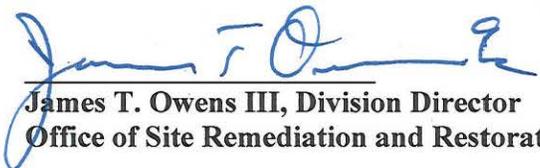


**FIVE-YEAR REVIEW REPORT FOR
SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE
PETERBOROUGH, NEW HAMPSHIRE**



Prepared by

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9/30/13
Date

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LIST OF ACRONYMS

AGQS	Ambient Groundwater Quality Standard
ARAR	Applicable or Relevant and Appropriate Requirement
B&M	Boston and Main
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
1,1-DCA	1,1-Dichloroethane
1,1-DCE	1,1-Dichloroethylene
DNAPL	Dense non-aqueous phase liquid
EPA	Environmental Protection Agency
ESD	Explanation of Significant Differences
FFS	Focused Feasibility Study
FCM	Fetal Cardiac Malformations
gpm	gallons per minute
HI	Hazard Index
HQ	Hazard Quotient
Hull	Hull & Associates, Inc.
HVAC	Heating, Ventilation, and Air Conditioning
IRIS	Integrated Risk Information System
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
NCP	National Contingency Plan
NHBB	New Hampshire Ball Bearings
NHDES	New Hampshire Department of Environmental Services
NPL	National Priorities List
O&M	Operations and Maintenance
OSWER	Office of Solid Waste and Emergency Response
PAH	Polyaromatic Hydrocarbon
PCB	Polychlorinated biphenyl compound
PCE	Tetrachloroethene
PDI	Pre-Design Investigation
ppb	parts per billion
PRB	Permeable Reactive Barrier

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LIST OF ACRONYMS (cont.)

RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SAPDI	Source Area Pre-Design Investigation
SDE	Staff Development for Educators, Inc.
Site	South Municipal Water Supply Well Superfund Site
South Well	South Municipal Water Supply Well
1,1,1-TCA	1,1,1-Trichloroethane
TCE	Trichloroethene
TI	Technical Impracticability/Technically Impracticable
$\mu\text{g/L}$	micrograms per liter
$\mu\text{g/m}^3$	micrograms per cubic meter
VES	Vacuum extraction system
VI	Vapor intrusion
VOC	Volatile organic compound

EXECUTIVE SUMMARY

This is the fourth five-year review for the South Municipal Water Supply Well (South Well) Superfund Site (Site). The review was conducted in accordance with the EPA's Office of Solid Waste and Emergency Response (OSWER) guidance No. 9355.7-03B-P. This report documents the results of the review and presents the results in accordance with the OSWER Guidance. This statutory five-year review is required since hazardous contamination remains at the Site above levels that allow for unlimited use and unrestricted exposure. The triggering action for this statutory five-year review is based on the August 19, 2008 signature date of the third five-year review.

The Record of Decision (ROD) for the Site was signed on September 27, 1989. The ROD called for a restriction on the use of the groundwater, in-situ vacuum extraction of contaminated soils, excavation and/or dredging with dewatering of sediments, wetlands restoration, groundwater extraction and treatment with air stripping and carbon columns for air emission control, and long-term environmental monitoring. A Unilateral Administrative Order for the design, construction, operation and maintenance of the remedy became effective on July 9, 1990. New Hampshire Ball Bearings (NHBB), the party potentially responsible for the contamination, completed the design of the remedy that was approved by EPA on May 3, 1993.

An Explanation of Significant Differences (ESD) was issued on May 6, 1993 that documented modifications to the remedy, principally for air emission controls and sediment excavation. A second ESD issued on February 3, 1997 waived certain Federal Drinking Water Standards for groundwater due to a technical impracticability, from an engineering perspective, to restore portions of the contaminated groundwater beneath the NHBB property. This portion of contaminated groundwater is known as the "technical impracticability (TI) waiver area." The desired outcome of the 1997 remedy change was to effectively capture and contain the contaminant plume within the TI Waiver Area while allowing the use of the South Well as a drinking water source.

Installation of the groundwater extraction and treatment system was completed in March, 1994 and the system has continually operated since then, except for interruptions related to routine maintenance, low water levels, field investigation, power outages, and process modifications. The in-situ vacuum extraction system began operation in October 1994 but ceased operation in 1997 when the second ESD was issued. The 1997 ESD revised the remedy to hydraulically contain the contaminant plume located on the NHBB property within the TI Waiver Area. Monitoring of groundwater quality and water levels has continued throughout the remedial design, construction, and post-construction phases.

The Third Five-Year Review determined the hydraulic containment remedy was not functioning as effectively as intended by the ROD and subsequent ESDs. EPA determined the remedy was not protective of human health or the environment in part because it could not capture all portions of the contaminated groundwater while the South Well was operating and because groundwater contaminant levels in areas outside of the TI Waiver Area were still above drinking water standards. The results of a long-term pumping test demonstrated the hydraulic extraction and containment system at the TI Waiver Area boundary was not capable of containing the plume of contaminated groundwater to areas within the TI Waiver Area when the South Well operates for extended periods.

To restore the use of the aquifer for water supply purposes, additional remedial technologies were evaluated during the current five-year review period, the results of which are summarized in the September 2009 Focused Feasibility Study for Source Mass Reduction and Plume Management (FFS). The FFS included the evaluation of several technologies designed to destroy or reduce known and suspected dense non-aqueous phase liquid (DNAPL) source area(s), as well as options to manage the remaining contaminant plume following source reduction measures. Activities and evaluations conducted during the FFS process also revealed that institutional controls for the Site previously established through Town of Peterborough zoning and ordinances had been inadvertently omitted from the code during revisions made in the early-to-mid-2000s. In light of the omission, the aquifer protection zoning overlay district previously established to prohibit the use of groundwater at the Site was reinstated as of May 2009, thereby satisfying the requirement for institutional controls identified in the ROD.

In May, 2010 and September, 2010, EPA published the proposed plan for the revised remedy and the ROD Amendment, respectively. These documents were based, in part, upon the information and treatment scenarios presented in the FFS. The 2010 ROD Amendment modified the Site remedy to include in-situ thermal treatment of soil and groundwater within targeted source areas, in-situ bioremediation of the dissolved groundwater plume, and in-situ groundwater control and treatment via a permeable reactive barrier (PRB). While the ROD Amendment specifies that the Site remedy will be modified to include the aforementioned alternative remedial technologies, the existing extraction system continues to operate during the design process for the new remedies. This five-year review report includes discussions on the continuing operation of the existing groundwater extraction system and summarizes the activities conducted to date to comply with the original ROD.

A substantial scope of pre-design investigation (PDI) activities related to the remedy modification was completed during this 5-year reporting period and a draft PDI Report was submitted in July 2013. The data presented in the draft PDI report is currently being evaluated by EPA and the New Hampshire Department of Environmental Services (NHDES). Significant findings from the PDI include the continued presence of 1,4-dioxane as a

contaminant of concern at the Site, the identification of an additional DNAPL source area under the NHBB building (referred to as the “High Bay AOC”), and vapor intrusion (VI) issues inside the NHBB facility.

The VI pathway was not identified as a potential exposure route of concern at the time of the original RI/FS and therefore was not evaluated or included as a remedial action objective (RAO) in the original ROD. However, the ROD Amendment included VI ARARs as an RAO for the entire Site, irrespective of the TI Waiver Area. Limited investigations conducted on the NHBB property prior to the completion of Third Five-Year Review indicated that there were insufficient data to evaluate the protectiveness of the original remedy relative to the VI pathway.

VI investigations conducted during the current five year review period indicated that VI is an exposure route of concern on the NHBB property, but not in areas outside of the TI Waiver boundary. Indoor air sampling results collected inside the NHBB building identified contaminant concentrations exceeding NHDES and EPA screening values. Indoor air sampling and vapor intrusion assessment in the NHBB Building is on-going. A summary of assessment and mitigation measures implemented through early 2013 is included in this five-year review and a Draft Vapor Intrusion Reevaluation and Baseline Human Health Risk Assessment of the NHBB Facility has been prepared and was submitted in early September, 2013.

At this time, there are still insufficient data to evaluate the sitewide protectiveness of the remedy due to the VI pathway and a determination of this pathway is deferred until 2015. The EPA and NHDES will review and comment on the VI reevaluation and baseline human health risk assessment report. Information contained in the report, plus pre-emptive VI mitigation measures, as necessary, will be evaluated to determine the protectiveness of the existing remedy with respect to the VI pathway.

Five-Year Review Protectiveness Statement:

A protectiveness determination for the Site cannot be made at this time until further information is obtained.

Further information was recently provided in a draft vapor intrusion reevaluation and baseline risk assessment report for the NHBB facility. It is anticipated that this report will provide the information needed to determine whether or not potential risks from vapor intrusion continue to exist within the NHBB facility. If mitigation measures are warranted, it is expected that these actions may take up to a year to implement and confirm their effectiveness, at which time a protectiveness determination will be made.

For other elements of the groundwater remedy at the Site, the following facts should be noted regarding protectiveness in the short-term:

- Reestablishment of the aquifer protection zoning overlay district was formally implemented in 2009, and
- The Site and adjacent areas are served by a municipal water system which prevents any current exposures to contaminated groundwater present at the Site.

The following issues persist with regard to the remedy at the Site:

- The existing groundwater extraction system does not hydraulically contain the contaminant plume to within the TI Waiver Area, and contamination above ARARs exists outside the TI Waiver Area.
- Indoor air concerns may continue to exist within the NHBB facility.

The following actions need to be taken:

- Integrate the recently submitted SA & PRB PDI report information into the remedial designs;
- Implement the 2010 ROD Amendment selected remedy to achieve all RAOs; and
- Implement pre-emptive VI mitigation measures at the NHBB facility, as necessary, to prevent or mitigate inhalation (exposure) by workers to volatilized subsurface contaminants.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site Name: South Municipal Water Supply Well		
EPA ID: NHD980671069		
Region: 1	State: NH	City/County: Peterborough/Hillsborough
SITE STATUS		
NPL Status: Final		
Multiple OUs? No	Has the site achieved construction completion? Yes	
REVIEW STATUS		
Lead agency: EPA		
Author name (Federal or State Project Manager): Kevin Heine		
Author affiliation: U.S. EPA, Region 1		
Review period: 12/14/12 – 9/30/13		
Date of site inspection: 8/22/13		
Type of review: Statutory		
Review number: 4		
Triggering action date: 8/19/08		
Due date (five years after triggering action date): 8/19/13		

Five-Year Review Summary Form (continued)

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): OU1-	Issue Category: Remedy Performance			
	Issue: Existing groundwater extraction system does not hydraulically contain the contaminant plume to within the TI Waiver Area, and contamination above ARARs exists outside the TI Waiver Area.			
	Recommendations: Integrate the recently submitted SA & PRB PDI report information into the remedial designs and Implement the ROD Amendment selected remedy to achieve all RAOs.			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
No	Yes	PRP	EPA/State	September 2017
Issues and Recommendations Identified in the Five-Year Review:				
OU(s): OU1-	Issue Category: Remedy Performance			
	Issue: Indoor air concerns may continue to exist within the NHBB facility.			
	Recommendations: Implement pre-emptive VI mitigation measures at the NHBB facility, as necessary, to prevent or mitigate inhalation (exposure) by workers to volatilized subsurface contaminants; and Implement the ROD Amendment selected remedy to achieve all RAOs.			
Affect Current Protectiveness	Affect Future Protectiveness	Implementing Party	Oversight Party	Milestone Date
Yes	Yes	PRP	EPA/State	March 2015

Five-Year Review Summary Form (continued)

Sitewide Protectiveness Statement (if applicable)

For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement.

Protectiveness Determination:

Protectiveness Deferred

Addendum Due Date (if applicable): March 2015

Protectiveness Statement:

A protectiveness determination for the Site cannot be made until further information is obtained.

Further information has been provided via a Draft Vapor Intrusion Reevaluation and Baseline Human Health Risk Assessment of the NHBB Facility report, which was submitted to the Agencies for review and comment in early September 2013. It is anticipated that this report provides the information needed to determine whether or not potential risks from vapor intrusion continue to exist within the NHBB facility. If mitigation measures are warranted, it is expected that these actions may take up to a year to implement and confirm their effectiveness, at which time a protectiveness determination will be made.

1.0 INTRODUCTION

The purpose of this five-year review is to determine whether the current remedy at the South Municipal Water Supply Well Superfund Site (Site) remains protective of human health and the environment. This report summarizes the five-year review processes, investigations, and remedial actions undertaken at the Site; evaluates the monitoring data collected over the past 19 years, with emphasis on the last five years; reviews Applicable or Relevant and Appropriate Requirement (ARARs) specified in the Record of Decision (ROD) and ROD Amendment for changes; and describes the current Site status.

The United States Environmental Protection Agency, Region 1 (EPA) prepared this five-year review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) §121 and the National Contingency Plan (NCP). CERCLA §121 states:

"If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the Site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that 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 EPA interpreted this requirement further in the NCP; 40 Code of Federal Regulations (CFR) §300.430(f)(4)(ii) states:

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

This is the fourth five-year review for the Site. This statutory five-year review is required due to the fact that dense non-aqueous phase liquids (DNAPL) are present on a portion of the Site and because Site groundwater is still being actively extracted and treated. The review was conducted from December 14, 2012 through September 30, 2013 in accordance with EPA's Office of Solid Waste and Emergency Response (OSWER) Comprehensive Five-Year Review Guidance (EPA, 2001). The triggering action for this statutory five-year review is based on the signature date of the third five-year review: August 19, 2008.

EPA conducted this five-year review of the remedy implemented at the Site. New Hampshire Ball Bearings (NHBB) and Hull & Associates, Inc. (Hull), NHBB's contractor, provided support to the EPA during this five-year review process.

2.0 SITE CHRONOLOGY

This section presents a summary of the historical events in chronological order that outline the decision framework which led to the selection of the remedial actions for the Site.

