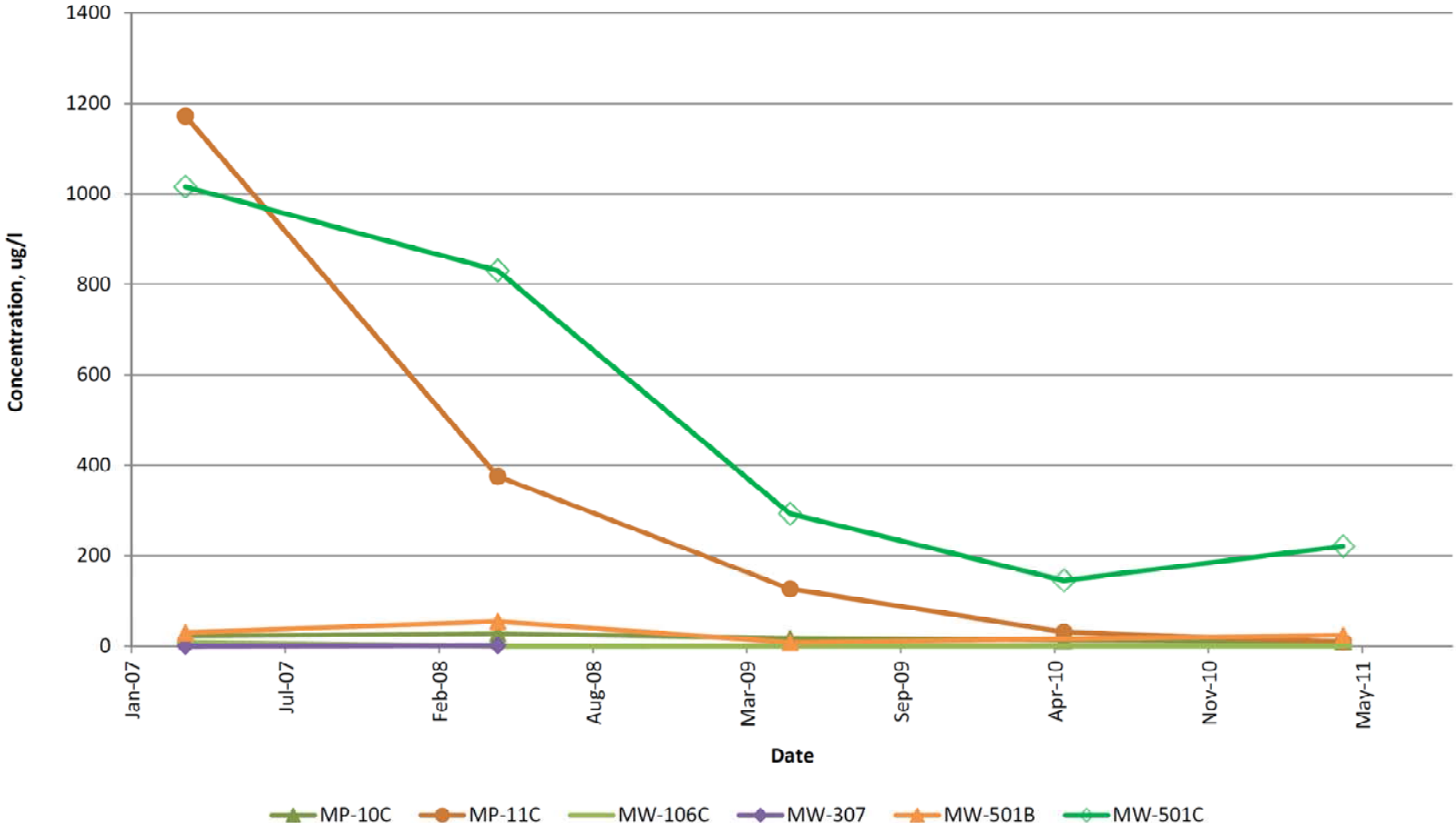


Figure 11. Total VOCs in Select Downgradient Area Wells (2007 – 2011), CCL Remediation Area, OU-1 Peterson-Puritan Superfund Site, OU-1, Cumberland, RI (AECOM 2011c)

APPENDIX B – FIVE-YEAR REVIEW INTERVIEWS

INTERVIEW DOCUMENTATION FORM	
The following is a list of individual interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.	
1. Public Meeting held in Town of Cumberland, RI	February 13, 2012
2. Interview with Cumberland, RI town officials at Cumberland Town Hall	April 4, 2012
3. Interview with Lincoln, RI town officials at Lincoln Town Hall	April 4, 2012
4. Interviews with Settling Defendant Representatives, property tenants, and Berkeley Acquisition Representative	April 12, 2012

INTERVIEW RECORD

Site Name: Peterson/Puritan Inc. Superfund Site	**EPA ID No.:** RID055176283	
Subject: Third Five-Year Review, Public Meeting	**Time:** 1830	**Date:** 2/13/2012
Type: Visit **Location of Visit:** Cumberland Library, Cumberland, RI		

Contact Made By: See Below

Individual Contacted: See Below

Summary Of Conversation

Attendees:

