Five-Year Review Report

Fourth Five-Year Review Report

for

Auburn Road Landfill Superfund Site

Town of Londonderry

Rockingham County, New Hampshire

September, 2007

PREPARED BY:

The United States Environmental Protection Agency
Region I New England
Boston, Massachusetts

Approved by:

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

Date: 9-28-07

Five-Year Review Report

Table of Contents

Figures

Tables

Appendices

List of Acronyms

ARAR	Applicable or Relevant and Appropriate Requirement
AROD	Amended Record of Decision
ARPPG	Auburn Road Performing Parties Group
CAMU	Corrective Action Management Unit
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
EPA	United States Environmental Protection Agency
CFR	Code of Federal Regulations
ESD	Explanation of Significant Differences
GMZ	Groundwater Management Zone
LTEMP	Long-Term Environmental Monitoring Program
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
NCP	National Contingency Plan
NHDES	New Hampshire Department of Environmental Services
NPL	National Priorities List
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PCBs	Polychlorinated biphenyls
PRP	Potentially Responsible Party
PSD	Performing Settling Defendant
RA	Remedial Action
RAO	Remedial Action Objective
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SDWA	Safe Drinking Water Act
VOC	Volatile Organic Compound
WasteLAN	The most current version of CERCLIS, the database that houses all Superfund site information. Also referred to as "CERCLIS 3."
WESTON	Weston Solutions, Inc.

Executive Summary

The remedy for the Auburn Road Landfill Superfund Site (the Site) in Londonderry, New Hampshire, as documented in the various decision documents, included installing a public water supply line, capping of three waste disposal areas, establishing institutional controls, and performing monitored natural attenuation on contaminated groundwater. The Site achieved construction completion with signing of the Preliminary Close-Out Report on 3 April 1998. The trigger for this Five-Year Review was the actual start of construction of the water line in April 1987.

The assessment of this Five-Year Review found that the potentially responsible parties constructed the remedy in accordance with the requirements of the 1986, 1989 and 1996 Records of Decision. Within this Five-Year Review, the EPA found that the remedy associated with the water supply line was protective of human health. The EPA found that capping of the three disposal areas to prevent direct contact with wastes and reduce flushing of contaminants through the landfill wastes is also protective of human health and the environment. The EPA determined that the groundwater remedy, monitored natural attenuation, was protective of human health and the environment in the short-term because no current risks are present at the Site in either groundwater, surface water and/or sediments. However, the EPA believes that for the groundwater remedy to be protective in the long-term and to achieve the new Maximum Contaminant Level (MCL) for arsenic of 10 parts per billion, groundwater institutional controls must be established and enforced throughout the groundwater plume on-Site and off-Site. Additionally, the long-term monitoring program needs to be modified to better assess water levels and geochemical conditions in the aquifer, previous modeling efforts need to be updated to determine a more accurate estimate of cleanup times, and the potential vapor intrusion pathway must be evaluated.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name *(from WasteLAN)*: Auburn Road Landfill		
EPA ID *(from WasteLAN)*: NHD980524086		
Region: I	**State:** NH	**City/County:** Town of Londonderry/Rockingham County
SITE STATUS		
NPL status: ☑ Final ☐ Deleted ☐ Other (specify)		
Remediation status (choose all that apply): ☐ Under Construction ☑ Operating ☑ Complete		
Multiple OUs?* ☑ YES (3) ☐ NO	**Construction completion date:** 4/3/1998	
Has site been put into reuse? ☐ YES ☑NO		
REVIEW STATUS		
Lead agency: ☑ EPA ☐ State ☐ Tribe ☐ Other Federal Agency _____		
Author name: Mr. Byron Mah		
Author title: Remedial Project Manager	**Author affiliation:** U.S. EPA Region I	
Review period:** 7/03/2007 to 9/28/2007		
Date(s) of site inspection: 7/31/2007		
Type of review: ☑ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☐ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion		
Review number: ☐ 1 (first) ☐ 2 (second) ☐ 3 (third) ☑ Other (specify) 4 (fourth)		
Triggering action: ☐ Actual RA Onsite Construction at OU #____ ☑ Actual RA Start at OU# 1 (water-line installation) ☐ Construction Completion ☐ Previous Five-Year Review Report ☐ Other (specify)		
Triggering action date *(from WasteLAN)*: 4/15/1987		
Due date *(five years after triggering action date)*: 9/24/2007		