**Table 2-1
Chronology of Site Events**

Event	Date
Contamination discovered in the municipal water well	October 1982
South Municipal Water Supply Well taken offline	December 1982
Final listing on NPL	September 21, 1984
Remedial Investigation/Feasibility Study complete	September 27, 1989
ROD signature	September 27, 1989
Effective date of Unilateral Order to New Hampshire Ball Bearings (NHBB) to implement remedy	July 9, 1990
First ESD addressing air emission controls and sediment excavation	May 6, 1993
Construction start	June 7, 1993
Start of groundwater treatment plant operation	March 12, 1994
Start of vacuum extraction system	October, 1994
Construction completion (wetlands restored)	December 15, 1994
Second ESD addressing technical impracticability waiver resulting in the termination of operation for several extraction wells and the soil vapor extraction	February 3, 1997
First Five-Year Review Report	June 2, 1998
Extraction well EX-7 in dilute plume off-line	November 17, 1998
Extraction well EX-10 begins operation	May 16, 2002
Second Five-Year Review Report	June 2, 2003
South Well Pumping Test	October 6, 2003 through February 3, 2005
Source Area Delineation	December 15, 2006 through February 6, 2007
Additional Source Area Delineation	April 2008
Third Five-Year Review Report	August 2008
Focused Feasibility Study for Source Mass Reduction and Plume Management submitted to Agencies	September 2009
Indoor Air Sampling (NHBB facility & SDE commercial building)	October 2009
Proposed Plan Issued and public comment period	May-June 2010
ROD Amendment	September 30, 2010
Phase II Indoor Air Sampling (residence & SDE commercial building)	November 2010
Phase II Indoor Air Evaluation, Revision 2	February 2012
Agency Requested Sonic Soil Borings	July 2012
Effective date of First Modification to Administrative Order/Scope of Work to NHBB and Minebea Co., Ltd.	September 28, 2012
Permeable Reactive Barrier (PRB) PDI	July 2011 through December 2012
NHBB Facility Indoor Air & Sub-Slab Soil Gas Sampling	January 2013
Source Area PDI (SAPDI)	August 2012 through May 2013
SA & PRB PDI Report, draft submittal	July 2013
VI Reevaluation and Baseline Human Health Risk Assessment of the NHBB Facility, draft submittal	September 2013

3.0 BACKGROUND

The following sections describe the Site characteristics, land and resource use, Site history, initial response on-Site, and the basis for implementing the cleanup action.

3.1 Physical Characteristics

The Site has been defined to include the South Municipal Water Supply Well (South Well), nearby commercial and residential properties along Sharon Road, a portion of the Contoocook River and U.S. Route 202, the adjacent wetlands, and the New Hampshire Ball Bearings (NHBB) property, which is located approximately two miles south of the center of the town of Peterborough in Hillsborough County, New Hampshire. As shown in Figure 1 in Appendix A, the South Well is located on the east side of Sharon Road, approximately 350 feet east of the Contoocook River. The NHBB facility is situated approximately 1,200 feet west-northwest of the South Well and approximately 800 feet west of the Contoocook River.

The NHBB property currently consists of an active manufacturing facility, asphalt parking lots, the groundwater treatment system, and sedge meadow wetlands. U.S. Route 202, an abandoned Boston & Maine (B&M) Railroad right-of-way on the west side of Route 202, and Sharon Road all cut north-south through the approximately 250 acre Site.

Four major surface water features have been identified at the Site including the sedge meadow, a shallow marsh, the Contoocook River/Noone Pond system, and its associated deep marsh. The sedge meadow drains into a shallow marsh located north of the NHBB property. These features in turn drain into the Contoocook River/Noone Pond system located east of Route 202 through culverts under the former B&M Railroad line and Route 202. An unnamed creek runs easterly across the northern edge of the NHBB parking lot and driveway and drains into the sedge meadow wetlands located between the eastern edge of the NHBB's northeastern parking lot and Route 202.

The Site is situated in the Contoocook River Valley, on glacial/fluvial deposits ranging from approximately 20 to over 100 feet in thickness. Deposits are predominantly sands and gravels, although silty layers are found dispersed both vertically and horizontally throughout the Site. The general direction of groundwater flow is east-northeast in the vicinity of the NHBB plant and changes to a more northerly direction in the vicinity of the Contoocook River.

3.2 Land and Resource Use

Land use in the vicinity of the Site, particularly east of the Contoocook River, is rural and undeveloped. A fitness center and several apartments are situated adjacent to, and south of, the NHBB property. Commercial

establishments are located approximately 1,000 feet north and northwest of the South Well. Residences are located to the west of the NHBB property along Old Jaffrey Road and two residences are located proximate to the Contoocook River along Sharon Road.

The Site and adjacent area are served by a municipal water system which receives water from three wells located north of the town center. The closest residential wells are located approximately one-half mile north of the Site. A private sand and gravel company has in the past allowed groundwater extraction from a shallow overburden well located several hundred feet south of the South Well named the Upland Springs. The South Well was installed in 1952 and provided water to the town of Peterborough for thirty years until it was shut down on December 2, 1982.

3.3 History of Contamination

On October 22, 1982, the New Hampshire Water Supply and Pollution Control Commission (now the New Hampshire Department of Environmental Services (NHDES)) found over 100 parts per billion (ppb) of total volatile organics in a sample of water from the South Well. At the recommendation of the EPA and the State, the Town of Peterborough discontinued the use of the South Well. Subsequent investigations determined that solvent use and disposal at the NHBB facility had resulted in a plume of contaminated groundwater extending from under the NHBB property to the vicinity of the South Well. The principal solvents NHBB had used and that were detected in the groundwater were tetrachloroethylene (PCE), trichloroethylene (TCE), and 1,1,1-trichloroethane (1,1,1-TCA).

3.4 Initial Response

NHBB completed a Remedial Investigation and Feasibility Study (RI/FS) to assess the extent of contamination and evaluate remedial alternatives in 1989 (EMTEK, 1989). In September 1989, a ROD was signed by the EPA Regional Administrator that selected a remedy for the Site. The original ROD was subsequently amended by the issuance of two Explanation of Significant Differences (ESDs), one in 1993 and a second in 1997, and a September 2010 ROD Amendment. The ROD Amendment is discussed further in subsequent sections.

3.5 Basis for Taking Action

EPA selected a remedy for the Site in 1989 based on the discovery of two media with contaminants which posed unacceptable risks to public health and the environment: (1) groundwater containing volatile organic solvents (PCE, TCE, 1,1,1-TCA); and (2) wetland sediments located on the NHBB property containing polychlorinated biphenyl compounds (PCBs) and polyaromatic hydrocarbons (PAHs). The primary Site contaminant risks were from ingestion of contaminated groundwater by residents and incidental ingestion of contaminated sediments.

The 2010 ROD Amendment reaffirmed the potential for unacceptable risks from groundwater contamination at the Site, as well as the potential for vapor intrusion exposures.

4.0 REMEDIAL ACTIONS

This section describes the remedial actions selected and implemented at the Site as described in the ROD, subsequent Explanation of Significant Differences (ESDs), and the ROD Amendment.

4.1 Remedy Selection

The remedial action objectives (RAOs), which were presented in the ROD issued September 27, 1989 were to:

- Eliminate or minimize, to the maximum extent practicable, the threat posed to the public health, welfare, and environment by the current extent of contamination for groundwater, soils, and sediments;
- Eliminate or minimize the migration of contaminants from the soils into the groundwater; and
- Meet federal and state ARARs.

To meet these objectives, the ROD included the following components:

- Groundwater extraction and treatment with air stripping and carbon columns for air emission control;
- In-situ vacuum extraction of contaminated soils;
- Excavation and/or dredging with dewatering of sediments and off-site disposal;
- Wetlands restoration;
- Long-term environmental monitoring;
- Institutional controls; and
- Five-year reviews.

Between July 1990 and January 1993, extensive pre-design investigations were undertaken and the design of the remedy was finalized. As a result of having obtained more detailed technical information during these pre-design investigations, an ESD was issued on May 6, 1993, which documented modifications to the remedy principally for air emission controls and sediment excavation.

The 1993 ESD determined that excavation of sediments was appropriate, but that a small area of contaminated sediments would be left in place and monitored. The ESD also documented the decision to: (1) remove the requirement for air emission controls; (2) use air sparging to attempt to enhance DNAPL removal; and (3) allow for natural attenuation of a small portion of the leading edge of the contaminant plume.

The groundwater extraction and treatment system commenced operation in March, 1994, and the in-situ vacuum extraction system (VES) began operation in October 1994. From 1994 to 1997, groundwater pump and treat and vapor extraction systems, designed to achieve the RAOs identified in the 1989 ROD, were fully operational at the Site.

After reviewing quarterly groundwater sampling data over the first two years of operation and considering the changes which had occurred since the 1989 ROD was issued, the EPA evaluated whether it was technically impracticable (TI) to restore the portion of the contaminated groundwater affected by DNAPL to drinking water quality in a reasonable time frame. On February 3, 1997, the EPA issued a second ESD which included a waiver of certain Federal Drinking Water Standards, or ARARs for groundwater, within a defined "TI Waiver Area." The established TI Waiver Area is shown on Figure 2 in Appendix A and applies to both the overburden and bedrock aquifers within it. The 1997 ESD and TI evaluation revised the remedy objectives to hydraulically contain contaminated groundwater located on the NHBB property to within the TI Waiver Area and the VES was discontinued.

As discussed in the Third Five-Year Review, the 2003-2005 long-term pumping test results at the South Well demonstrated the inability of the existing hydraulic containment system to meet the original RAOs for the Site. The Third Five-Year Review concluded the remedy was not functioning as intended by the 1989 ROD and subsequent ESDs. EPA determined the remedy was not protective of human health or the environment in part because it could not capture all portions of the contaminated groundwater while the South Well was operating and because groundwater outside of the TI Waiver Area was still above drinking water standards.

Additional investigations into the location and extent of contaminant source areas were performed between 2006 and 2008. Results from these investigations were used by Hull to prepare a Focused Feasibility Study (FFS) in 2009. The FFS identified and evaluated new remedial alternatives for source mass reduction and dissolved phase contaminant plume management at the Site which supported the 2010 ROD Amendment prepared by the EPA.

The ROD Amendment changes the original remedy for the Site as set forth in the 1989 ROD. Both the original 1989 selected remedy and the ROD Amendment selected remedy incorporate a combination of technologies to provide a comprehensive approach to Site remediation. Specifically, the ROD Amendment includes the following major components:

- In-situ thermal treatment of contaminated soil and groundwater in identified source areas;
- In-situ bioremediation of contaminated soil and groundwater after the in-situ thermal treatment program;

- In-situ treatment of contaminated groundwater via a permeable reactive barrier (PRB);
- Monitoring and maintenance of existing institutional controls (ICs) that prohibit the use of groundwater;
- Long-term monitoring of Site groundwater; and
- Five-Year Reviews to ensure that the selected remedy remains protective of human health and the environment.

The RAOs for the ROD Amendment are designed to provide adequate protection to human health from direct contact, ingestion, or inhalation of hazardous constituents from the groundwater and soil. The 2010 ROD Amendment RAOs are:

- Restore the entire aquifer outside of the TI Waiver Area to drinking water quality, i.e. maximum contaminant levels (MCLs), in as short a time as practicable in order to return the South Municipal Water Supply Well to the Town of Peterborough as a drinking water source without the implementation of wellhead treatment;
- Prevent the migration of contamination from within the TI Waiver Area into other portions of the aquifer, the dilute plume area, and overlying structures to the extent practicable;
- Reduce contaminant concentrations within the TI Waiver Area;
- Reduce soil contaminant concentrations outside the TI Waiver Area to New Hampshire Department of Environmental Services (NHDES) Method 1 Category S-1 Soil Standards; and
- Prevent exposure to the contaminated soil and groundwater both within the TI Waiver Area and outside the TI Waiver Area.

Pre-design investigation activities for the revised remedy were completed in May 2013 and a draft report was submitted to the Agencies by NHBB on July 12, 2013.

4.2 Remedy Implementation

A Unilateral Administrative Order for the design, construction, operation and maintenance of the groundwater and vapor extraction remedy components in the 1989 ROD became effective on July 9, 1990. NHBB, the party potentially responsible for the contamination, completed the design of the original remedy which was approved by EPA on May 3, 1993. Construction began on June 7, 1993. The groundwater extraction and treatment system began operation in March 1994 and has operated since then. The in-situ vacuum extraction system began operation in October 1994, but ceased operation in 1997 when the second ESD was issued (see above).

In 1994, sediments were removed and disposed of at the Turnkey Landfill in Rochester, NH, a secure landfill operating in compliance with the Resource Conservation and Recovery Act (RCRA). A pre-final inspection was held on September 27, 1994, with a follow-up inspection held October 20, 1994, to ensure completion of the sediment removal and backfilling. Backfilling with enriched, hydric soils and replanting was completed on November 5, 1994.

Monitoring of groundwater quality and water levels has continued throughout the remedial design, construction and post-construction phases. In the fall of 1998, an analysis of the data indicated that cleanup levels had been achieved and maintained for the previous three years in that portion of the dilute plume being captured by extraction well EX-7 located between Route 202 and the Contoocook River. As a result, EX-7 was turned off and that portion of the aquifer, from just east of Route 202 to just west of EX-5A has continued to meet the cleanup levels without the use of EX-7. On October 9, 2000, extraction well EX-5A was shut down as part of an ongoing investigation into persistent volatile organic compounds (VOCs) near the leading edge of the plume. Based on the VOC concentrations, NHBB resumed pumping at EX-5A on April 9, 2003 to remove the contamination from the dilute plume.

A long term, three-stage pumping test was performed by NHBB and the Town of Peterborough on the South Well, in conjunction with the operation of the extraction well containment/remedial system, from October 6, 2003 through February 3, 2005 to determine if reactivation of the South Well was feasible. Prior to the pumping test, the combination of extraction wells EX-4 and EX-10 (pumping at approximately 94 gallons/minute (gpm)) appeared to be containing the contamination in the TI Waiver Area.