Sandra Belliveau, Blackstone River Watershed Council (BRWC)
Alice Clemente, BRWC
Peter Coffin, Blackstone River Coalition
Flora Gardner, Stop Trashing Our Place (S.T.O.P.)
William Gardner, STOP
Daniel Groher, USACE
Ken Heim USACE
Paul Kulpa, RIDEM
Frank Matta, BRWC
Dave Newton, US EPA
Jan Reitsma, NPS, Blackstone Valley National Heritage Corridor Commission
Sarah White, US EPA
Kevin Whitney, AECOM

Notes:

On Monday, February 13, 2012, representatives from the United States Environmental Protection Agency (EPA), Rhode Island Department of Environmental Management (RIDEM) and Army Corp of Engineers (USACE) held a meeting with key community stakeholders for the purpose of conducting interviews to asses concerns relevant to the 3rd Five Year Review of the Peterson Puritan Superfund Site. These community concerns will be incorporated into the final five year review report. The interview session was held at the Public Library in Cumberland.

Introductions

DN: Meeting is to provide background and solicit public input regarding the 3rd 5 year review (5yr) being conducted for the Peterson Puritan (P-P) site. The first 5yr was completed in 2002

and the second was completed in 2002. The 3rd 5yr will focus only on Operable Unit 1 (OU-1) but a Remedial Investigation (RI) for OU-2 is expected to be completed within the next month and a Feasibility Study (FS) will follow in approximately 6 months. Public is encouraged to call EPA to receive a copy.

SW: The purpose of the 5yr is to describe how the site is meeting the cleanup goals indicated in the Record of Decision (ROD). The Environmental Protection Agency (EPA) is looking for stakeholder feedback. During the development of the 5 yr the EPA will reach out to municipalities, officials from Cumberland and Lincoln, water purveyors, and owner/operators for OU-1.

DN: Description of the site owners/operators including Dean/Okonite/Portola Tech/Hope Global and the site itself including the locations of RR lines, the Blackstone River and canals.

FG: There is a concern that behind the old Gracious Living facility the Fleet Construction Company is trucking in a significant amount of sand and gravel to the property. The concern is that the material is from sites being cleaned up by Fleet and that it is contaminated. Fleet has been involved in cleaning up sites for National Grid.

DN: The Fleet property is not part of the OU-1 area and is not part of the cleanup. The property will have institutional controls placed on a portion of the property due to the cleanup in that area which is generally the CCL area. The State of RI has inspected the site in the past and has taken certain actions. EPA has been told that the Town is also concerned in that there was an earlier discussion about a construction/demo-debris facility considered for the property. Concerned citizens should contact the State or town officials.

FG: STOP has brought up their concerns with the Town and the impression from STOP is that everyone knew of the potential impacts but the residents.

DN: The Superfund cleanup at the P-P site is only concerned with groundwater as indicated in the ROD and Institutional Controls (ICs) guard against groundwater use at the site.

PK: Concerned citizens should call the Rhode Island (RI) Dept. of Compliance and Inspection to give an anonymous complaint. Inspectors can be sent out.

FG: Rhode Island Department of Environmental Management (RIDEM) was called about KIK in the past about a 100' high plume, which caused them to leave their home in the middle of the night. A DVD was even sent to EPA documenting the plume.

DN: EPA pursued the complaint but since KIK was leaving the property they did not receive much information and Portola Tech has since occupied the KIK property.

FG: There have been emissions from Portola Tech since they moved in to the KIK property

and two STOP members have mentioned a sweet odor from the area of Portola Tech.

DN: The onsite treatment system will occasionally release an air discharge but nothing like the 100' plume released from KIK.

FG: The 100' plume has not been seen since KIK left the property currently occupied by Portola Tech.

DN: There is a Technical Assistance Grant (TAG) currently in place that may be used to help explore site-wide issues. Alice Clemente is the TAG committee lead.

DN: The goal of the 5yr is to describe progress, optimization and regulatory requirements to ensure that the remedy remains protective. Approximately 90% of the site is being cleaned up according to plan with the only exception being arsenic in groundwater. VOCs at the CCL source and the down gradient areas are decreasing. The goal of the cleanup is to cleanup groundwater so that it can be used as a drinking water supply. Arsenic is generally due to past activities at the PAC source area. Remediation via an oxygen delivery system (ODS) was tried as indicated in the ROD but was not successful in the long term and elevated arsenic concentrations are still being measured in the PAC source and it's down gradient areas and also in the CCL down gradient area. When the ROD was written for the site, the drinking water limit for arsenic was 50 ppb but the limit has since been reduced to 10 ppb. Due to geochemical changes at the PAC source area, arsenic that occurs naturally in the soils was mobilized. Arsenic concentrations at OU-1 are currently monitored yearly.

PK: The statewide average "background" arsenic concentration is 1.9 ppb and the upper limit is 7 ppb.

BG: Is the pond located up gradient in the gravel pit operations contributing to the elevated arsenic concentrations in groundwater?

DG: Probably not because the arsenic problem is that it is already in soil but as an immobile form and is mobilized due to geochemical changes in the ground caused by the discharge to the leach fields in the PAC source area.