* ["OU" refers to operable unit.]
** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

The primary contaminant of concern at the Site, arsenic, currently has an interim cleanup level of 50 parts per billion. Recent regulatory changes lowered the MCL for arsenic from 50 to 10 parts per billion. The remedy has not yet attained the 50 ppb interim cleanup level in off-Site groundwater by the 2001 date specified in the 1996 AROD. A preliminary technical assessment indicated that cleanup times at the Site will be greater than anticipated.

As such the following issues were identified in this Five Year Review Report:

1) Timeframe to reach cleanup levels requires updating;
2) Groundwater Institutional Controls are not in-place yet;
3) Potential VOC vapor intrusion pathway requires assessment;
4) Damaged fencing around landfill caps;
5) Assess arsenic-iron hydroxide stability in sediments; and
6) Current arsenic MCL changed from 50 ppb to 10 ppb; trans 1,2-dichloroethylene cleanup level incorrect.

Recommendations and Follow-up Actions:

The following recommendations and follow-up actions were identified in this Five Year Review Report:

1) Update groundwater and solute transport modeling with additional field data and analysis to determine more accurate cleanup times;
2) Obtain approval of revised GMZ Permit from NHDES;
3) Evaluate potential VOC vapor intrusion pathway;
4) Repair fencing and continue maintenance of the landfill caps, fencing, and drainage swales;
5) Follow up on University of Connecticut arsenic study of Cohas Brook sediments; and
6) Prepare ESD for arsenic and trans 1,2-dichloroethylene cleanup level changes.

Protectiveness Statement(s):

All immediate threats at the Site have been addressed.

A public water supply line, implemented as Operable Unit 1 (OU1) in accordance with the 1986 ROD, provides drinking water to residences in the affected area and is protective of human health. The water supply from the Manchester, New Hampshire Water Works was installed in 1987.

The source control remedy, Operable Unit 3 (OU3), which includes the three (3) landfill caps, encapsulates contaminated materials at the Site; thereby preventing direct contact with these materials. The landfill caps also reduce flushing of contaminants from the landfill wastes. Based on observations made during the July 2007 Site inspection, OU3 is protective of human health and the environment since ongoing operation, maintenance and monitoring will ensure that the source control remedy is functioning properly.

The management of migration remedy, Operable Unit 2 (OU2), relies on the three landfill caps to function properly together with abiotic natural attenuation mechanisms to reduce the concentration of contaminants (primarily arsenic) in groundwater. EPA's analysis of Site data and conditions at the Site indicate that the remedy under OU2, monitored natural attenuation, is protective in the short-term because no current risks are present at the Site in either groundwater, surface water or sediment. However, in order to be protective in the long-term, a number of follow-up actions are recommended. These actions include, but are not limited to: installation of replacement monitoring wells; additional geochemical analyses during LTEMP; updated, more accurate groundwater modeling; and implementation of institutional controls.

Long-Term Protectiveness Statement(s):

Overall, the remedial actions at the Site are protective in the short-term, but follow-up actions at OU2 are required in order for all remedial actions to be protective in the long-term.

Five-Year Review Report

I. Introduction

The purpose of a five-year review is to determine whether a remedy at a Superfund site is protective of human health and the environment. The methods, findings, and conclusions of a review are documented in a Five-Year Review report. In addition, Five-Year Review reports identify issues, if any, and recommend action(s) necessary to address them.