Following the three-stage pumping test at the South Well, NHBB initiated field activities to better define the nature and extent of contamination on their property near two suspected sources, outfalls 003A and 002 shown on Figure 1. Information obtained from these investigations was incorporated into the 2009 FFS. Results indicated groundwater concentrations within the core of the contaminant plume had rebounded to pre-remedial concentrations. Concurrent with the source area delineation work, extraction wells EX-1 and EXH-3 were permanently reactivated in 2007 to decrease the contaminant load at the primary containment wells EX-4 and EX-10. Since the reactivation of these interim remedial extraction wells, routine groundwater monitoring results show that VOC concentrations within the TI Waiver Area have decreased. VOC concentrations in the dilute plume located outside the TI Waiver Area are typically less than cleanup criteria except for EX-8 (a non-operational extraction well) and RP-1 shown on Figure 2.

The cleanup goals for groundwater beyond the limits of the TI Waiver Area include maximum contaminant levels and the NHDES ambient groundwater quality standards. Groundwater cleanup goals and results for select contaminants located outside the TI Waiver Area are presented in Table 4-1.

**Table 4-1
Groundwater Cleanup Goals and Results for the Dilute Plume**

Contaminant	MCL/AGQS (ug/L)	2008-2012 Maximum / Date / Well No.	Recent Maximum / Date / Well No.
Tetrachloroethylene (PCE)	5	272 ppb/April 2009/EX-5A (see Note)	4.84 ppb/Aug 2012/RP-1
Trichloroethene (TCE)	5	37.9 ppb/April 2009/MW-5B	18.1 ppb/Aug 2012/RP-1
1,1,1-trichloroethane (1,1,1-TCA)	200	35.2 ppb/April 2009/EX-5A (see Note)	32.6 ppb/Aug 2012/P-7
cis 1,2-dichloroethene (cis 1,2-DCE)	70	14.3 ppn/Aug 2011/EX-8	12.5 ppb/Aug 2012/EX-8
trans 1,2-dichloroethene (trans 1,2-DCE)	100	2.4 ppb/Aug 2011/EX-8 & RP-1	1.88 ppb/Aug 2012/EX-8
1,1-dichloroethene (1,1-DCE)	7	6.3 ppb/Aug 2009/EX-8	3.64 ppb/Aug 2012/EX-8
1,1-dichloroethane (1,1-DCA)	81	7.4 ppb/April 2009/MW-5B	3.47 ppb/Aug 2012/RP-1
Vinyl Chloride	2	3.5 ppb/Aug 2011/EX-8	1.1 ppb/May 2012/EX-8
1,4-dioxane	3	9.61 ppb/Aug 2011/RP-1	3.7 ppb/May 2012/EX-8
<small>Note: The April 2009 sampling results from EX-5A are considered anomalous detections due to the biomass present within the extraction well and the resulting extraction limitations. Further explanation of the anomalous sampling results can be found in the memorandum <i>Results from April 2009 Groundwater Sampling Event; South Municipal Water Supply Well Superfund Site in Peterborough, New Hampshire (Site)</i> (Hull document # NHB033.200.0078).</small>			

4.3 System Operations/Operation and Maintenance (O&M)

There are two principal aspects related to the O&M for the hydraulic containment remedy: (1) groundwater treatment facility O&M, and (2) extraction well O&M.

Groundwater Treatment Facility

The groundwater extraction and treatment system has been in operation for the past nineteen years beginning in March 1994. This five-year review includes Years 15 through 19 of operation (2008 through March 2013). The system has been consistently operating barring interruptions for routine maintenance, low water levels, field investigations, power outages, and process modifications. Approximately 2.06 billion gallons of water have been

extracted and treated by the groundwater treatment plant through March 2013. Annual totals are less than initial years because fewer wells are currently in service. In this current five-year review period, approximately 73 million gallons of water have been treated. The average cumulative flow rate of the operating extraction wells is approximately 198 gpm. The actual cumulative pumping rate is likely higher than reported due to recording issues at EX-10, where the plumbing near the flow meter creates backpressure, resulting in erratic and anomalous flow readings. The estimated pumping rate for EX-10 is based on information provided by facility technicians involved with the operation of the groundwater treatment system.

System effluent water (surface water discharge) analytical results were generally in the range of less than 1 ppb to 29.7 ppb total VOCs (March 2009), which is within the compliance limit of 100 ppb total VOCs for discharge into a surface water body. Approximately 11,762 pounds of VOCs (907 gallons) have been removed over the past 19 years: 8,700 pounds of PCE; 2,106 pounds of 111-TCA; and 955 pounds of TCE. Tables 14 and 15 included in Appendix B are from the Year 19 Annual Groundwater Monitoring Report being prepared by Hull. These tables present the annual and cumulative gallons of groundwater treated and the quantity of VOCs removed, respectively.

The removal efficiency for the Tower 2 air stripper ranged from 12.5% to 100% of VOCs during the period since 2008. In Year 19, efficiency ranged from 95.2% to 100%. Efficiencies on the lower end of the range generally coincided with times prior to tower packing change outs. Air stripper tower cleaning is performed using a citric acid solution when pressure differentials get to be too great and/or the removal efficiency declines.

Air emission concentrations in Year 19 ranged from 0.0 lbs./day (0.0 mg/m³) in August 2012 to 0.86 lbs./day (1.77 mg/m³) in November 2012. The range observed during Year 15 through Year 19 (2008 through March 2013) was 0.0 lbs./day (0.0 mg/m³) in August 2012 to 2.64 lbs./day (4.64 mg/m³) in August 2008.

Extraction Well O&M

There are currently five groundwater extraction wells operating at the Site (Figure 3). Extraction wells EX-4 and EX-10 are located on the eastern edge of the NHBB property and serve as the primary containment wells to hydraulically control contaminated groundwater within the TI Waiver Area. Decreased capacity associated with biofouling in EX-4 led to the installation of EX-10 in 2002. Periods immediately following well rehabilitation typically produce a combined pumping capacity of approximately 100 gpm in these wells; however, this rate rapidly decreases. EX-4 historically operates between 70-90 gpm and EX-10 between 40-50 gpm. Biofouling in EX-4 reduced its capacity to 20-25 gpm from 2008-2010 to < 1 gpm in 2011/2012. While biofouling occurs throughout the aquifer; the effects are most prevalent in extraction wells EX-4, EX-5A, and EX-10. Low yield and/or excessive drawdown in these wells indicate the need for well cleaning.

Extraction well EX-5A is located at the downgradient edge of the groundwater plume, east of Sharon Road. After an extended evaluation period during which the well was not being used, it was reactivated in April 2003 to remove dissolved phase VOCs from the dilute plume outside the TI Waiver Area. EX-5A has historically pumped 50-70 gpm; however, this pumping rate was reduced to an average of 8 gpm in 2008 which prompted preventative maintenance in November 2008 and rehabilitation efforts in November 2009. Most recently in 2012, EX-5A has been pumping at an average rate of 61 gpm.

Extraction wells EX-1 and EXH-3 are located east of the northeast corner of the NHBB facility and were reactivated in 2006 to provide mass removal and alleviate the contaminant loading on the primary containment wells, EX-4 and EX-10. EX-1 and EXH-3 are considered interim remedial action wells and have current pumping rates of 10-22 gpm and 30-50 gpm, respectively; rates that are less than those achieved prior to their deactivation in 1997.

Well rehabilitation and equipment cleaning protocols were modified in 2007 to include a shock solution that uses muriatic and glycolic acids and a proprietary dispersant, CB-4. The protocol involves adding the shock solution to the wells and allowing it to set overnight. pH values in surrounding wells are monitored to determine whether the shock solution has made contact with the sandpack and aquifer materials surrounding the extraction well. Each well is then redeveloped using a surge block and lift pumps. The wells are redeveloped using mechanical pumping and cleaning methods until the discharge water was relatively clear of silt. During the well rehabilitation efforts, the well pumps and down-well piping are also cleaned with the shock solution.

Well rehabilitation is typically performed once a year; however, with the temporary suspensions in operation of the extraction system due to on-going pre-design work, well rehabilitation has not been implemented since 2011. Rehabilitation protocols as developed by ARCC, Inc. for EX-4, EX-10, EX-1 and EXH-3 (EX-5A will be added as needed) will be implemented or modified, as necessary, based on well yields.

4.4 ROD Amendment

As previously discussed, the EPA issued a ROD Amendment in September 2010 modifying the Site remedy to include components that will focus on source area reduction as well as dissolved plume treatment and management. Pursuant to the ROD Amendment, pre-design investigation activities were implemented during the current five-year review period. These PDI activities were selected to further characterize the distribution and size of the known and suspected source areas as well as to collect technology specific data needed to design the remedies. Tasks associated with the PDI include those outlined in the PRB Pre-Design Investigation Work Plan and subsequent Work Plan Amendments 1 through 4. Field work for the PRB-PDI took place from July 2011 through December 2012.

Pre-design investigations tasks specific to the source area are generally outlined in the Source Area Pre-Design Investigation Work Plan (Rev 1, March 2012). Field work for the SAPDI began in August 2012 and was completed in May 2013.

A Draft Source Area and PRB PDI Report was recently submitted to the Agencies on July 12, 2013 and the Agencies have begun their review of the substantive data contained in it separately from this five-year review. While the Agency review of the PDI data is on-going, PDI findings of significant note thus far have included:

- the continued presence of 1,4-dioxane as a contaminant of concern at the Site,
- the identification of an additional DNAPL source area (referred to as the “High Bay AOC”) under the NHBB building, and
- the discovery of vapor intrusion (VI) issues inside the NHBB building.

The VI pathway was not identified as a potential exposure route of concern at the time of the original RI/FS and therefore was not evaluated or included as a remedial action objective (RAO) in the original ROD. However, the ROD Amendment included VI ARARs as an RAO for the entire Site, irrespective of the TI Waiver Area. Limited investigations conducted on the NHBB property prior to the completion of Third Five-Year Review indicated that there were insufficient data to evaluate the protectiveness of the original remedy relative to the VI pathway.

VI investigations conducted during the current five year review period indicated that VI is an exposure route of concern on the NHBB property, but not in two buildings (a commercial building and a residence) located outside of the TI Waiver boundary. Indoor air sampling results collected inside the NHBB building identified contaminant concentrations exceeding NHDES and EPA screening values. Samples collected from the commercial building and residence did not exceed screening levels. Indoor air sampling and vapor intrusion assessment in the NHBB Building is on-going. A summary of the VI assessment and mitigation measures implemented through early 2013 is included in this five-year review and a Draft VI Reevaluation and Baseline Human Health Risk Assessment of the NHBB Facility was recently submitted to the Agencies in September 2013.

5.0 PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

This is the fourth five-year review for the Site. The third five-year review contained three recommendations for ensuring the protectiveness of the remedy. The status of their implementation is presented below.

Recommendation/Follow-up Action 1

Evaluate alternative remedial technologies and implement approved engineering technology in the TI Waiver Area and at the northern property boundary outside the TI Waiver Area.

To address this recommendation, NHBB and Hull completed a FFS in September 2009. Following the FFS, the EPA issued a ROD Amendment in September 2010 that modified the original remedy to include a combination of technologies to target the treatment of contaminants in soil and groundwater located within high concentration source areas. Pursuant to the ROD Amendment, pre-design investigation activities have occurred during the current five-year period to further characterize the Site and to provide data that can be used to design the remedial technologies. At present, the general vision for the application of the remedial technologies specified in the ROD Amendment is for a zero valent iron PRB to be installed at the boundary of the TI Waiver Area along U.S. Route 202 in overburden using a trenchless construction method to achieve compliance with MCLs outside of the TI Waiver Area. Comprehensive in-situ thermal treatment of source areas, followed by bioremediation, will occur in areas within the TI Waiver Area.

Recommendation/Follow-up Action 2

Implement vapor intrusion assessment in the TI Waiver Area and outside the TI Waiver Area.

VI assessments were conducted at the NHBB facility, the Staff Development for Educators, Inc. (SDE) commercial building on Sharon Road, and a residence located at 33 Sharon Road (Figure 2). Both the commercial building and the residence are located above the downgradient edge of the of the dilute groundwater plume. Indoor air sampling was initiated within the NHBB facility and SDE building in October 2009. Results from the 2009 sampling indicated the existing remedy was not protective of the VI pathway at either the NHBB facility or the SDE building because PCE and TCE concentrations in indoor air exceeded commercial and industrial indoor air EPA Regional Screening Levels at both locations. However, the indoor air concentrations did not exceed a cancer risk of 1E-04 or a hazard quotient of 1. During November 2010, focused phase II indoor air sampling occurred within the SDE building and the Sharon Road residence. Results from the phase II indoor air sampling did not suggest that vapor intrusion at either SDE or the residence was an issue and no unacceptable exposure to receptors in the vicinity of the dilute plume from the VI pathway was identified.

At the NHBB facility, indoor air and sub-slab soil gas samples collected during January 2013 were similar to the results from the 2009 sampling event. When compared to the EPA Regional Screening Levels under the industrial exposure scenario, the January 2013 indoor air results show cancer screening level risks of 2×10^{-5} or less, which is within the EPA's acceptable risk range of 10^{-4} to 10^{-6} for incremental carcinogenic risk. However, the non-cancer screening level hazard quotient (HQ) was greater than 1 in all samples. The ROD Amendment states that there will be a reduction in potential human health risk levels such that they do not exceed EPA's acceptable risk range of 10^{-4} to 10^{-6} for incremental carcinogenic risk, and that the remedy will ensure that the non-carcinogenic hazard is below a level of concern because the calculated hazard index (HI) will not exceed 1.

EPA posted a Toxicological Review of TCE on its Integrated Risk Information System (IRIS) on September 28, 2011. The review presents newly established toxicity values for use in developing TCE screening levels and site-specific risk assessments. Based on the revised IRIS value for TCE, NHDES published updated TCE vapor intrusion screening levels (as part of a more comprehensive Vapor Intrusion Policy update) on February 7, 2013.