DN: The local source of the geochemical changes that mobilized arsenic is the PAC source area leachfields. The CCL source area and downgradient area pumping is intended to treat VOCs but has an added affect of treating arsenic. The EPA is currently looking into the best approach for dealing with arsenic at the site. The organic carbon [in leachfields] that is generally responsible for developing the reducing conditions responsible for mobilizing the arsenic is from the PAC source area and potentially from other areas. The EPA is still working on site wide institutional controls (ICs) for OU-1 but have ICs in place at the PAC source area.

BG: Why does the boundary for the site extend all the way up stream to Ashton Dam? Is there

contamination all the way up to the dam? Is the area around the dam, e.g., at/near the Kelly House, a source?

DN: This is from a detection of contaminants in groundwater and a potential source in a potential OU-3 area of the site. EPA worked with the State (under their Brownfield Program) and a developer at the Owens Corning facility. The developer shared data with EPA and EPA conducted a study at Kelly House and this information combined resolved the fact that the former OC facility was not a source to the site. While the source of the contamination in groundwater at the Kelly House is not known, it is isolated. The land is owned by the State and possibly the State should set environmental land use restrictions on groundwater there. The EPA has surveyed wells in this area and has inquired about private well use in the area but has not found any wells being used in this area. The Kelly House is on Town water. The measured concentrations near the Kelly House are low and are expected to attenuate naturally.

SB: How will the U.S. Army Corps of Engineers (USACE) Flood Control Project affect the cleanup at OU-1?

DN: EPA is coordinating with USACE and comments are being provided to the USACE to express any potential concerns. These comments are public information and are available upon request.

PC: Is the Blackstone River a gaining or losing stream?

DN: The short answer is both. This is entirely dependent on the location in question due to the localized effects of the groundwater extraction system.

PC: Would dam modifications (as part of the flood control project) effect groundwater at the site?

DN: The EPA needs to first see what the USACE is proposing for a remedy to flooding.

DG: Regarding the schedule, the EPA will publish the 3rd 5yr in about August 2012. In the near term the USACE/EPA will interview the OU-1 owners/operators.

SB: When the EPA does health assessments to identify populations at risk does the EPA ever notify citizens of the risk? For example, there are currently people fishing the Blackstone River and eating the fish.

DN: The EPA has worked with RIDEM and released technical data concerning fish consumption and to get information out to the public but the job falls to RIDOH to make that happen in a more formal way. The EPA finds risks associated with the consumption of native, warm water fish from the Blackstone River [in the vicinity of the site], but not because of contaminants found at the OU-1 portion of the site. This does not include trout in the river

since these are stocked species that are released there for recreational purposes and have a much shorter residence time in the river. In general, the EPA suggests a catch and release strategy for fishing on the Blackstone River.

JR: Is groundwater treatment still occurring at OU-1?

DN: Yes.

JR: Is MNA still being used as a remedy to groundwater cleanup?

DN: Yes, for a portion of the site.

JR: The first two 5 year review concluded certain findings. Does the EPA expect anything different in the 3rd 5yr?

DN: The EPA does not expect to conclude anything substantially different than what was concluded in the 1st and 2nd 5yrs. However, the EPA is looking at ways to enhance the remedy, consider MNA for arsenic, and to consider the cleanup time frames. EPA is always looking at methods used at similar sites to improve the approach at OU-1.

JR: Does the risk assessment focus on human health?

DN: For OU-1 and OU-2 the EPA looked at risks to human health and ecological risk. At OU1 ecological risks were not shown. At OU2 there are ecological impacts. EPA found risks to human health at both OU1 and OU2.

SW: The group was encouraged to review the questions provided in the flyer provided at the start of the meeting and contact the EPA with any additional concerns.

Meeting adjourned at 8:00 pm

INTERVIEW RECORD

Site Name: Peterson/Puritan Inc. Superfund Site	**EPA ID No.:** RID055176283	
Subject: Third Five-Year Review, Interview with Cumberland, RI town officials	**Time:** 1100	**Date:** 4/04/2012
Type: Visit **Location of Visit:** Cumberland Town Hall, Cumberland, RI		

Contact Made By: See Below

Individual Contacted: See Below

Summary Of Conversation

Attendees:

Alan R. Brodd (Public Works Dept. Director)
John Aubin (Planning Dept. Director)
Dan McKee, Mayor
Daniel Groher, USACE
Ken Heim USACE
Paul Kulpa, RIDEM
Dave Newton, US EPA
Sarah White, US EPA

Notes:

On Wednesday, April 4, 2012, representatives from the United States Environmental Protection Agency (EPA), Rhode Island Department of Environmental Management (RIDEM) and Army Corp of Engineers (USACE) held a meeting with representatives from the Town of Cumberland for the purpose of conducting interviews to asses concerns relevant to the 3rd Five Year Review of the Peterson Puritan Superfund Site. These concerns will be incorporated into the final five year review report. The interview session was held at the Cumberland Town Hall.