This review is required by statute. The U.S. Environmental Protection Agency (EPA)-Region I is preparing this Five-Year Review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA Section 121(c) as amended states:

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

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

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

The EPA Region I has conducted a five-year review of the remedial actions implemented at the Auburn Road Landfill Superfund Site (the Site) in Londonderry, Rockingham County, New Hampshire (Figures 1a and 1b). This review was conducted for the entire Site from September 2002 through September 2007. This report documents the results of the review. Weston Solutions, Inc. (WESTON), under contract as consultants to the Auburn Road Performing Parties Group (ARPPG), has provided technical input and summary analysis of the data evaluated for this Five-Year Review Report.

This is the fourth Five-Year Review Report for the Site. The triggering action for this statutory review is the initiation of the Operable Unit 1 (OU1) remedial action on April 15, 1987, as shown in EPA's WasteLAN database. This five-year review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the Site above levels that allow for unlimited use and unrestricted exposure. Specifically, following construction of the landfill caps, wastes remain on-site and groundwater is currently contaminated.

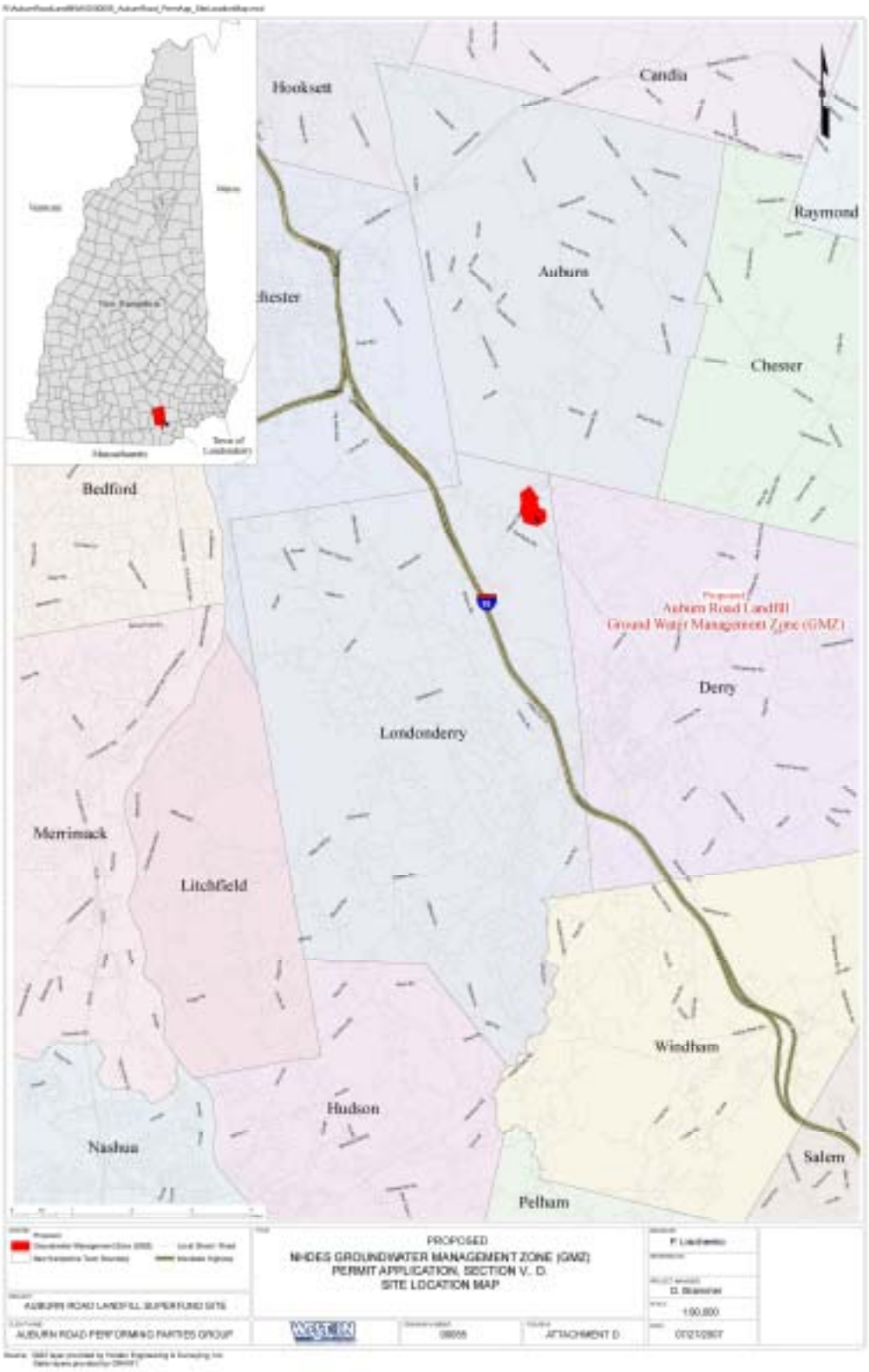

Figure 1a: Site Location Map (with proposed GMZ boundary).