A comparison of the January 2013 results to the NHDES Revised Vapor Intrusion Screening Levels revealed concentrations of PCE, TCE, and trans-1,2-dichloroethene at concentrations that exceed the NHDES Revised Screening Levels. The NHDES considers their revised TCE indoor air screening level of $8.8 \mu\text{g}/\text{m}^3$ for a commercial exposure scenario protective of an increase in fetal cardiac malformations (FCM) during the first trimester of pregnancy. Some of the January 2013 indoor air samples collected from the NHBB facility exceeded the NHDES Revised Screening Level for TCE, which indicated that indoor air quality may not be protective of the FCM effect that could result from short term exposure to TCE by women of child bearing age present within the NHBB building.

In light of the NHDES update, EPA reviewed the November 2010 focused phase II indoor air sampling results for the SDE commercial building and the Sharon Road residence. The November 2010 TCE concentrations in soil gas and indoor air are lower than the revised February 7, 2013 NHDES Vapor Intrusion Screening Levels for residential and commercial indoor air, and groundwater to indoor air (GW-2 standards) screening levels. Current toxicity factors were also used with the November 2010 data to calculate indoor air risks in the SDE building. All risks were below $1\text{E}-06$ and $\text{HQ}=1$, EPA's carcinogenic and non-carcinogenic risk criteria; a finding consistent with previous findings.

Substantial additional indoor air assessments and pre-emptive VI mitigation measures have been completed or explored at the NHBB facility in 2013. A chronology of the activities is provided in Table 5-1. Additional information and data regarding these activities is provided in the *Draft Vapor Intrusion Reevaluation and*

Baseline Human Health Risk Assessment of the NHBB Facility Hull prepared and submitted to the Agencies on September 5, 2013.

**Table 5-1
Chronology of 2013 Vapor Intrusion Investigations and Mitigation Measures at NHBB facility**

Date	Activity
January 19 & 20	Paired sub-slab soil gas and indoor air samples collected from locations in the Microball, Highbay and Grind areas of NHBB.
February 28	NHBB issues written notification to employees regarding indoor air TCE concentrations detected above the updated NHDES guidance screening level for short-term exposures.
March 2 & 3	Facility-wide High Volume Purge Study conducted to better define sub-slab source areas; photoionization detector screening of floor penetrations and joints in the Microball area; and caulk sealing of openings.
March 2-8	Pilot test in the Microball area to evaluate the efficacy of portable air scrubbers.
March 5	Indoor air samples collected from the Assembly and Fishbowl areas.
March 11	Concrete floor within air plenum installed in the Microball ledge area.
April 2	Heating, ventilation, and air conditioning (HVAC) consultant inventoried the existing HVAC system to design a building pressurization test.
April 17	Facility-wide indoor air sampling event (51 sample locations).
April 23	Make-up air ventilation fan installed in the first floor cafeteria.
May 4 & 5	Conducted building pressurization testing to evaluate potential for inducing facility-wide positive pressure as large-scale mitigation measure, and indoor air sampling during positive pressure conditions to evaluate mitigation effect of pressurization.
May 15	Conducted indoor air sampling in First Floor Cafeteria and First Floor Inspection Office to evaluate potential effect of cafeteria make-up air fan.
May 17	Issued written notification to employees regarding results of the April 17, 2013 facility-wide indoor air sampling event.
May 15-20	Relocated employees and operations from the first floor Inspection Office to a temporary location on the second floor and implemented adjustments to the ventilation in the office area northeast of the Grind Area (Gauge Room).
May 20-24	Installed make-up air ventilation in the first floor Inspection Office.
June 7	Conducted indoor air sampling within the first floor Inspection Office and the Gauge Room to evaluate the effects of ventilation adjustments in these areas.

August 12	Conducted air flux testing and air quality testing within the building's vertical air shafts to assist with the design of potential mitigation measures through building pressurization.
September 5	Draft VI Reevaluation and Baseline Human Health Risk Assessment of the NHBB Facility submitted.

At this time, there are still insufficient data to evaluate the sitewide protectiveness of the remedy due to the VI pathway and a determination of this pathway is deferred until 2015. The EPA and NHDES will review and comment on the VI reevaluation and baseline risk assessment report and this information will be used to evaluate the protectiveness of the existing remedy with respect to the VI pathway.

Recommendation/Follow-up Action 3

Reinstate the aquifer protection zoning overlay district (Chapter 245 Zoning Ordinance and Building Code).

On May 12, 2009, Peterborough voters approved Article 2, Item 1, to amend the §245-14- Groundwater Protection Overlay Zone to comply with EPA requirements. EPA documented this in a May 15, 2009 Memorandum to the Site file (document ID 450951), which was included in the Administrative Record for the 2010 ROD Amendment.

6.0 FIVE-YEAR REVIEW PROCESS

This section provides a summary of the five-year review process and the actions taken by EPA to complete the fourth five-year review for the Site.

6.1 Administrative Components

The EPA served as the lead agency for this five-year review. NHBB and their contractor, Hull, provided support to EPA by providing information pertinent to the evaluations outlined in this report. Kenneth Richards, Remedial Project Manager for NHDES, was part of the review team. Hull, on behalf of NHBB, provided figures and tables to assist with data presentation.

6.2 Community Notification and Involvement

The community was notified of the start of the fourth five-year review via an EPA Region 1 news release on May 9, 2013. A copy of the news release is provided in Appendix C.

The Town of Peterborough remains informed of progress related to the Site through formal and informal meetings with EPA, NHDES, and NHBB. On December 1, 2009, the EPA, NHDES, and NHBB provided an update on the Site to attendees at the Selectman's Meeting. A public informational meeting to learn more about and openly discuss the proposed remedy change for the Site was held in the Peterborough Town Hall on May 18, 2010. A Public Hearing with a formal comment session that provided attendees the opportunity to offer comments on the Proposed Plan directly into the public record was also held at the Peterborough Town Hall on June 16, 2010. The Town of Peterborough remains very interested in the Site and the activities undertaken to reactivate the South Municipal Well.

Copies of all documents pertaining to the Site are available for public review and Site information repositories are maintained at the Peterborough Town Library, 2 Concord St., Peterborough, NH and the EPA Records and Information Center, 5 Post Office Square, Boston, MA.

6.3 Document Review

This five-year review consisted of a review of relevant documents including decision documents and monitoring reports. The documents reviewed are listed in Appendix D.

6.4 Data Review

Data reviewed in preparing this five-year review report included, but were not limited to: records and annual groundwater monitoring reports for Years 14 through 19; Focused Feasibility Study for Source Mass Reduction

and Groundwater Management (2009); Indoor Air Sampling Results (2009); ROD Amendment (2010); Phase II Focused Indoor Air Evaluation, Revision 2 (2012); Source Area PDI Work Plan and PRB PDI Work Plan (2012) and associated Amendments; and NHBB facility indoor air and sub-slab soil gas sampling results for January 2013.

6.5 Site Inspection

A Site inspection was conducted on August 22, 2013, with representatives from the EPA, NHDES, and NHBB. No problems/issues were observed and ongoing and upcoming Site activities were discussed. The Site Inspection Checklist is in Appendix E.

6.6 Interviews

Two individuals were interviewed on August 22, 2013 as a part of this five year review: Rodney Bartlett, the Public Works Director for the Town of Peterborough; and David Weir, a resident who maintains an interest in the Site. Overall impressions of the project were discussed and comments were solicited regarding the Site's activities and management. Interview Records are included in Appendix F.

7.0 TECHNICAL ASSESSMENT

This section provides a technical assessment of the remedy that is expected to be implemented at the Site. This fourth five-year review follows the Comprehensive Five-Year Review Guidance (EPA, 2001) and was developed to answer the questions below.

7.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

No. Review of Site-related documents, data representing the last five plus years (2008 through 2013), O&M procedures, ARARs, and Site inspection notes indicate that the remedy is not functioning as intended by the ROD and subsequent ESDs, consistent with the findings of the previous five year review. In order to restore the use of the aquifer beyond the TI Waiver Area for water supply purposes and reactivate the South Well, the combination of treatment technologies selected in the 2010 ROD Amendment must be implemented. These treatment technologies will replace the existing containment system once fully designed and implemented. As noted in Section 7.1.5 below, reestablishment of the aquifer protection zoning overlay district in 2009 and the fact that the Site and adjacent areas are served by a municipal water system prevents any current direct exposures to contaminated groundwater existing at the Site.

7.1.1 Remedial Action Performance

The previous five year review determined the original remedy was not performing as intended due its inability to contain the contaminant plume to areas within the TI Waiver Area, insufficient data on the vapor intrusion pathway, and the aquifer protection zone not being maintained. Data collected and reviewed during this five year review period indicate that the groundwater extraction wells are still not hydraulically containing the contaminant plume to within the TI Waiver Area and there remains insufficient data on the vapor intrusion pathway at the NHBB facility.

7.1.2 System Operations/O&M

The existing extraction well containment/remedial system cannot ensure that containment is achieved and that VOC concentrations in the dilute plume will remain below cleanup concentrations. Biofouling of the well screens in extraction wells EX-4 and EX-10 limits their ability to maintain a hydraulic capture zone within the TI Waiver Area, as illustrated by the continued presence of VOCs above the MCL and AGQS goals in Table 4-1. Continued production losses have been observed at extraction wells during this review period even after the implementation of an alternative cleaning protocol. According to NHBB, the modified method of cleaning the pumps has not reduced the amount or frequency of biofouling.

7.1.3 Opportunities for Optimization

The Source Area Pre-design Investigation was developed and implemented using a technology-phased Triad approach. This approach assisted with data collection activities required to obtain work plan objectives within reasonable time frames. By using systematic planning, dynamic work strategies, and real-time measurement technologies, decision making uncertainty was better managed during the Source Area and PRB PDI field efforts conducted in 2012-2013.

7.1.4 Early Indicators of Potential Remedy Problems

A substantial scope of pre-design investigation (PDI) activities related to the revised remedy was completed during this 5-year reporting period and a draft PDI Report was submitted in July, 2013. EPA and NHDES are currently reviewing and evaluating the data presented in the draft PDI report and three significant findings have thus far been identified:

- the continued presence of 1,4-dioxane as a contaminant of concern at the Site,
- the identification of an additional DNAPL source area (referred to as the “High Bay AOC”) under the NHBB building, and
- the discovery of VI issues inside the NHBB building.

The revised remedy specified in the 2010 ROD Amendment may have limited efficacy in addressing all of these issues. For example, remedial components specified in the ROD Amendment may require expansion to areas not previously identified, such as the High Bay AOC, or additional remedial technologies beyond those specified in the ROD Amendment may be required to address all contaminants, such as 1,4-dioxane, to achieve all RAOs for the Site. Once the EPA and NHBB complete their review of the draft PDI, NHBB will need to incorporate and address all findings of significance into the upcoming design documents.

7.1.5 Implementation of Institutional Controls

An aquifer protection zoning overlay district (Aquifer Protection District D) was established by the town of Peterborough for the Site in the Peterborough Code (Code), Chapter 245 Zoning to disallow groundwater use throughout the Site. The boundary has been set approximately 1,000 feet beyond the extent of contamination as determined by chemical analyses of the groundwater at the Site. The zoning overlay was present in the Code dated March 12, 2002. However, the zoning overlay was not maintained when the Code was revised as of March 2005. This oversight was identified in the previous third year review and subsequent efforts by EPA and the Town of Peterborough contributed to the reinstatement of an aquifer protection overlay district on May 12, 2009 that complies with EPA requirements.

7.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and Remedial Action Objectives (RAOs) Used at the Time of the Remedy Selection Still Valid?

No. In 2011, EPA revised the integrated risk information system (IRIS) value for TCE, resulting in greater toxicity for cancer and non-cancer effects. This does not change the current protectiveness related to direct ingestion of contaminated groundwater because municipal water is being provided and the use of groundwater on the Site is prohibited. However, the IRIS change may affect current protectiveness related in inhalation of TCE in the NHBB building due to VI. In addition, as noted above in Section 7.1.4 above, 1,4-dioxane was identified subsequent to the remedial alternatives presented in the 2009 FFS and additional activities beyond those specified in the 2010 ROD Amendment should be considered since they may be required to achieve the RAOs for the Site.

The following ARARs were reviewed for changes that could affect protectiveness:

- Safe Drinking Water Act (40 CFR 141.11-141.16) from which many of the groundwater cleanup levels were derived - [MCLs, and MCL Goals (MCLGs)];
- Resource Conservation and Recovery Act (40 CFR 264);
- Clean Water Act (40 CFR 122);
- New Hampshire Code of Administrative Rules - Drinking Water Quality Standard (Env-Ws 315.01) and AGQS (Env-Or 603.03); and
- New Hampshire Code of Administrative Rules – Method 1 Category S-1 Soil Remediation Standards (Env-Or 606.19)

7.3 Question C: Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

Yes. EPA posted a Toxicological Review of TCE on its Integrated Risk Information System (IRIS) on September 28, 2011. The review presents newly established toxicity values for use in developing TCE screening levels and site-specific risk assessments. Based on the revised IRIS value for TCE, NHDES published updated TCE vapor intrusion screening levels (as part of a more comprehensive Vapor Intrusion Policy update) on February 7, 2013. A comparison of the January 2013 results for the NHBB facility to the NHDES Revised Vapor Intrusion Screening Levels revealed concentrations of PCE, TCE, and trans-1,2-dichloroethene at concentrations that exceed the NHDES Revised Screening Levels. The NHDES considers their revised TCE indoor air screening level of 8.8 µg/m³ for a commercial exposure scenario protective of an increase in fetal cardiac malformations (FCM) during the first trimester of pregnancy. Some of the January 2013 indoor air samples collected from the NHBB facility exceeded the NHDES Revised Screening Level for TCE and are thus not protective of the FCM

effect that could result from short term exposure to TCE risks to women of child bearing age present within the NHBB building.

7.4 Technical Assessment

Based on the data reviewed, and consistent with the findings of the previous five year review, the existing remedy is not functioning as intended by the original ROD and subsequent ESDs. However, implementation of the remedy components selected in the 2010 ROD Amendment are expected to meet the RAOs for the Site. Vapor intrusion issues continue to be of concern within the NHBB facility which will likely require implementation of mitigation measures.

8.0 ISSUES

Persistent biofouling of the groundwater extraction wells continues to affect the performance and effectiveness of the plume containment. The groundwater extraction and containment system needs to be maintained and operated until the remedy components selected in the 2010 ROD Amendment are installed and operating as designed.