Introductions

DN: Described the 5 year review process and how the third five-year review fits into the CERCLA program at Berkeley Industrial Park. Specific locations around the Superfund site were highlighted using posters. The Quinnville wellfield has been closed due to groundwater contamination. The Martin Street well was closed prior to the site being a Superfund site due to metals fouling (even though it was not tested for VOCs nearby monitoring wells suggest that it very likely was contaminated). The Lenox Street well at OU-2 was also contaminated. The ROD for OU-1 has already been signed and the RI/FS for OU-2 is currently being prepared.

AB: Believes that the Martin Street well was closed due to contamination.

DN: The Martin Street well was not sampled for VOCs but monitoring wells in the immediate vicinity did indicate the presence of VOC after the well was closed.

AB: Two homes near the Lenox Street well have household wells with VOC contamination and the Town would like to acquire funding to get a municipal water supply brought to these homes.

DN: The private wells at these two homes have been sampled and VOC concentrations were found to be below health-based levels.

AB: Would like to continue monitoring water quality at these two locations.

DN: The EPA is still investigating OU-2 and is almost ready to issue an RI/FS for the site. The aquifer at the site is currently classified as GA by the State of Rhode Island. The EPA is currently working with the Pawtucket Water Supply Board at OU-2 to understand water distribution in the area.

AB: The Town has lost the use of the Martin Street and Lenox Street wells as a result of contamination. Is there any opportunity [legally or otherwise] for the Town to get the lost water supply back? The Town currently purchases water from the Pawtucket Water Supply Board and has an emergency water connection to the Woonsocket water distribution system. Currently, the Town of Cumberland extracts groundwater from Manville Wells #1 and #2, which are up river and each provide approximately 1,500 gpm.

DN: This is certainly a legal question in which the Town may seek out legal advice from independent counsel. I am not an attorney and I would not know the answer. As I recall, the Town of Lincoln's only water supply was the Quinnville well field when it was shut down due to VOC contamination. The Town of Lincoln sued the potentially responsible parties to pay for the connection to an outside water supply and the case was settled for approximately $750K. I am unaware of Cumberland pursuing any legal arguments; has Cumberland ever taken any legal steps? In that EPA has completed negotiations for the cleanup of OU1, it may be very late in the process for OU-1[Martin St. well] but perhaps for OU-2 [Lenox St. well]?.

DG: Regardless of whether the EPA has an agreement on the cleanup of OU-1 the Town may be able to consider legal recourse independently.

AB: There are other areas around Town that could be pursued to provide groundwater and the Town is not interested in pumping and treating groundwater at existing contaminated wells and is willing to accept a lower water volume than what was lost.

DN: The previous 5 year reviews, the ROD, and Consent Decree for OU-1 are all available on

the EPA's website for the Peterson Puritan Superfund Site.

AB: Regarding the flood control project currently being worked on by the USACE, is there any chance to acquire some property for flood storage at OU-1?

DN: OU-1 is a groundwater site. The only concerns regarding changes at OU-1 will be the effective cleanup of the groundwater.

DN: If monitoring wells are lost as a result of the flood control project they could be replaced but losing a treatment system may be more of an issue for EPA and the cleanup of the site. We need to know more about Corps study and the potential impact on OU-1. There may be no impact at all.

AB: Can any of OU-2 be acquired for compensatory flood storage?

DN: The J.M. Mills landfill is currently 70 feet high and is a solid/hazardous waste landfill. The remediation will probably be to cap in place, manage gasses, and O&M, paid for by the PRPs. A portion of the unnamed island is also a landfill and may be small enough to be moved. The EPA is considering some consolidation but not moving the majority of the J.M. Mills landfill.

PK: The Town needs to let the State know of a need for floodway capacity so that the State can consider this when looking at the Proposed Plan [for OU-2], which should be available in 9-12 months.

DN: There is a long timeline for the RI/FS for OU-2 including the RI/FS, Proposed Plan, and Consent Decree. The remedy for capping the landfill is the likely option but the design will be complicated, especially because of its steep sides.

PK: The TAG Group [BRWC-Friends of the Blackstone] may be able to offer help in bringing the Town's concerns to the State.

DN: BRWC- Friends of the Blackstone have asked EPA if they could help to get the word out about fish consumption.

AB: Fleet is currently expanding their storage capacity.

DN: P&W railroad wants to add a second rail line close to the J.M Mills landfill. Samples from the area have been found to have concentrations of H2S greater than the IDLH concentration. The EPA has informed the P&W railroad that they are a PRP at the site because the landfill is within their right-of-way and that they should have maintained their boundary to have avoided encroachment. The original second rail line was taken up in the mid-1950s.

DN: Does the Town have anything on the horizon for development planning within the Berkeley Industrial Park? The Town should let the EPA know about Town's plans and any changes about their [site] Reuse Plan and the Comprehensive Plan. Dean is expanding buildings at the warehouse and the Town has informed EPA of their concern if Fleet also expands as a construction/demo debris facility. Has anyone approached the Town concerning the need for more water [use of the aquifer]?

JA: [As to development] Just the Fleet demolition and associated court case. Nothing else.

DN: Land uses by local industry may be of concern if water from the aquifer is required.

AB: Any water that is required can be met from a trunk like that which extends along Mendon Road.