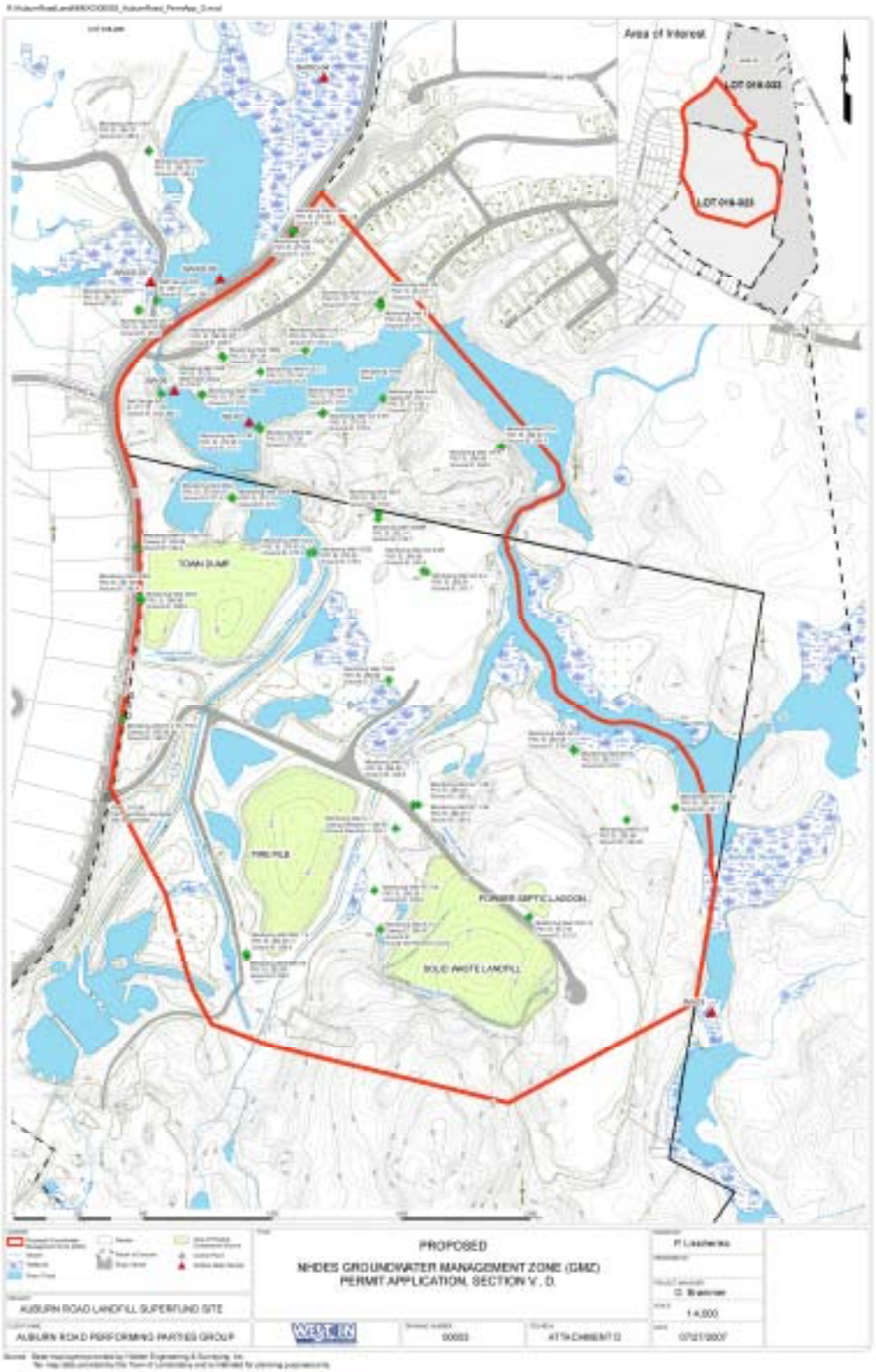

Figure 1b: Site Features (with proposed GMZ boundary).

II. Site Chronology

Table 1 below summarizes the chronology of the events at the Site.

Table 1: Auburn Road Landfill Londonderry, New Hampshire Chronology of Site Events	
Date	**Event**
Up to 1965	Sand and gravel operation.
1965 – 1980	Operated as a municipal solid waste landfill accepting all wastes. Disposal activities cease and landfill shutdown in 1980.
8 September 1983	Site listed on National Priorities List (NPL), ranking 383 out of 416 sites nationally.
1985 – 1986	*Remedial Investigation* found buried drums containing hazardous material.
Spring 1986	EPA excavated and removed approximately 1,900 drums from the Site.
17 September 1986	EPA signed *Record of Decision* (ROD) for construction of a public water supply line.
18 February 1987	EPA issued the Town of Londonderry an Administrative Order to install a municipal water supply line to residents potentially affected by Site contamination.
November 1987	Public water supply line constructed by the Town of Londonderry. Potentially affected residents along portions of Auburn Road (including Whispering Pines Pond Mobile Home Park), Longwood Avenue, and Shady Lane served by public water line.
1988	EPA removed 316 additional drums from the Site.
29 September 1989	Following additional investigations, EPA signed a second ROD that directed the construction of caps over three disposal areas as well as the design and construction of a pump and treat groundwater remedy.
31 August 1990	A group of Potentially Responsible Parties (PRPs) were issued an Administrative Order to perform the remedies selected in the 29 September 1989 ROD.
30 September 1992	First Five-Year Review. The EPA found the installation of a public water supply line to residents near the Site (along portions of Auburn Road (including Whispering Pines Pond Mobile Home Park), Longwood Avenue, and Shady Lane) to be protective of human health and the environment (EPA, 1992).
24 July 1996	*Remedial Action Completion Report* signed by EPA. The Town of Londonderry completed the three landfill cap construction activities and drainage improvements.

Table 1: Auburn Road Landfill Londonderry, New Hampshire Chronology of Site Events	
Date	**Event**