Elevated soil vapor VOC concentrations exceeding screening levels have been detected beneath the NHBB facility. Ambient air samples collected from within the NHBB facility indicate VOCs in excess of NHDES screening levels. Additional information and data regarding the indoor air assessments and pre-emptive VI mitigation measures that have been completed or explored at the NHBB facility in 2013 was recently provided in the Draft Vapor Intrusion Reevaluation and Baseline Human Health Risk Assessment of the NHBB Facility report submitted to the Agencies in September 2013.

Identified issues and their effects on protectiveness are summarized in Table 8-1.

Table 8-1
Issues

Issues	Affects Current Protectiveness?	Affects Future Protectiveness?
Existing groundwater extraction system does not hydraulically contain the contaminant plume to within the TI Waiver Area, and contamination above ARARs exists outside the TI Waiver Area.	No	Yes
Indoor air concerns may continue to exist within the NHBB facility.	Yes	Yes

9.0 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

In response to the issues noted in Section 8.0, recommended actions for each identified issue raised are listed in Table 9-1. NHBB, Inc. is a U.S. subsidiary of Minebea Co., Ltd., a Japanese conglomerate.

**Table 9-1
Recommendations/Follow-up Actions**

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Current Protective-ness?	Affects Future Protective-ness?
Existing groundwater extraction system does not hydraulically contain the contaminant plume to within the TI Waiver Area, and contamination above ARARs exists outside the TI Waiver Area.	Integrate the recently submitted SA & PRB PDI report information into the remedial designs and Implement the ROD Amendment selected remedy to achieve all RAOs	NHBB/ Minebea	EPA/ NHDES	Sept. 2017	No	Yes
Indoor air concerns may continue to exist within the NHBB facility.	Implement pre-emptive VI mitigation measures at the NHBB facility, as necessary, to prevent or mitigate inhalation (exposure) by workers to volatilized subsurface contaminants; and Implement the ROD Amendment selected remedy to achieve all RAOs	NHBB/ Minebea	EPA/ NHDES	March 2015	Yes	Yes

10.0 PROTECTIVENESS STATEMENTS

A protectiveness determination for the Site cannot be made at this time until further information is obtained. Further information was recently provided in a draft vapor intrusion reevaluation and baseline risk assessment report for the NHBB facility, which was submitted to the Agencies for review and comment on September 5, 2013. It is anticipated that this report will provide the information needed to determine whether or not potential risks from vapor intrusion continue to exist within the NHBB facility. If mitigation measures are warranted, it is expected that these actions may take up to a year to implement and confirm their effectiveness, at which time a protectiveness determination will be made.

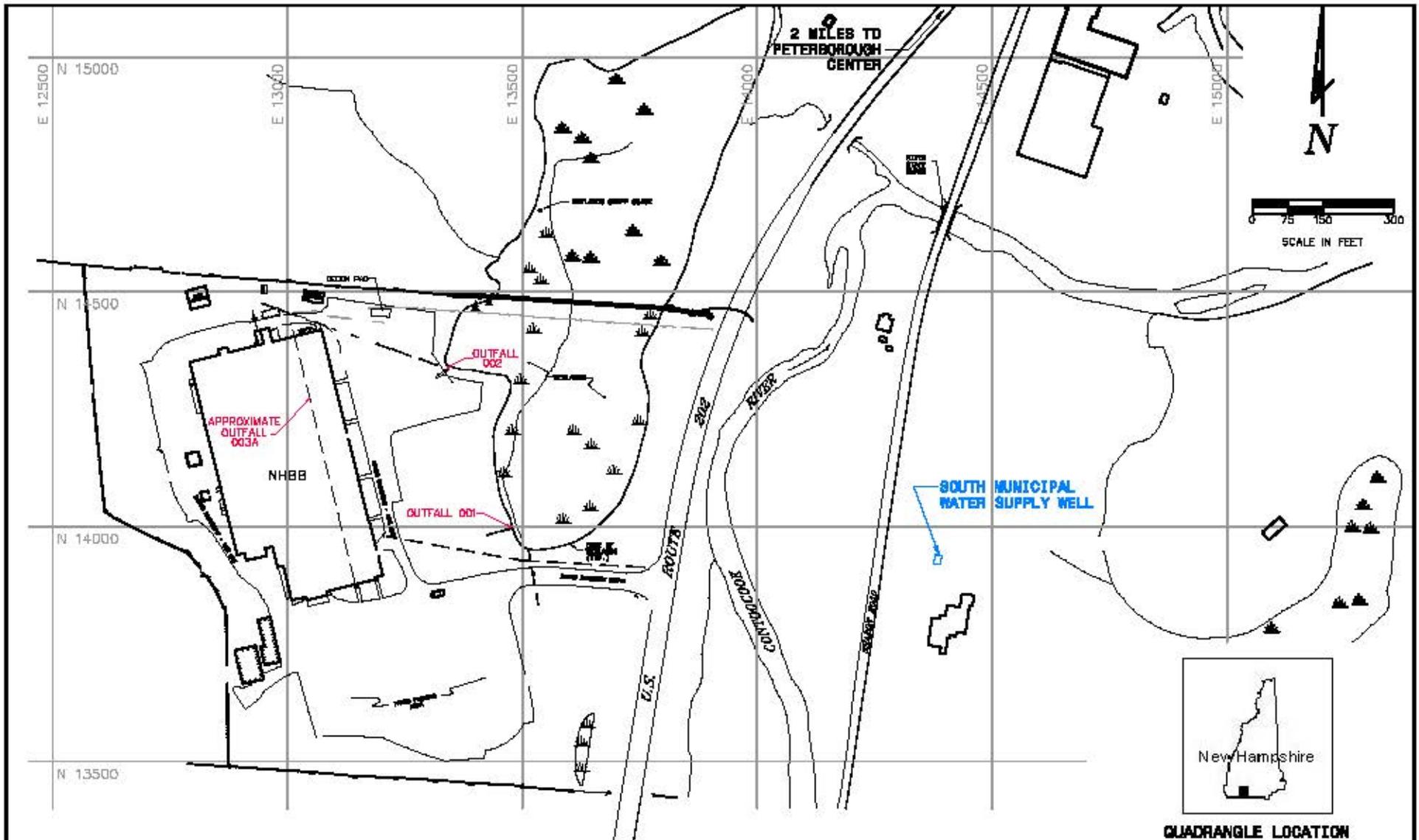
For other elements of the groundwater remedy at the Site, the following facts should be noted for protectiveness in the short-term:

- Reestablishment of the aquifer protection zoning overlay district was formally implemented in 2009, and
- The Site and adjacent areas are served by a municipal water system which prevents any current direct exposures to contaminated groundwater present at the Site.

11.0 NEXT REVIEW

The fifth five year review for the South Municipal Well Water Supply Superfund Site will be completed five years from the signature date of this five year review document. Due to the *Protectiveness Deferred* determination for the Site at this time, a revised protectiveness determination and a five year review addendum is scheduled for March 2015.

APPENDIX A
SITE FIGURES



QUADRANGLE LOCATION

Hull
& associates, inc.

ENGINEERS | GEOLOGISTS | SCIENTISTS | PLANNERS

4770 DUKE DRIVE
SUITE 300
MASON, OHIO 45040

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SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE

**FIGURE 1
SITE PLAN**

PETERBOROUGH, NEW HAMPSHIRE

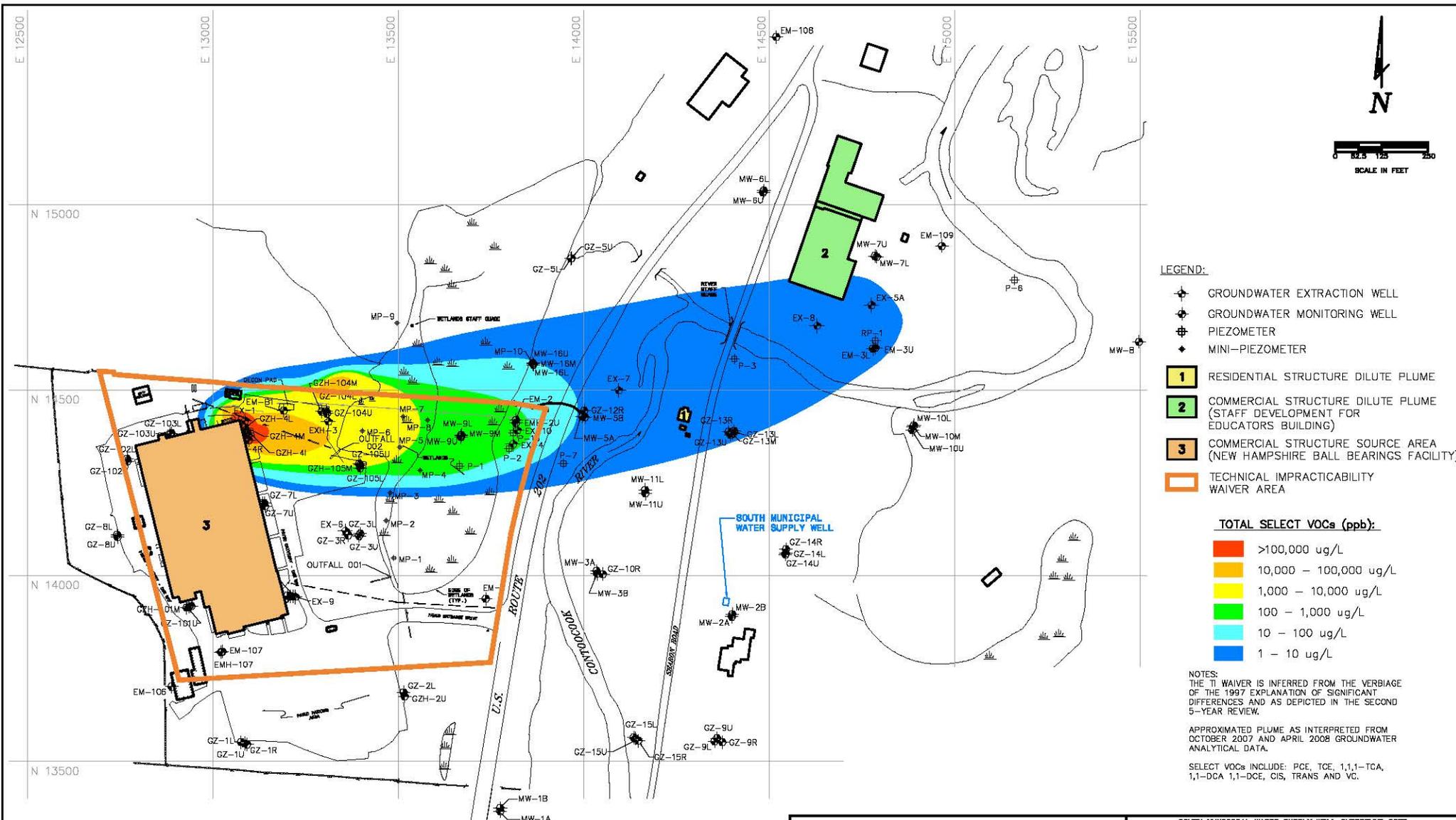
PROJECT NO.: NH034

CAD DWG FILE: NH034.200.0037

SUBMITTAL DATE: FEBRUARY 2010

PLOT DATE: 2/18/10

SOURCE: THIS DRAWING WAS RE-DRAFTED FROM T.F. MORAN, INC. "BOUNDARY PLAN OF LAND FOR NEW HAMPSHIRE BALL BEARINGS, INC.", DATED JANUARY 19, 1990.



- LEGEND:**
- ⊕ GROUNDWATER EXTRACTION WELL
 - ⊕ GROUNDWATER MONITORING WELL
 - ⊕ PIEZOMETER
 - ⊕ MINI-PIEZOMETER
 - 1** RESIDENTIAL STRUCTURE DILUTE PLUME
 - 2** COMMERCIAL STRUCTURE DILUTE PLUME (STAFF DEVELOPMENT FOR EDUCATORS BUILDING)
 - 3** COMMERCIAL STRUCTURE SOURCE AREA (NEW HAMPSHIRE BALL BEARINGS FACILITY)
 - ▭ TECHNICAL IMPRACTICABILITY WAIVER AREA

TOTAL SELECT VOCs (ppb):

	>100,000 ug/L
	10,000 – 100,000 ug/L
	1,000 – 10,000 ug/L
	100 – 1,000 ug/L
	10 – 100 ug/L
	1 – 10 ug/L

NOTES:
 THE TI WAIVER IS INFERRED FROM THE VERBIAGE OF THE 1997 EXPLANATION OF SIGNIFICANT DIFFERENCES AND AS DEPICTED IN THE SECOND 5-YEAR REVIEW.
 APPROXIMATED PLUME AS INTERPRETED FROM OCTOBER 2007 AND APRIL 2008 GROUNDWATER ANALYTICAL DATA.
 SELECT VOCs INCLUDE: PCE, TCE, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, CIS, TRANS AND VC.

SOURCE: THIS DRAWING WAS RE-DRAFTED FROM T.F. MORAN, INC. "BOUNDARY PLAN OF LAND FOR NEW HAMPSHIRE BALL BEARINGS, INC.", DATED JANUARY 19, 1990.