DN: CCL has moved out and Portola Tech has moved in and has retooled the facility. The EPA has required a study be performed for potential vapor intrusion (VI). Old RODs did not consider VI. If the facility were to continue use the same manufacturing methods air quality would be an OSHA issue but because Portola Tech is a different facility EPA believes VI must be considered.

DN: A VI study is underway that begun as Portola Tech was moving in. Sampling indicates that there are measurable COCs beneath and possibly entering into the building. More information is needed. It is possible to mitigate VI at the former CCL facility.

DN: There will be a site inspection by the EPA and USACE on April 12th [For the Five Year Review]. PAC is of interest because of arsenic in groundwater still at levels near 200 ppb. The EPA is considering an Explanation of Significant Difference (ESD) to the original Record of Decision in response for arsenic.

DN: There are metal pickers at OU-2 and the police and fire chiefs have told the EPA that they are concerned about access and public safety at Nunes [OU-2].

DN: Are there any further questions?

Group: No

Meeting adjourned at 1230 hrs.

INTERVIEW RECORD

Site Name: Peterson/Puritan Inc. Superfund Site	**EPA ID No.:** RID055176283	
Subject: Third Five-Year Review, Interview with Lincoln, RI town officials	**Time:** 1330	**Date:** 4/04/2012
Type: Visit **Location of Visit:** Lincoln Town Hall, Cumberland, RI		

Contact Made By: See Below

Individual Contacted: See Below

Summary Of Conversation

Attendees:

Nancy Kurowski (Lincoln Water Department)
Michael Gagnon (Public Works Director)
Albert Ranaldi (Town Planner)
Joseph Almond (Town Administrator)
Daniel Groher, USACE
Ken Heim USACE
Paul Kulpa, RIDEM
Dave Newton, US EPA
Sarah White, US EPA

Notes:

On Wednesday, April 4, 2012, representatives from the United States Environmental Protection Agency (EPA), Rhode Island Department of Environmental Management (RIDEM) and Army Corp of Engineers (USACE) held a meeting with representatives from the Town of Lincoln for the purpose of conducting interviews to assess concerns relevant to the 3rd Five Year Review of the Peterson/Peterson Superfund Site. These community concerns will be incorporated into the final five year review report. The interview session was held at the Lincoln Town Hall.

Introductions

DN: Provided background information for the Peterson Puritan site and read the three questions that the 5 year review is responsible for answering and describe the involvement of RIDEM and the USACE along with the manufacturers including PAC/CCL/Okonite/Hope Global at OU-1. A Decision Document has been written for OU-1 to address groundwater contamination. Contamination at the site is due to a 6200 gallon PCE spill at the former Peterson/Puritan site.

As a result the Quinnville wellfield was closed. Lincoln sued the potentially responsible parties for $750K for hook up to the [Providence] Scituate Reservoir and the water commission is now distributing/selling water. The EPA is now developing the 3rd 5 year review for OU-1 and continues to manage the cleanup of groundwater and maintain interceptor wells and the vapor and pump and treat system at the source area.

DN: The Quinnville wellfield is part of OU-1 because this area is a receptor of OU-1 groundwater. The EPA is still investigating OU-2 and the RI/FS is almost complete. Once the RI is complete, there will be a Feasibility Study and then a Decision Document, which will include the area of the J.M. Mills landfill, Nunes Parcel and the unnamed island. The area known as Potential OU-3 has been identified because of work done at Ashton Mill and is no longer a Superfund priority. This was only isolated to highlight groundwater concerns at the Kelly House.

DN: Is there anything new in the Town of Lincoln's development plans that the EPA should be aware of which may impact the site?

AR: The Lonsdale Bleachery site, and other mill sites, there is a concern for Lincoln in terms of periodic flooding as a major issue. The Town has turned down improvement money within the valley because there is no guarantee that future flooding would not continue and impact any improvement sites. The Town would like to know how to better control flooding and make better use of the resources.

DN: The EPA is currently working with the USACE to develop a flood control plan.

AR: The Town does not want flooding to continue to be an issue to impede development.

DN: Flood is the result of many things including the loss of canals to convey floodwaters. The Cumberland Police Chief has also raised concerns for public safety and flooding in the vicinity of the Pratt Dam. The Police and Fire want access maintained at Nunesto access the river in case of an emergency. The EPA does not know who owns Pratt Dam but it is presumably the State. The unnamed island appears to be split by town ownership with landfill wastes occupying the south portion of the island both Cumberland and Lincoln. Once the ROD is done for OU-2 the EPA will need to know how flooding will affect the remediation.

NK: There are currently no plans by the Town to bring any of the Quinnville wells back online.

DN: The EPA notes that one of the well houses at the Quinnville wellfield was demolished but is not sure if the well house debris has been hauled off. The EPA also notes that large pieces of debris routinely move down river during high flow events and does not want to have any debris from the well house to do the same.

MG: Believes that the Town has removed all the debris from the one demolished building that

there are still two buildings abandoned and intact.

NK: The well house was torn down because there were issues of trespass and vandalism taking place there. The water department was concerned about public safety and potential liability.

PK: RIDEM needs to insure removal has taken place, including transformers, tanks and leachfields, which could be subject to solid waste regulations.