19 December 1996	EPA signed an *Amended ROD* (AROD). The AROD, based on investigations over the previous five years and then-current Site conditions, chose not to implement the pump and treat groundwater remedy but rather utilize an alternative remedy of monitored natural attenuation (MNA) for the groundwater contamination.
29 September 1997	EPA issued second Five-Year Review. The EPA found the public water supply line and three landfill caps constructed at the Site to be protective of human health and the environment (EPA, 1997).
22 November 1999	EPA signed a Consent Decree with PRP groups for monitoring groundwater, surface water, and sediments. The agreement also bound the PRPs to performing an active groundwater remedial action, if necessary.
February 2000	First annual report submitted for the Long-Term Environmental Monitoring Program (LTEMP). Subsequently, reports have been submitted annually from 2000 to 2006 (SME, 2000; WESTON, 2001 through 2006a and 2007).
24 March 2000	*Natural Attenuation Remedy Project Operations Plan* (NARPOP) for the LTEMP completed (WESTON, 2000).
24 September 2002	EPA issued third Five-Year Review. The EPA found that the public water supply line and the capping of the three disposal areas to be protective of human health and the environment. The EPA determined that the MNA groundwater remedy was protective of human health and the environment in the short-term. The EPA believed that for the groundwater remedy to be protective in long-term, it would be necessary to increase hydraulic and contaminant monitoring in groundwater and surface water and increase maintenance of drainage structures near the landfills (EPA, 2002).
29 September 2006	*Field Sampling Plan* and a *Quality Assurance Project Plan* completed to address additional tasks associated with the Fall 2006 LTEMP sampling, including installation of two additional well couplets at downgradient locations outside of the proposed GMZ boundary (WESTON, 2006).
2 March 2007	Draft updated Site Conceptual Model submitted with LTEMP 2006 Annual Report (WESTON, 2007).
15 May 2007	Groundwater Management Zone (GMZ) Permit Application submitted to NHDES.
15 August 2007	Revised Groundwater Management Zone (GMZ) Permit Application submitted to NHDES per comments received on 24 July 2007.
September 2007	EPA issued this fourth Five-Year Review.