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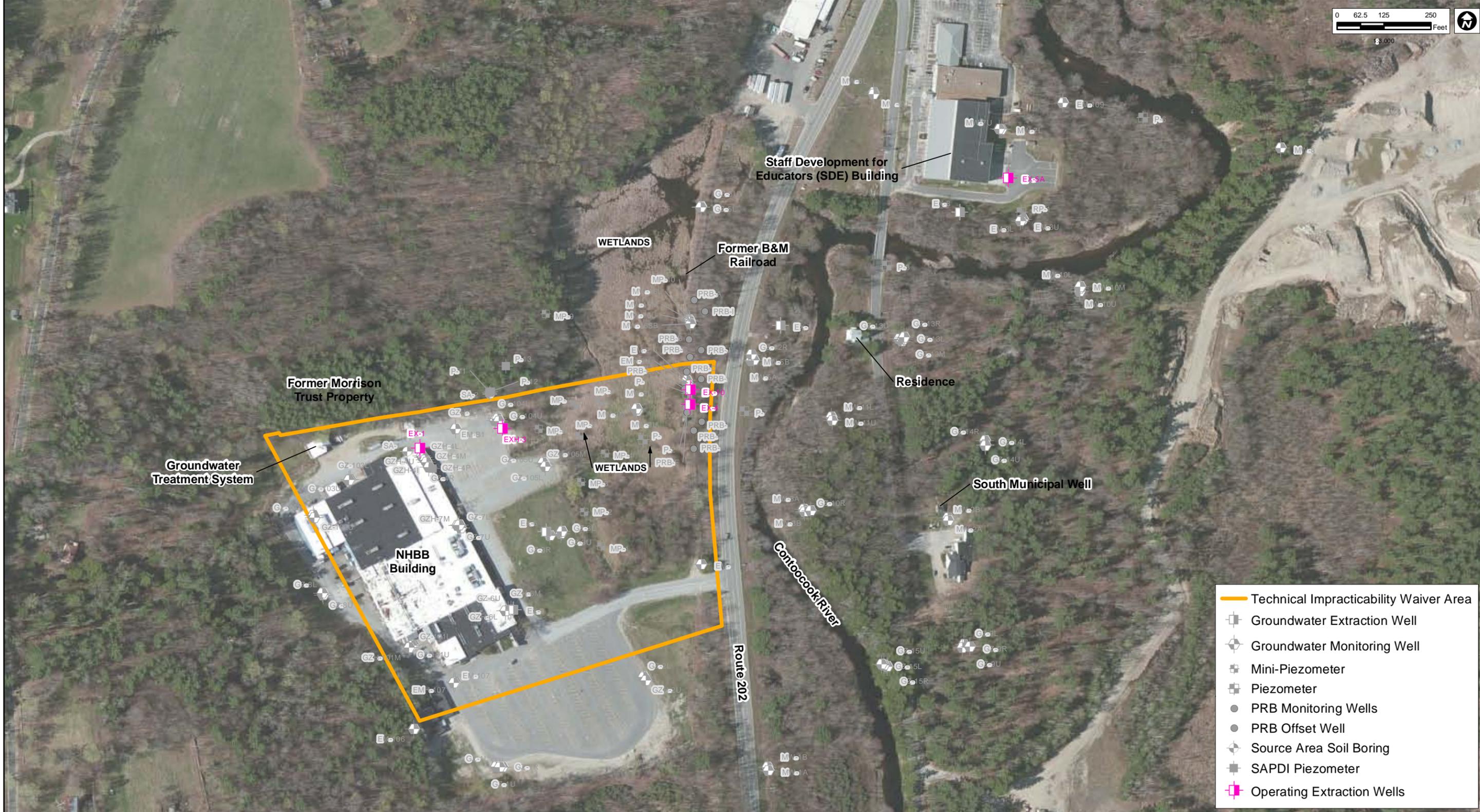
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SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE

FIGURE 2
GROUNDWATER VOC PLUME

PETERBOROUGH, NEW HAMPSHIRE

PROJECT NO.: NH8034	SUBMITTAL DATE: FEBRUARY 2010
CAD DWG FILE: NH8034.200.0038	PLOT DATE: 2/18/10



- Technical Impracticability Waiver Area
- Groundwater Extraction Well
- Groundwater Monitoring Well
- Mini-Piezometer
- Piezometer
- PRB Monitoring Wells
- PRB Offset Well
- Source Area Soil Boring
- SAPDI Piezometer
- Operating Extraction Wells



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August 2013
South Municipal Water Supply Well Superfund Site

Operating Extraction Wells

Rt. 202 South
Peterborough, Hillsborough County, New Hampshire

Figure
3

APPENDIX B
DATA SUMMARY TABLES

**NEW HAMPSHIRE BALL BEARINGS, INC.
SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE**

TABLE 14

SUMMARY OF ANNUAL AND CUMULATIVE GALLONS OF GROUNDWATER TREATED OVER NINETEEN YEARS OF OPERATION

Operational Year	Groundwater Treated (gallons) ^a								Annual Totals
	EX-1	EXH-3	EX-4	EX-5A	EX-6	EX-7	EX-9	EX-10	
Year 1	45,328,270	36,160,754	90,147,232	24,527,124	4,625,280	50,421,334	13,751,272	-- ^e	264,961,266
Year 2	46,641,744	38,868,120	78,772,723	30,873,744	3,071,606	54,543,614	11,919,557	-- ^e	264,691,108
Year 3	49,046,469	38,872,115	78,322,179	27,512,532	2,955,291	59,406,360	9,075,745	-- ^e	265,190,691
Year 4	14,754,643	11,767,133	89,728,119	14,646,580	18,077,486	37,848,719	2,758,874	-- ^e	189,581,554
Year 5	-- ^b	-- ^b	91,221,349	13,907,376	-- ^b	36,003,600	-- ^b	-- ^e	141,132,325
Year 6	-- ^b	-- ^b	71,507,223	18,282,996	-- ^b	-- ^c	-- ^b	-- ^e	89,790,219
Year 7	-- ^b	-- ^b	56,678,076	10,825,783	-- ^b	-- ^c	-- ^b	-- ^e	67,503,859
Year 8	-- ^b	-- ^b	43,847,654	-- ^d	-- ^b	-- ^c	-- ^b	-- ^e	43,847,654
Year 9	-- ^b	-- ^b	34,815,744	-- ^d	-- ^b	-- ^c	-- ^b	5,298,048	40,113,792
Year 10	-- ^b	-- ^b	33,173,078	15,573,197	-- ^b	-- ^c	-- ^b	32,769,828	81,516,103
Year 11	-- ^b	-- ^b	31,788,288	21,289,954	-- ^b	-- ^c	-- ^b	12,961,822	66,040,063
Year 12	-- ^b	-- ^b	27,666,533	14,939,654	-- ^b	-- ^c	-- ^b	20,432,174	63,038,362
Year 13	6,558,000 ^f	6,558,000 ^f	22,848,912	19,239,750	-- ^b	-- ^c	-- ^b	15,350,040	57,438,702
Year 14	5,015,644 ^f	7,493,912 ^f	35,835,901	7,114,410 ^d	-- ^b	-- ^b	-- ^b	14,847,927	50,683,828
Year 15	10,480,581	16,369,217	42,919,436	1,229,465	-- ^b	-- ^b	-- ^b	11,690,935	82,689,634
Year 16	12,413,511	15,023,291	39,011,613	3,134,678	-- ^b	-- ^b	-- ^b	10,009,526	79,592,619
Year 17	9,825,777	11,208,367	36,201,751	29,049,386	-- ^b	-- ^b	-- ^b	2,559,146 ^g	86,285,282
Year 18	5,936,644	6,420,745	23,045,222	19,187,740	-- ^b	-- ^b	-- ^b	111,314 ^g	54,590,352
Year 19	4,419,627	10,846,743	28,641,377	28,858,020	-- ^b	-- ^b	-- ^b	473,040 ^g	72,765,768

Total Treated Over Nineteen Years:	2,061,453,180
---	----------------------

Notes:

- a. Based on the yearly average pumping rate and percent operational rate observed during each operational year.
- b. Extraction wells EX-1, EXH-3, EX-6, and EX-9 were deactivated (with EPA approval) on June 26, 1997 coincident with implementation of the remedial action plan.
- c. EX-6 and EX-9 were deactivated (with EPA approval) on November 17, 1998.
- d. EX-5A was shut down between October 9, 2000 and August 9, 2003 as part of an investigation into persistent VOC concentrations near the end of the plume.
- e. EX-10 was installed during Year 8. Pumping was initiated at EX-10 during Year 9.
- f. EX-5A was shut down from January 15, 2007 through November 21, 2009 due to biofouling.
- g. EX-1 and EXH-3 pumping rates are estimated at 25 gpm for Year 13 and from March 2007 through September 2007 during Year 14.
- g. The flow meter for EX-10 was malfunctioning for several months in Years 17, 18 and 19 resulting in low (estimated) cumulative gallons of extracted groundwater.

**NEW HAMPSHIRE BALL BEARINGS, INC.
SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE**

TABLE 15

SUMMARY OF VOCs REMOVED PER YEAR

SUMMARY OF VOCs REMOVED DURING YEAR 1											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 1	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-1	96.9	89	45,328,270	2,362.50	174.35	515.54	45.74	184.58	15.12	3,062.62	235.22
EXH-3	96.9	71	36,160,754	456.84	33.72	91.43	8.11	87.81	7.19	636.07	49.02
EX-4	96.9	177	90,147,233	145.18	10.71	136.91	12.15	52.66	4.31	334.74	27.17
EX-5A	76.5	61	24,527,124	4.30	0.32	11.46	1.02	7.16	0.59	22.92	1.92
EX-6	88	10	4,625,280	0.46	0.03	19.68	1.75	2.20	0.18	22.35	1.96
EX-7	96.9	99	50,421,334	47.12	3.48	91.72	8.14	29.45	2.41	168.30	14.03
EX-9	96.9	27	13,751,272	1.03	0.08	35.34	3.14	3.10	0.25	39.47	3.47
Totals:				3,017.43	222.69	902.09	80.04	366.96	30.05	4,286.48	332.79

SUMMARY OF VOCs REMOVED DURING YEAR 2											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 2	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-1	98.6	90	46,641,744	1,148.15	84.73	209.39	18.58	72.00	5.90	1,429.54	109.21
EXH-3	98.6	75	38,868,120	19.78	1.46	11.35	1.01	19.46	1.59	50.60	4.06
EX-4	98.6	152	78,772,723	5.92	0.44	4.60	0.41	1.97	0.16	12.49	1.01
EX-5A	97.9	60	30,873,744	1.03	0.08	4.64	0.41	2.06	0.17	7.73	0.66
EX-6	97.4	6	3,071,606	0.03	0.00	1.18	0.10	0.08	0.01	1.28	0.11
EX-7	97.9	106	54,543,614	1.37	0.10	3.19	0.28	1.82	0.15	6.37	0.53
EX-9	98.6	23	11,919,557	1.49	0.11	38.79	3.44	1.99	0.16	42.27	3.71
Totals:				1,177.76	86.92	273.14	24.24	99.38	8.14	1,550.28	119.29

SUMMARY OF VOCs REMOVED DURING YEAR 3											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 3	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-1	96.4	96.8	49,046,469	982.24	72.49	155.52	13.80	53.20	4.36	1190.97	90.65
EXH-3	95.8	77.2	38,872,115	6.16	0.45	8.11	0.72	11.68	0.96	25.95	2.13
EX-4	95.4	156.2	78,322,179	1.96	0.14	1.31	0.12	0.00	0.00	3.27	0.26
EX-5A	95	55.1	27,512,532	0.92	0.07	2.75	0.24	1.38	0.11	5.05	0.43
EX-6	95.3	5.9	2,955,291	0.00	0.00	0.25	0.02	0.05	0.00	0.30	0.03
EX-7	95.3	118.6	59,406,360	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
EX-9	95.4	18.1	9,075,745	1.36	0.10	17.42	1.55	1.36	0.11	20.14	1.76
Totals:				992.65	73.26	185.36	16.45	67.67	5.54	1,245.68	95.25

TABLE CONTINUES

NEW HAMPSHIRE BALL BEARINGS, INC.
SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE

TABLE 15

SUMMARY OF VOCs REMOVED PER YEAR

SUMMARY OF VOCs REMOVED DURING YEAR 4											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 4	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-1	29.0 ⁴	96.8 ⁴	14,754,643	270.86	19.99	38.17	3.39	0.00	0.00	309.03	23.38
EXH-3	29.0 ⁴	77.2 ⁴	11,767,133	1.47	0.11	3.73	0.33	1.02	0.08	6.22	0.52
EX-4	95.8	178.2	89,728,119	1.50	0.11	1.50	0.13	0.75	0.06	3.74	0.30
EX-5A	68.3	40.8	14,646,580	0.49	0.04	0.86	0.08	0.61	0.05	1.96	0.16
EX-6	29.0 ⁴	118.6 ⁴	18,077,486	2.87	0.21	1.66	0.15	0.21	0.02	4.74	0.38
EX-7	91.5	78.7	37,848,719	0.32	0.02	0.32	0.03	0.32	0.03	0.95	0.08
EX-9	29.0 ⁴	18.1 ⁴	2,758,874	0.69	0.05	4.83	0.43	0.08	0.01	5.60	0.49
			Totals:	278.20	20.53	51.06	4.53	2.98	0.24	332.24	25.31

SUMMARY OF VOCs REMOVED DURING YEAR 5											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 5	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-4	96.1	180.6	91,221,349	30.45	2.25	83.73	7.43	22.84	1.87	137.02	11.55
EX-5A	94.5	28	13,907,376	0.72	0.05	0.75	0.07	0.57	0.05	2.04	0.17
EX-7	68.5 ⁴	100	36,003,600	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
			Totals:	31.17	2.30	84.49	7.50	23.40	1.92	139.06	11.71

SUMMARY OF VOCs REMOVED DURING YEAR 6											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 6	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-4	85.7	158.75	71,507,223	45.35	3.35	33.41	2.96	19.69	1.61	98.45	7.92
EX-5A	77.3	45	18,282,996	0.92	0.07	0.76	0.07	0.61	0.05	2.29	0.19
			Totals:	46.26	3.41	34.18	3.03	20.30	1.66	100.74	8.11

TABLE CONTINUES

NEW HAMPSHIRE BALL BEARINGS, INC.
SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE

TABLE 15

SUMMARY OF VOCs REMOVED PER YEAR

SUMMARY OF VOCs REMOVED DURING YEAR 7											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 7	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-4	91	118.5	56,678,076	99.32	7.33	41.62	3.69	33.58	2.75	174.52	13.77
EX-5A	43 ⁴	47.9	10,825,783	0.36	0.03	0.18	0.02	0.27	0.02	0.81	0.06
Totals:				99.68	7.36	41.80	3.71	33.85	2.77	175.33	13.84