DN: Are there any other issues?

MG: Does the EPA want to pump the Quinnville wellfield as part of the remedy?

DN: It was briefly considered during remedy design but dismissed because pumping would only tend to draw contamination across the river. As of now, groundwater contaminants have attenuated at the wellfield.

AR: Most of the use that the Town has for the river is for recreational purposes and issues revolve around access.

DN: During OU-2 investigations, the Quinnville wellfield soils show measurable levels of elevated lead [among other compounds of concern].

DN: The entire Blackstone River corridor may be a national park in the future.

DN: Does the EPA do enough outreach to keep the Town informed of progress?

MG: The Town has no complaints about the level of outreach.

NK: The Town has no plans to develop the Quinnville wellfield and the Lonsdale wells are on standby status.

DN: Aquifer is currently being remediated to GA standards.

DN: Any other questions?

Meeting adjourned at 1440 hrs.

INTERVIEW RECORD

Site Name: Peterson/Puritan Inc. Superfund Site	**EPA ID No.:** RID055176283	
Subject: Third Five-Year Review, Site Visit and Inspection, PAC and CCL Remediation Areas	**Time:** 0900	**Date:** 4/12/2012
Type: Visit **Location of Visit:** Former PAC Facility, Former CCL Facility, Dean Warehousing Facility, and environs Cumberland, RI		

Contact Made By: See Below

Individual Contacted: See Below

Summary Of Conversation

Attendees:

Daniel Groher, USACE
Ken Heim, USACE
Kyle Rivers, USACE
Dave Newton, US EPA
Kevin Whitney, AECOM
Carolyn Scott AECOM
Brad Dean, Berkeley Industries – Owner/Operator former PAC & Former CCL facilities and Dean Warehouse facility

Notes:

On Thursday, April 12, 2012, representatives from the United States Environmental Protection Agency (EPA) and the Army Corp of Engineers (USACE) met with representatives from AECOM for an overview and tour of the vapor and water treatment system and with Brad Dean (Berkeley Industries) for a site visit and tour of properties.

~0900 hrs: USACE and EPA arrived at former PAC facility to meet with Carolyn Scott and Brad Dean for an exterior site inspection. The group walked the entire perimeter of the building looking at monitoring well condition and asphalt condition. The group entered the former PAC facility and walked through a garage and maintenance area and by a book recycling area. The group then went into the waste disposal area of the garage to where labeled drums of oil, hydraulic fluid, engine coolant, and washer fluid are stored. Berkley Industries owns the former PAC property and rents the property to five different tenants. Brad Dean indicated that he would provide a tenant list to the EPA. The group also viewed an AECOM sampling team during their annual groundwater sample collection.

~1000 hrs: USACE and EPA followed Brad Dean to Portola Tech for an interior walk through to inspect the locations and condition of VI sampling ports that were installed by AECOM for their recent VI investigation. The EPA/USACE group was met by Kevin Whitney of AECOM and Matt (?) from Portola Tech for an overview of the hazardous chemicals used at the facility and wastes generated. The group walked the interior of the facility and viewed all of the VI sampling ports. Following the interior walkthrough, the group went outside and walked the perimeter of the building to view the extraction well values and vapor extraction locations. The vapor system was not working at the time because the motor used to create the vacuum had recently failed and was in the process of being replaced.

~1100 hrs: USACE and EPA followed Kevin Whitney to the Treatment System that is monitored and maintained by AECOM. The group viewed the RW-1 well vault and some of the exterior piping and the locations of the vapor wells. Then the group entered the control room and the larger vapor and water pretreatment and mixing room. The group then proceeded to the other side of the building's interior to look at the carbon-treatment system and to see the recent upgrades and addition of 2K pounds of additional activated carbon. Kevin Whitney provided an overview of the treatment system processes during the walk through and agreed to provide the EPA a schematic of the system for inclusion in the 5 year review. The group then proceeded across Martin Street to view the vault where all the plumping is located that meters and combines the water being pumped from the downgradient extraction system prior to being discharged to the Narragansett Bay Commissions wastewater system.

~1300 hrs: USACE and EPA met Brad Dean at the Dean Warehouse facility for an interior and exterior walkthrough of the site. Mr. Dean provided a description of the expansion planned for the Dean Warehouse and described the planned movement of tenants, which will occur after construction. Mr. Dean agreed to the request made to insure the integrity of well MW-308 during construction.

~1400 hrs: Site visit ended.

Meeting adjourned at 1440 hrs.