III. Background

The Auburn Road Landfill Superfund Site (the "Site") is located in the Town of Londonderry, Rockingham County, New Hampshire. The 200-acre property is owned by the Town of Londonderry, and is bordered by Auburn Road and residences to the west, Old Derry Road and residences to the south, an unnamed stream and wetland areas to the east, and Whispering Pines Pond and a mobile home park to the north (see Figure 1b).

Geology

The Site is underlain by glacial overburden which overlies the bedrock. The glacial deposits are predominantly thick outwash deposits which overlie a discontinuous basal till unit. The outwash deposits are predominantly well-graded sand and gravel which range in thickness from 0 feet (ft) in the southern portion of the Site (i.e., south of the landfills); and generally thicken northward where they are approximately 75 ft thick north of the Site in the vicinity of Whispering Pines Pond. Where present, the discontinuous till is up to 20 ft thick and consists of sand, gravel, silt, and clay mixtures.

Locally, bedrock underlying the Site consists of an un-named member of the Berwick Formation which is similar in composition but contains more calc-silicate (up to 15%) than the remainder of the Formation (Lyons et al., 1997). A thin band of the late Devonian two-mica granite (part of the New Hampshire Plutonic Suite) trending northeast-southwest is encountered in the southern portion of the Site and is similar to the Concord Granite (Lyons et al., 1997). Bedrock classifications from four bedrock core logs (B 301A, B 302A, B 303A, B 304A) retrieved in 1992, indicate that the Site is underlain by gneiss, pegmatite, quartzite, schist, breccia, and mylonite [Sevee and Maher Engineers, Inc. (SME), 1994]. Based on depth to bedrock data collected during monitoring well installation, bedrock topography generally slopes to the northwest. The bedrock elevation contour plan developed from this data is shown in Figure 2.

Hydrogeology

Groundwater at the Site occurs in two hydrogeologic units: the overburden and the bedrock aquifers. The overburden aquifer consists of the saturated portions of the outwash and discontinuous till units. Groundwater flow within the overburden aquifer is consistently towards the north and northwest (see Figure 3a) (WESTON, 2007). Overburden groundwater discharges to the Whispering Pines Pond; however, a component of overburden groundwater from the Site discharges north of the Whispering Pines Pond to Cohas Brook. Hydraulic conductivities within wells in both the outwash deposits and the till vary from approximately 0.1 to 140 ft per day (SME, 1994; WESTON, 2007).

Groundwater flow within the bedrock aquifer is consistently towards the north and northwest (see Figure 3b) (WESTON, 2007). Based on historical data since 2000, the average spring and fall horizontal hydraulic gradients are 0.0087 and 0.0077 ft/ft, respectively. The average bedrock horizontal hydraulic gradient for all available data collected between June 2000 and October 2006 is 0.0082 ft/ft (SME, 1994; WESTON, 2007).