SUMMARY OF VOCs REMOVED DURING YEAR 8											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 8	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-4	96	86.9	43,847,654	69.52	5.13	43.91	3.90	19.76	1.62	133.00	10.6
Totals:				69.52	5.13	43.91	3.90	19.76	1.62	133.00	10.60

SUMMARY OF VOCs REMOVED DURING YEAR 9											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 9	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-4	96	69	34,815,744	31.96	2.36	19.17	1.70	7.26	0.59	58.39	4.65
EX-10	36	28	5,298,048	5.31	0.39	2.25	0.20	1.19	0.10	8.75	0.69
Totals:				37.27	2.75	21.42	1.90	8.45	0.69	67.14	5.34

TABLE CONTINUES

NEW HAMPSHIRE BALL BEARINGS, INC.
SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE

TABLE 15

SUMMARY OF VOCs REMOVED PER YEAR

SUMMARY OF VOCs REMOVED DURING YEAR 10											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 10	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-4	98	66	33,173,078	45.39	3.35	36.88	3.27	13.62	1.12	95.88	7.74
EX-5A	96	32	15,573,197	23.53	1.74	17.99	1.60	6.37	0.52	47.89	3.85
EX-10	98	65	32,769,828	0.81	0.06	0.54	0.05	1.08	0.09	2.44	0.20
Totals:				69.73	5.15	55.41	4.92	21.07	1.73	146.21	11.79

SUMMARY OF VOCs REMOVED DURING YEAR 11											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 11	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-4	90	67.2	31,788,288	87.54	6.46	23.88	2.12	13.79	1.13	125.22	9.71
EX-5A	86	47.1	21,289,954	0.14	0.01	0.07	0.01	0.18	0.01	0.39	0.03
EX-10	91	27.1	12,961,822	14.06	1.04	0.97	0.09	2.81	0.23	17.85	1.35
Totals:				101.75	7.51	24.92	2.21	16.79	1.37	143.45	11.10

SUMMARY OF VOCs REMOVED DURING YEAR 12 ^a											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 12	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-4	93	56.6	27,666,533	106.21	7.84	23.09	2.05	13.85	1.13	143.15	11.02
EX-5A	68	41.8	14,939,654	0.25	0.02	0.11	0.01	0.25	0.02	0.61	0.05
EX-10	93	26.1	12,757,889	59.62	4.40	12.78	1.13	7.35	0.60	79.75	6.14
Totals:				166.08	12.26	35.98	3.19	21.45	1.76	223.51	17.21

TABLE CONTINUES

**NEW HAMPSHIRE BALL BEARINGS, INC.
SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE**

TABLE 15

SUMMARY OF VOCs REMOVED PER YEAR

SUMMARY OF VOCs REMOVED DURING YEAR 13											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 13	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-1 ⁴	50	25	6,558,000	27.36	2.02	27.36	2.43	27.36	2.24	82.09	6.69
EXH-3 ⁴	50	25	6,558,000	27.36	2.02	27.36	2.43	27.36	2.24	82.09	6.69
EX-4	96	45.4	22,848,912	43.85	3.24	15.06	1.34	5.34	0.44	64.26	5.01
EX-5A	86	42.5	19,239,750	0.48	0.04	0.16	0.01	0.64	0.05	1.28	0.10
EX-10	96	30.5	15,350,040	46.11	3.40	5.51	0.49	7.94	0.65	59.56	4.54
			Totals:	145.18	10.71	75.46	6.70	68.65	5.62	289.29	23.03

SUMMARY OF VOCs REMOVED DURING YEAR 14											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 14	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-1	48	18.5	5,015,644	167.42	12.36	12.56	1.11	8.37	0.69	188.35	14.16
EXH-3	60	24.2	7,493,912	250.15	18.46	18.76	1.66	12.51	1.02	281.41	21.15
EX-4	74	100.4	35,835,901	68.78	5.08	23.62	2.10	8.37	0.69	100.78	7.86
EX-5A	61	18.8	7,114,410	0.18	0.01	0.06	0.01	0.24	0.02	0.47	0.04
EX-10	66	40.3	14,847,927	44.61	3.29	5.33	0.47	7.68	0.63	57.62	4.39
			Totals:	531.13	39.20	60.33	5.35	37.17	3.04	628.63	47.60

SUMMARY OF VOCs REMOVED DURING YEAR 15											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 15	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-1 ⁴	93	21.4	10,480,581	290.37	21.43	26.68	2.37	15.22	1.25	332.26	25.04
EXH-3	94	33.1	16,369,217	487.66	35.99	39.61	3.51	22.13	1.81	549.41	41.32
EX-4	89	92.0	42,919,436	22.03	1.63	22.03	1.95	3.15	0.26	47.21	3.84
EX-5A ⁵	30	7.8	1,229,465	0.04	0.00	0.01	0.00	0.01	0.00	0.06	0.00
EX-10	88	25.2	11,690,935	25.46	1.88	2.71	0.24	1.88	0.15	30.06	2.27
			Totals:	825.56	60.93	91.04	8.08	42.39	3.47	959.00	72.47

TABLE CONTINUES

**NEW HAMPSHIRE BALL BEARINGS, INC.
SOUTH MUNICIPAL WATER SUPPLY WELL SUPERFUND SITE**

TABLE 15

SUMMARY OF VOCs REMOVED PER YEAR

SUMMARY OF VOCs REMOVED DURING YEAR 16											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 16	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-1	95	24.9	12,413,511	333.56	24.62	30.97	2.75	21.44	1.76	385.98	29.12
EXH-3	95	30.1	15,023,291	97.04	7.16	12.16	1.08	9.78	0.80	118.98	9.04
EX-4	92	80.7	39,011,613	10.74	0.79	6.19	0.55	1.63	0.13	18.56	1.48
EX-5A	12	49.7	3,134,678	0.13	0.01	0.03	0.00	0.08	0.01	0.24	0.02
EX-10	92	20.7	10,009,526	22.72	1.68	1.67	0.15	1.42	0.12	25.81	1.94
Totals:				464.19	34.26	51.02	4.53	34.35	2.81	549.56	41.60

SUMMARY OF VOCs REMOVED DURING YEAR 17											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 17	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-1	95	21.4	10,688,984	161.45	11.92	19.80	1.76	12.13	0.99	193.38	14.67
EXH-3	95	24.1	12,032,923	50.51	3.73	10.34	0.92	7.11	0.58	67.96	5.23
EX-4	92	78.4	37,934,402	5.92	0.44	9.18	0.81	1.74	0.14	16.84	1.39
EX-5A	12	55.2	3,482,110	0.03	0.00	0.01	0.00	0.04	0.00	0.08	0.01
EX-10	92	8.9	4,298,253	3.69	0.27	0.37	0.03	0.33	0.03	4.39	0.33
Totals:				221.61	16.35	39.71	3.52	21.35	1.75	282.66	21.63

SUMMARY OF VOCs REMOVED DURING YEAR 18											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 18	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-1	66	17.1	5,936,644	8.03	0.59	0.29	0.03	0.44	0.04	8.75	0.65
EXH-3	50	24.4	6,420,745	294.16	21.71	0.73	0.06	0.44	0.04	295.33	21.81
EX-4	51	86.0	23,045,222	8.69	0.64	12.35	1.10	0.85	0.07	21.89	1.81
EX-5A	51	71.6	19,187,740	0.45	0.03	0.14	0.01	0.38	0.03	0.98	0.08
EX-10	51	0.4	111,314	0.04	0.00	0.05	0.00	0.00	0.00	0.09	0.01
Totals:				311.37	22.98	13.56	1.20	2.11	0.17	327.04	24.36

SUMMARY OF VOCs REMOVED DURING YEAR 19											
Extraction Well	Percent Operational ¹	Average Pumping Rate (gpm) ¹	Adjusted Total Pumped (Gallons) ²	Calculated PCE Removed ³		Calculated 1,1,1-TCA Removed ³		Calculated TCE Removed ³		TOTAL VOCs REMOVED DURING YEAR 19	
				Pounds	Gallons	Pounds	Gallons	Pounds	Gallons	Pounds	Gallons
EX-1	82	10.3	4,419,627	42.78	3.16	6.32	0.56	1.38	0.11	50.47	3.83
EXH-3	84	24.6	10,846,743	62.17	4.59	6.00	0.53	44.13	3.61	112.30	8.73
EX-4	85	64.1	28,641,377	8.52	0.63	8.86	0.79	1.21	0.10	18.59	1.51
EX-5A	89	61.7	28,858,020	0.27	0.02	0.00	0.00	0.19	0.02	0.45	0.03
EX-10	90	1.0	473,040	0.22	0.02	0.03	0.00	0.01	0.00	0.26	0.02
Totals:				113.95	8.41	21.21	1.88	46.92	3.84	182.08	14.13

Total 19 Years	11,761	907
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APPENDIX C
COMMUNITY NOTIFICATION



Newsroom

News Releases from Region 1

EPA Conducts “Five-Year Review” for 16 New England Superfund Sites

Release Date: 05/09/2013

Contact Information: David Deegan, (617) 918-1017 

(Boston, Mass. – May 9, 2013) – EPA is beginning the process of routine Five-Year Reviews of 16 Superfund sites across New England.

EPA conducts evaluations every five years on previously-completed clean up and remediation work performed at sites listed on the “National Priorities List” (aka Superfund sites) to determine whether the implemented remedies at the sites continue to be protective of human health and the environment. Further, five year review evaluations identify any deficiencies to the previous work and, if called for, recommend action(s) necessary to address them.

In addition to a careful evaluation of technical work at the sites, during the Five Year Review process EPA also provides the public with an opportunity to evaluate preliminary findings and to provide input on potential follow up activity that may be required following the review process.

The Superfund sites at which EPA is performing Five Year Reviews over the following several months include the following sites. Please note, the Web link provided after each site provides detailed information on site status and past assessment and cleanup activity.

Massachusetts

Iron Horse Park, North Billerica <http://www.epa.gov/region1/superfund/sites/ironhorse>

Nyanza Chemical Waste Dump, Ashland <http://www.epa.gov/region1/superfund/sites/nyanza>

Re-Solve, Inc., North Dartmouth <http://www.epa.gov/region1/superfund/sites/resolve>

Sullivan’s Ledge, New Bedford <http://www.epa.gov/region1/superfund/sites/sullivansledge>

Maine

McKin Co., Gray <http://www.epa.gov/region1/superfund/sites/mckin>

Saco Tannery Waste Pits, Saco <http://www.epa.gov/region1/superfund/sites/sacotannery>

West Site/Howe’s Corner, Plymouth <http://www.epa.gov/region1/superfund/sites/howe>

New Hampshire

Kearsarge Metallurgical Corp., Conway <http://www.epa.gov/region1/superfund/sites/kearsarge>

Ottati & Goss, Kingston <http://www.epa.gov/region1/superfund/sites/o&q>

South Municipal Water Supply Well, Peterborough <http://www.epa.gov/region1/superfund/sites/southmuni>

Tinkham Garage, Londonderry <http://www.epa.gov/region1/superfund/sites/tinkham>

Town Garage/Radio Beacon, Londonderry <http://www.epa.gov/region1/superfund/sites/towngarage>

Rhode Island

Central Landfill, Johnston <http://www.epa.gov/region1/superfund/sites/central>

Picillo Farm, Coventry <http://www.epa.gov/region1/superfund/sites/picillo>

Vermont

Elizabeth Mine, Strafford <http://www.epa.gov/region1/superfund/sites/elizmine>

Old Springfield Landfill, Springfield <http://www.epa.gov/region1/superfund/sites/oldspringfield>

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Learn More about the [Latest EPA News & Events in New England](http://www.epa.gov/region1/newsevents/index.html) (<http://www.epa.gov/region1/newsevents/index.html>)

Follow [EPA New England on Twitter](http://twitter.com/epanewengland) (<http://twitter.com/epanewengland>)

More info on [EPA's Environmental Results in New England](http://www.epa.gov/region1/results/index.html) (<http://www.epa.gov/region1/results/index.html>)

Last updated on Friday, May 10, 2013

<http://yosemite.epa.gov/opa/admpress.nsf/6d651d23f5a91b768525735900400c28/c>

APPENDIX D
DOCUMENT REVIEW LIST/REFERENCES

DOCUMENT REVIEW LIST/REFERENCES

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- EPA, 1989. *Record of Decision*, September 27, 1989.
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- Hull, 2012. *Source Area Pre-Design Investigation Work Plan, Revision 1*, March 30, 2012.
- Hull, 2012. *Annual Groundwater Monitoring Report – Year 18*, December, 2012.
- Hull, 2013. *Annual Groundwater Monitoring Report – Year 19*, 2013.
- Hull, 2013. *Analytical Results of January 2013 Sub-slab and Indoor Air Sampling*, March 8, 2013.
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APPENDIX E
SITE INSPECTION CHECKLIST

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)				
1.	O&M Documents O&M manual As-built drawings Maintenance logs Remarks _____	Readily available Readily available Readily available	Up to date Up to date Up to date	N/A N/A N/A
2.	Site-Specific Health and Safety Plan Contingency plan/emergency response plan Remarks _____	Readily available Readily available	Up to date Up to date	N/A N/A
3.	O&M and OSHA Training Records Remarks _____	Readily available	Up to date	N/A
4.	Permits and Service Agreements Air discharge permit Effluent discharge Waste disposal, POTW Other permits _____ Remarks _____	Readily available Readily available Readily available Readily available	Up to date Up to date Up to date Up to date	N/A N/A N/A N/A
5.	Gas Generation Records Remarks _____	Readily available	Up to date	N/A
6.	Settlement Monument Records Remarks _____	Readily available	Up to date	N/A
7.	Groundwater Monitoring Records Remarks _____	Readily available	Up to date	N/A
8.	Leachate Extraction Records Remarks _____	Readily available	Up to date	N/A
9.	Discharge Compliance Records Air Water (effluent) Remarks _____	Readily available Readily available	Up to date Up to date	N/A N/A
10.	Daily Access/Security Logs Remarks _____	Readily available	Up to date	N/A