APPENDIX C – FIVE-YEAR REVIEW SITE CHECKLIST

Five-Year Review Site Inspection Checklist

I. SITE INFORMATION	
Site name: Peterson/Puritan, Inc.	**Date of inspection: 4/12/2012**
Location and Region:	**EPA ID: RID055176283**
Agency, office, or company leading the five-year review: EPA/USACE	**Weather/temperature: Mostly Cloudy/ 55 degrees**
Remedy Includes: (Check all that apply) ☐ Landfill cover/containment **X** Access controls **X** Institutional controls **X** Groundwater pump and treatment ☐ Surface water collection and treatment **X** Other: Soil Vapor Extraction **X** Monitored natural attenuation **X** Groundwater containment ☐ Vertical barrier walls	
Attachments: **X** Inspection team roster attached	X Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager (PAC)** Carolyn Scott (Name) Regional Manager, AECOM (Title) 4/12/2012 (Date)
   Interviewed: **X** at site ☐ at office ☐ by phone Phone no. 978.905.2386
   Problems, suggestions: Some monitoring well outer casing/pad(s) in need of repair (minor)

2. **O&M site manager (CCL)** Kevin Whitney (Name) Sr. Project Manager, AECOM (Title) 4/12/2012 (Date)
   Interviewed: X at site ☐ at office ☐ by phone Phone no. 978.905.2457
   Problems, suggestions: SVE System is not operating. Motor/starter in need of repair. Electrician called.

3. **Local regulatory authorities and response agencies**
   Agency: RI Department of Environmental Management, Office of Waste Management
   Contact: Paul Kulpa (Name) Project Manager (Title) 401.222.4700, ext 7111 (Phone no.)
   Note: Not present during inspection, but in routine communication with Agency.

4. **Other interviews** (optional) **X** Report attached. (see Appendix C of this Report)

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

1. **O&M Documents**

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

Remarks: No As-built drawings on file with Agency; Maintenance logs available; O&M manual on file and a revision is under discussion with SD.

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

Remarks: On-site H&S briefing held prior to inspection

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

Remarks:

4. **Permits and Service Agreements**

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

Remarks: Compliance monitoring for air emissions under review (see CAS discussion in report); Monthly Self-Monitoring Compliance Reports for POTW on file with Agency

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_____

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

Remarks_____

9. **Discharge Compliance Records**

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

Remarks_____

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

Remarks: Operating Commercial/Industrial facilities; each facility controls access independently; treatment systems independently secured and inspected regularly.

IV. O&M COSTS

1. **O&M Organization**
   - ☐ State in-house
   - ☐ PRP in-house
   - ☐ Federal Facility in-house
   - ☐ Other _____
   - ☐ Contractor for State
   - **X** Contractor for PRP
   - ☐ Contractor for Federal Facility

2. **O&M Cost Records**
   - ☐ Readily available ☐ Up to date
   - **X** Funding mechanism/agreement in place

   Remarks: Funding of O&M costs are the responsibility of the OU-1 PRP Group. See Section 4.4 of this report for further breakdown.

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

   Describe costs and reasons: N/A

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

A. Fencing

1. **Fencing damaged** ☐ Location shown on site map ☐ Gates secured ☐ N/A

   Remarks: Operating facilities which independently monitor/control access; fence maintenance by Owner/Operator (O/O) ; minor fence damage/breach at PAC/CCL property line — O/O is aware and provided explanation for temporary condition.

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map **X** N/A

   Remarks: Operating Industrial/Commercial facilities maintained by O/O

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

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

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

   Type of monitoring (*e.g.*, self-reporting, drive by) _____

   Frequency _____

   Responsible party/agency _____

   Contact _____ _____ _____ _____

   Name Title Date Phone no.

   Reporting is up-to-date ☐ Yes ☐ No ☐ N/A

   Reports are verified by the lead agency ☐ Yes ☐ No ☐ N/A

   Specific requirements in deed or decision documents have been met ☐ Yes ☐ No ☐ N/A

   Violations have been reported ☐ Yes ☐ No ☐ N/A

   Other problems or suggestions: ☐ Report attached

   _____

   _____

   _____

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

Remarks: While ICs are completed at PAC source area; many ICs have not been formally implemented within CCL source/downgradient areas and PAC downgradient area of Site. As indicated in this report, some progress has been made throughout the review period in completing ICs for all affected properties.

D. General

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

Remarks_____

2. **Land use changes on site** ☐ N/A

Remarks: YES. CCL facility bought by Berkley Acquisition with Portola-Tech operating on-site. Numerous small business operations at PAC. Nominal operations conducted at other Site properties.

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

Remarks_____

VI. GENERAL SITE CONDITIONS

A. Roads ☐ Applicable ☐ N/A

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

Remarks_____

B. Other Site Conditions

Remarks: Capped (bituminous concrete and/or concrete) areas at PAC and CCL source areas are in good condition. Monitoring wells which need maintenance are being addressed promptly.

VII. LANDFILL COVERS ☐ Applicable **X** N/A

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

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

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: During the month of July, Recovery Well #1 was redeveloped (to reduce iron fouling) as part of normal maintenance activities.

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: Available on demand from various vendors.

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

C. Treatment System X Applicable ☐ N/A

1. **Treatment Train** (Check components that apply)
☐ Metals removal ☐ Oil/water separation ☐ Bioremediation
X Air stripping X Carbon adsorbers
☐ Filters
X Additive (*e.g.*, chelation agent, flocculent) FeREMEDE® (proprietary polyphosphate iron chelating agent)
☐ Others
X Good condition ☐ Needs Maintenance
X Sampling ports properly marked and functional
☐ Sampling/maintenance log displayed and up to date
X Equipment properly identified
X Quantity of groundwater treated annually: 31,000,000 gals (CCL Source Area only)*
☐ Quantity of surface water treated annually N/A
Remarks: SVE System repair underway at time of inspection. Faulty motor/starter and relay issue. SVE operations resumed 5/10/12.
*CCL Downgradient Area system currently pumps ~ 87,000,000 gal/year (without treatment prior to discharge to the POTW).