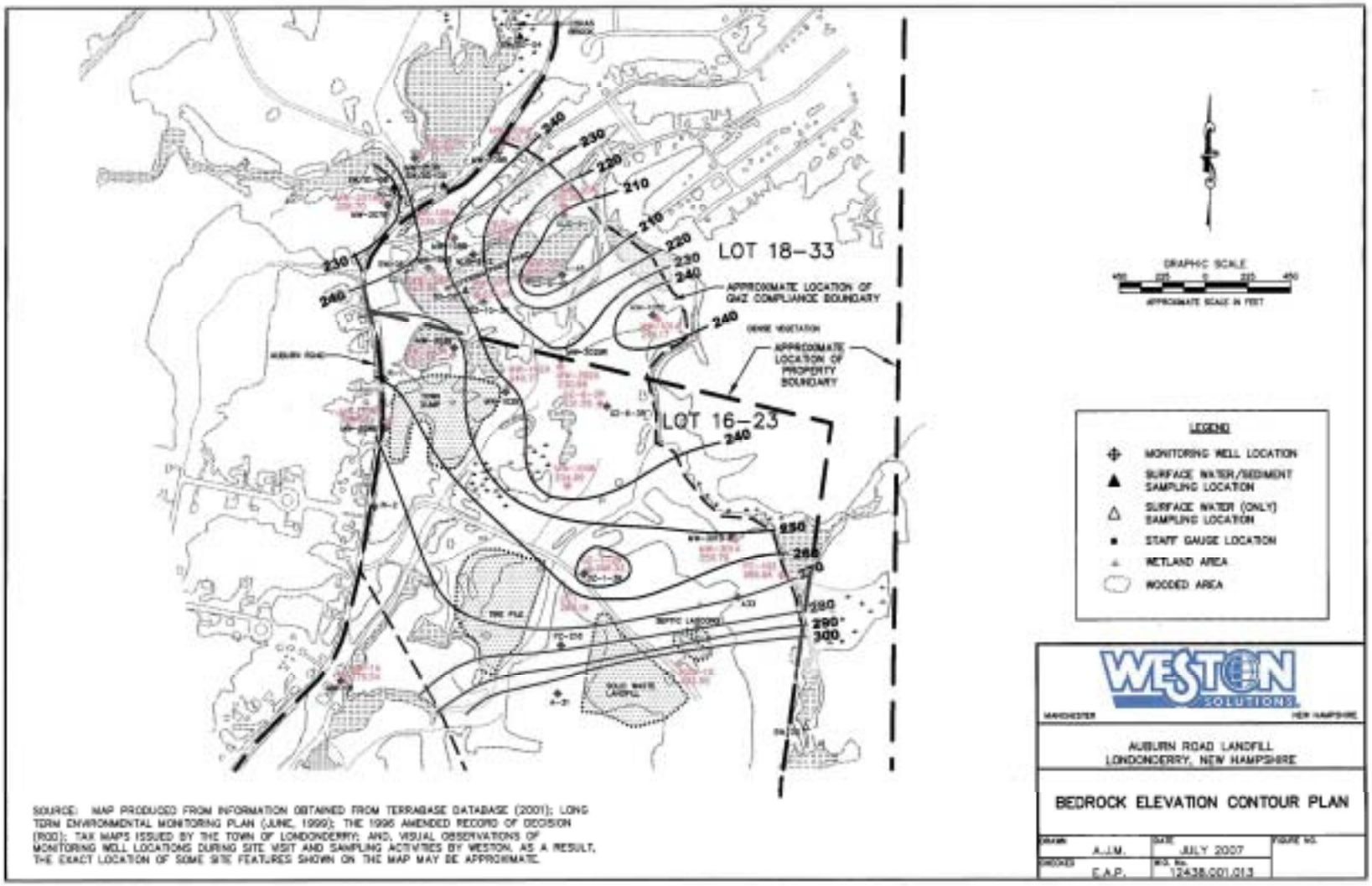

Figure 2: Bedrock elevation contour plan.