IV. O&M COSTS				
1.	O&M Organization			
	State in-house			Contractor for State
	PRP in-house			Contractor for PRP
	Federal Facility in-house			Contractor for Federal Facility
	Other _____			
2.	O&M Cost Records			
	Readily available	Up to date		
	Funding mechanism/agreement in place _____			
	Original O&M cost estimate _____			Breakdown attached
	Total annual cost by year for review period if available			
	From _____	To _____	_____	Breakdown attached
	Date	Date	Total cost	
	From _____	To _____	_____	Breakdown attached
	Date	Date	Total cost	
	From _____	To _____	_____	Breakdown attached
	Date	Date	Total cost	
	From _____	To _____	_____	Breakdown attached
	Date	Date	Total cost	
3.	Unanticipated or Unusually High O&M Costs During Review Period			
	Describe costs and reasons: _____			

V. ACCESS AND INSTITUTIONAL CONTROLS				
			Applicable	N/A
A. Fencing				
1.	Fencing damaged	Location shown on site map	Gates secured	N/A
	Remarks _____			

B. Other Access Restrictions				
1.	Signs and other security measures	Location shown on site map		N/A
	Remarks _____			

C. Institutional Controls (ICs)				
1.	Implementation and enforcement			
	Site conditions imply ICs not properly implemented	Yes	<u>No</u>	N/A
	Site conditions imply ICs not being fully enforced	Yes	<u>No</u>	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
	Reports are verified by the lead agency		Yes	No
	Specific requirements in deed or decision documents have been met		Yes	No
	Violations have been reported		Yes	No
	Other problems or suggestions: Report attached			

2.	Adequacy	<u>ICs are adequate</u>	ICs are inadequate	N/A
	Remarks _____			

D. General				
1.	Vandalism/trespassing	Location shown on site map	<u>No vandalism evident</u>	
	Remarks _____			

2.	Land use changes on site	<u>N/A</u>		
	Remarks _____			

3.	Land use changes off site	<u>N/A</u>		
	Remarks _____			

VI. GENERAL SITE CONDITIONS				
A. Roads	Applicable	<u>N/A</u>		
1.	Roads damaged	Location shown on site map	Roads adequate	N/A
	Remarks _____			

B. Other Site Conditions			
Remarks _____ _____ _____ _____			
VII. LANDFILL COVERS		Applicable	N/A
A. Landfill Surface			
1.	Settlement (Low spots) Areal extent _____ Remarks _____	Location shown on site map Depth _____	Settlement not evident
2.	Cracks Lengths _____ Remarks _____	Widths _____ Depths _____	Cracking not evident
3.	Erosion Areal extent _____ Remarks _____	Location shown on site map Depth _____	Erosion not evident
4.	Holes Areal extent _____ Remarks _____	Location shown on site map Depth _____	Holes not evident
5.	Vegetative Cover Trees/Shrubs (indicate size and locations on a diagram) Remarks _____	Grass _____ Cover properly established	No signs of stress
6.	Alternative Cover (armored rock, concrete, etc.) Remarks _____		N/A
7.	Bulges Areal extent _____ Remarks _____	Location shown on site map Height _____	Bulges not evident

8.	Wet Areas/Water Damage		Wet areas/water damage not evident	
	Wet areas		Location shown on site map	Areal extent _____
	Ponding		Location shown on site map	Areal extent _____
	Seeps		Location shown on site map	Areal extent _____
	Soft subgrade		Location shown on site map	Areal extent _____
	Remarks _____			
9.	Slope Instability	Slides	Location shown on site map	No evidence of slope instability
	Areal extent _____			
	Remarks _____			
B. Benches	Applicable	N/A		
(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)				
1.	Flows Bypass Bench		Location shown on site map	N/A or okay
	Remarks _____			
2.	Bench Breached		Location shown on site map	N/A or okay
	Remarks _____			
3.	Bench Overtopped		Location shown on site map	N/A or okay
	Remarks _____			
C. Letdown Channels	Applicable	N/A		
(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)				
1.	Settlement		Location shown on site map	No evidence of settlement
	Areal extent _____		Depth _____	
	Remarks _____			
2.	Material Degradation		Location shown on site map	No evidence of degradation
	Material type _____		Areal extent _____	
	Remarks _____			
3.	Erosion		Location shown on site map	No evidence of erosion
	Areal extent _____		Depth _____	
	Remarks _____			

4.	Undercutting	Location shown on site map	No evidence of undercutting
	Areal extent _____	Depth _____	
	Remarks _____		
5.	Obstructions	Type _____	No obstructions
	Location shown on site map	Areal extent _____	
	Size _____		
	Remarks _____		
6.	Excessive Vegetative Growth	Type _____	
	No evidence of excessive growth		
	Vegetation in channels does not obstruct flow		
	Location shown on site map	Areal extent _____	
	Remarks _____		
D. Cover Penetrations			
	Applicable	N/A	
1.	Gas Vents	Active	Passive
	Properly secured/locked	Functioning	Routinely sampled
	Evidence of leakage at penetration		Good condition
	N/A		Needs Maintenance
	Remarks _____		
2.	Gas Monitoring Probes	Active	Passive
	Properly secured/locked	Functioning	Routinely sampled
	Evidence of leakage at penetration		Good condition
			Needs Maintenance
			N/A
	Remarks _____		
3.	Monitoring Wells (within surface area of landfill)		
	Properly secured/locked	Functioning	Routinely sampled
	Evidence of leakage at penetration		Good condition
			Needs Maintenance
			N/A
	Remarks _____		
4.	Leachate Extraction Wells		
	Properly secured/locked	Functioning	Routinely sampled
	Evidence of leakage at penetration		Good condition
			Needs Maintenance
			N/A
	Remarks _____		
5.	Settlement Monuments	Located	Routinely surveyed
			N/A
	Remarks _____		

E. Gas Collection and Treatment		Applicable	N/A
1.	Gas Treatment Facilities Flaring Good condition Remarks _____	Thermal destruction Needs Maintenance	Collection for reuse
2.	Gas Collection Wells, Manifolds and Piping Good condition Remarks _____	Needs Maintenance	
3.	Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings) Good condition Remarks _____	Needs Maintenance	N/A
F. Cover Drainage Layer		Applicable	N/A
1.	Outlet Pipes Inspected Remarks _____	Functioning	N/A
2.	Outlet Rock Inspected Remarks _____	Functioning	N/A
G. Detention/Sedimentation Ponds		Applicable	N/A
1.	Siltation Areal extent _____ Depth _____ Siltation not evident Remarks _____		N/A
2.	Erosion Areal extent _____ Depth _____ Erosion not evident Remarks _____		
3.	Outlet Works Remarks _____	Functioning	N/A
4.	Dam Remarks _____	Functioning	N/A

H. Retaining Walls		Applicable	N/A
1.	Deformations Horizontal displacement _____ Rotational displacement _____ Remarks _____	Location shown on site map	Deformation not evident Vertical displacement _____
2.	Degradation Remarks _____	Location shown on site map	Degradation not evident
I. Perimeter Ditches/Off-Site Discharge		Applicable	N/A
1.	Siltation Areal extent _____ Remarks _____	Location shown on site map	Siltation not evident Depth _____
2.	Vegetative Growth Vegetation does not impede flow Areal extent _____ Remarks _____	Location shown on site map	N/A Type _____
3.	Erosion Areal extent _____ Remarks _____	Location shown on site map	Erosion not evident Depth _____
4.	Discharge Structure Remarks _____	Functioning	N/A
VIII. VERTICAL BARRIER WALLS		Applicable	N/A
1.	Settlement Areal extent _____ Remarks _____	Location shown on site map	Settlement not evident Depth _____
2.	Performance Monitoring Performance not monitored Frequency _____ Head differential _____ Remarks _____	Type of monitoring _____	Evidence of breaching

IX. GROUNDWATER/SURFACE WATER REMEDIES		Applicable	N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines		Applicable	N/A
1.	Pumps, Wellhead Plumbing, and Electrical Good condition	All required wells properly operating	Needs Maintenance N/A
Remarks _____			
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances Good condition	Needs Maintenance	
Remarks _____			
3.	Spare Parts and Equipment Readily available	Good condition	Requires upgrade Needs to be provided
Remarks _____			
B. Surface Water Collection Structures, Pumps, and Pipelines		Applicable	N/A
1.	Collection Structures, Pumps, and Electrical Good condition	Needs Maintenance	
Remarks _____			
2.	Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances Good condition	Needs Maintenance	
Remarks _____			
3.	Spare Parts and Equipment Readily available	Good condition	Requires upgrade Needs to be provided
Remarks _____			

C. Treatment System		Applicable	N/A
1.	Treatment Train (Check components that apply) Metals removal Air stripping Filters Additive (e.g., chelation agent, flocculent) Others Good condition Sampling ports properly marked and functional Sampling/maintenance log displayed and up to date Equipment properly identified Quantity of groundwater treated annually <u>YR IS 54 million Gallons</u> Quantity of surface water treated annually _____ Remarks _____	Oil/water separation Carbon adsorbers	Bioremediation
2.	Electrical Enclosures and Panels (properly rated and functional) N/A Remarks _____	Good condition	Needs Maintenance
3.	Tanks, Vaults, Storage Vessels N/A Remarks _____	Good condition	Proper secondary containment Needs Maintenance
4.	Discharge Structure and Appurtenances N/A Remarks _____	Good condition	Needs Maintenance
5.	Treatment Building(s) N/A Chemicals and equipment properly stored Remarks _____	Good condition (esp. roof and doorways)	Needs repair
6.	Monitoring Wells (pump and treatment remedy) Properly secured/locked All required wells located Remarks _____	Functioning Needs Maintenance	Routinely sampled Good condition N/A
D. Monitoring Data			
1.	Monitoring Data Is routinely submitted on time Is of acceptable quality		
2.	Monitoring data suggests: Groundwater plume is effectively contained	Contaminant concentrations are declining	

Plume is stable, containment of plume is maintained as long as all operable extraction wells are on line (EX-4, EX-10, EX-18, EX-3)

D. Monitored Natural Attenuation			
1.	Monitoring Wells (natural attenuation remedy)		
	Properly secured/locked	Functioning	Routinely sampled
	All required wells located	Needs Maintenance	Good condition
	Remarks _____		N/A
X. OTHER REMEDIES			
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.			
XI. OVERALL OBSERVATIONS			
A. Implementation of the Remedy			
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).			

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.			

C. Early Indicators of Potential Remedy Problems
<p>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.</p> <hr/>
D. Opportunities for Optimization
<p>Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.</p> <hr/>

APPENDIX F
INTERVIEW RECORDS

INTERVIEW RECORD

Site Name: South Municipal Water Supply Well	EPA ID No.: NHD980671069
Subject: Fourth Five-Year Review	Time: 1400 Date: 8/22/13
Type: <input type="checkbox"/> Telephone <input checked="" type="checkbox"/> Visit <input type="checkbox"/> Other Location of Visit: Peterborough, NH	<input type="checkbox"/> Incoming <input type="checkbox"/> Outgoing

CONTACT MADE BY

Name(s): Kevin Heine & Kenneth Richards	Title(s): Project Managers	Organization(s): U.S. EPA, Region 1 & NHDES, Waste Mgmt. Division
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INDIVIDUAL CONTACTED:

Name: Rodney Bartlett	Title: Public Works Director	Organization: Town of Peterborough
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Street Address: 1 Grove St.
City, State, Zip: Peterborough, NH 03458

SUMMARY OF CONVERSATION

- 1) What is your overall impression of the project?

Compared to previous five year review periods, significant movement forward has been made to capture, treat, and remove contamination from the Site and a plan exists to continue this progress.

- 2) Have there been routine communications or activities (site visits, inspection, reporting activities, etc.) conducted by the town regarding the Site?

Nothing onsite. However, routine conversations With Chris Rawnsley and NHBB's consultant, Hull, regarding activities at NHBB and the Scott Mitchell Landfill occur regularly.

- 3) Have there been any complaints, violations, or other incidents related to the Site requiring a response by the town?

None from the Department of Public Works.

- 4) Do you feel well informed about the Site's activities and progress?

Yes. Updates provided by the agencies are sufficient.

- 5) Do you have any comments, suggestions, or recommendations regarding the Site's management or operation?

Management of the Site is good. If questions arise, NHBB and Hull are readily available.

INTERVIEW RECORD

Site Name: South Municipal Water Supply Well	EPA ID No.: NHD980671069
Subject: Fourth Five-Year Review	Time: 1315 Date: 8/22/13
Type: <input type="checkbox"/> Telephone <input checked="" type="checkbox"/> Visit <input type="checkbox"/> Other Location of Visit: Peterborough, NH	<input type="checkbox"/> Incoming <input type="checkbox"/> Outgoing

CONTACT MADE BY

Name(s): Kevin Heine & Kenneth Richards	Title(s): Project Managers	Organization(s): U.S. EPA, Region 1 & NHDES, Waste Mgmt. Division
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INDIVIDUAL CONTACTED:

Name: David Weir	Title: Resident	Organization: none
		Street Address: 335 Old Jaffrey Rd City, State, Zip: Peterborough, NH 03458

SUMMARY OF CONVERSATION

- 1) What is your overall impression of the project?

Delighted to have a more serious approach implemented to solve the current issues.

- 2) What effects have Site operations had on the surrounding community?

Past effects have included noise issues. Neighbors surrounding the Site would not want the reintroduction of any noise issues into the surrounding community. The community remains disappointed the South Municipal Water Supply Well cannot be fully utilized as a town resource.

- 3) Are you aware of any community concerns regarding the Site or its operation and administration?

No.

- 4) Do you feel well informed of the about the Site's activities and progress?

Yes. The EPA and NHDES team is very communicative and reachable.

- 5) Do you have any comments, suggestions, or recommendation regarding the Site's management or operation?

Continue to follow the deed restrictions regarding the wooded, undeveloped property (known as the Morrison Trust Property) that was sold to NHBB and is located north of the NHBB manufacturing plant and parking lots. Maintain entry to the Site from U.S. Route 202, not Old Jaffrey Road. NHBB management, including Chris Rawnsley, is very well respected.