2. **Electrical Enclosures and Panels** (properly rated and functional)
X N/A ☐ Good condition ☐ Needs Maintenance
Remarks: did not inspect but expect all is functioning nominally with the exception of SVE (at the time of inspection)

3. **Tanks, Vaults, Storage Vessels**
☐ N/A **X** Good condition **X** Proper secondary containment ☐ Needs Maintenance
Remarks: Functional

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

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

6. **Monitoring Wells** (pump and treatment remedy)
X Properly secured/locked **X** Functioning **X** Routinely sampled **X** Good condition
☐ All required wells located ☐ Needs Maintenance ☐ N/A
Remarks: Some minor repairs to wells are being addressed

D. Monitoring Data

1.	**Monitoring Data** **X** Is routinely submitted on time **X** Is of acceptable quality
2.	**Monitoring data suggests:** **X** Groundwater plume is effectively contained **X** Contaminant concentrations are generally declining

E. 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: MNA continues to be evaluated through monitoring and trend analysis. Continued discussions with PRP Group concerning monitoring strategies and reporting efficiencies in order to develop an effective long term monitoring plan.

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. N/A

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.).

The goal of the remedial action for OU-1 is to restore the ground water to its beneficial use as a potential drinking water resource. Thus, on half the site (the CCL area) CVOC concentrations must be reduced to below the MCL, and on the other half of the site (the PAC area) the remedy must reduce Arsenic concentrations to below it's MCL. The CCL Area remedy is currently effective and functioning as designed with regard to preventing exposure to contaminated groundwater since the plume is contained and the groundwater is not currently used as a water supply. However, the persistence of high concentrations of CVOCs in extracted groundwater remediation and groundwater samples near the CCL Source Area, indicate the likely presence of residual DNAPL in the saturated overburden and shallow bedrock acting as a continuing source of contaminants in valley fill. Therefore, remediation of the overburden may be prolonged for an unknown period of time. The long-term protectiveness of the current remedy could be compromised by the potential DNAPL source. Achievement of the ROD specified cleanup criteria of drinking water MCLs may not be achievable with the current remedy without system modifications or remedy enhancements or contingency measures (as called out in the ROD). Analysis of the duration of the current remedy for achieving the ROD specified cleanup goals, including predictive modeling, should be performed to establish remediation timeframes and explore remediation enhancements to achieve the above stated goal. In the PAC Remediation Area, Arsenic concentrations are likely to remain above the drinking water standard of 10 µg/L in much of the PAC Remediation Area into the foreseeable future (SD's projected cleanup timeframe to be between 2027 to 2041) utilizing MNA as a remedy. Thus, while the goal of the remedial action may still be valid, cleanup timeframes will need to be extended from what was originally intended in the OU-1 ROD. The PAC Remediation Area remedy is protective in the short-term since the Arsenic plume is stable (or shrinking) and the groundwater is not currently used as a water supply

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.

Based on the findings of this review, the scope of the O&M procedures may undergo further refinement as the remedy may evolve to address DNAPL (at CCL) and Arsenic (at PAC) in order to meet the established cleanup goal. Refinements in Site monitoring, as enhancements to the remedy are employed, will also identify new or modified O&M procedures to be documented and followed over a longer period of time until cleanup levels for OU-1 have been achieved.

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.

The CCL treatment system is aging, albeit still functioning as designed. CAS emission compliance issues have been identified and, for the time being, are being addressed. However, as the concentrations of CVOCs in the extracted vapor and groundwater decrease, the cost of carbon as a polishing agent may be increasing significantly. Also, consistent with the ROD requirements, evaluation of the CCL remedy leading to the potential for further modification and enhancements may be necessary over the next review period to address potential DNAPL and/or meeting remediation goals within an acceptable timeframe.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

The SDs for CCL have asserted, based on interpretation of the JGWMP results, that the groundwater remediation extraction well network in the CCL Downgradient Area could be optimized by shutting down the extraction wells closest to the Blackstone River, and focusing pumping on the deepest part of the aquifer in the center of the valley. This modification would entail installing a new extraction well near the MW-501 well cluster. By enhancing the remediation system and re-focusing the pumping, it may be possible to reduce the mass of CVOCs in the Downgradient Area to a low enough level that, at an appropriate point in the future, the downgradient pumping system can be decommissioned and employ MNA as a final remedy for the CCL Downgradient Area.

EPA and the SDs for the PAC Remediation Area are discussing modifying the remedy for the PAC Source Area (for remediation of dissolved arsenic) to exclude active oxidation source control, leaving just excavation source control with monitored natural attenuation. Remediation of the PAC Source Area appears to be progressing naturally as organic carbon in the subsurface degrades. MNA appears to be an appropriate remedy for this area, and can be applied in conjunction with the current MNA remedy for the Downgradient Area.