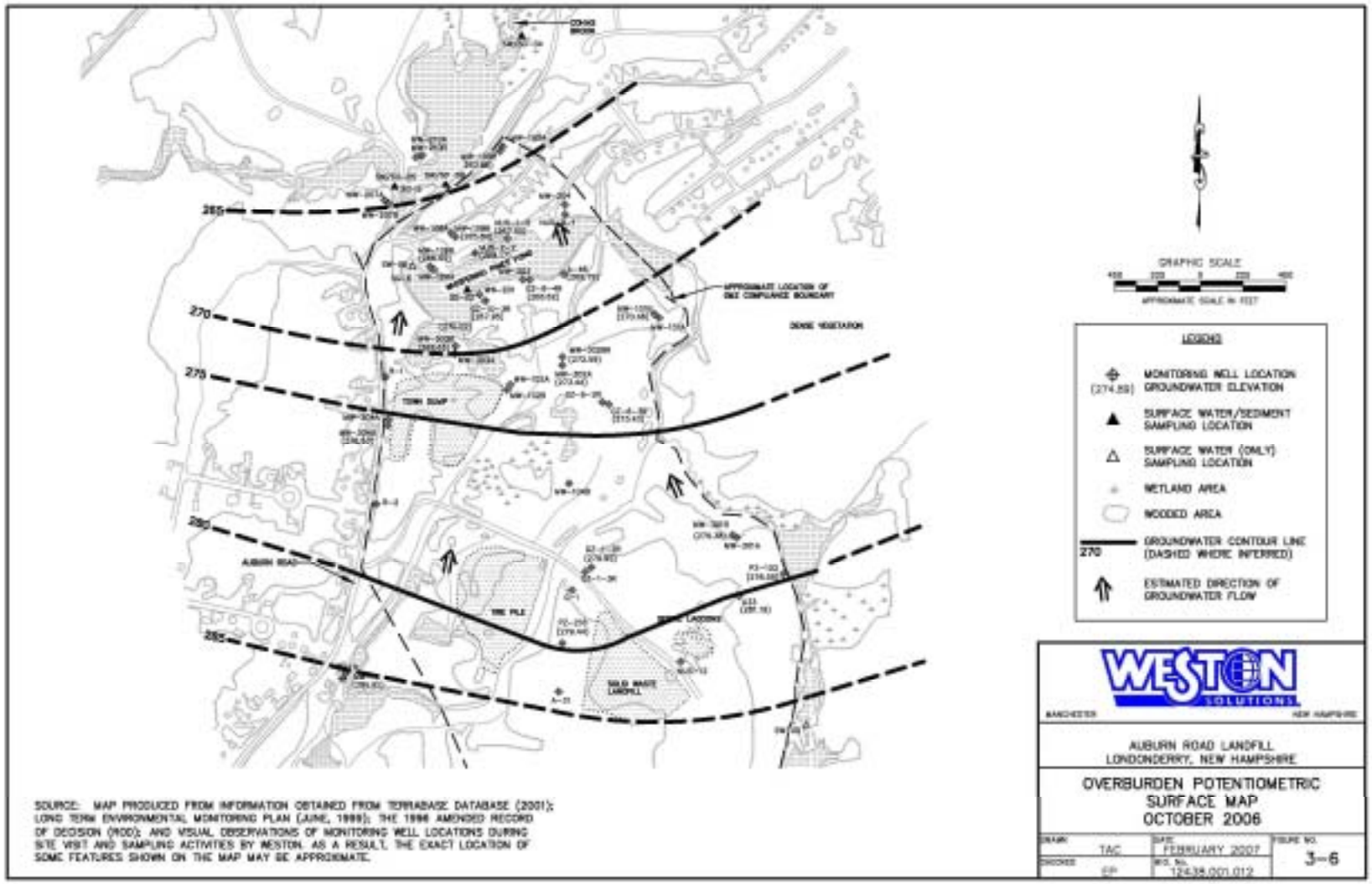

Figure 3a: Overburden groundwater elevation contours.

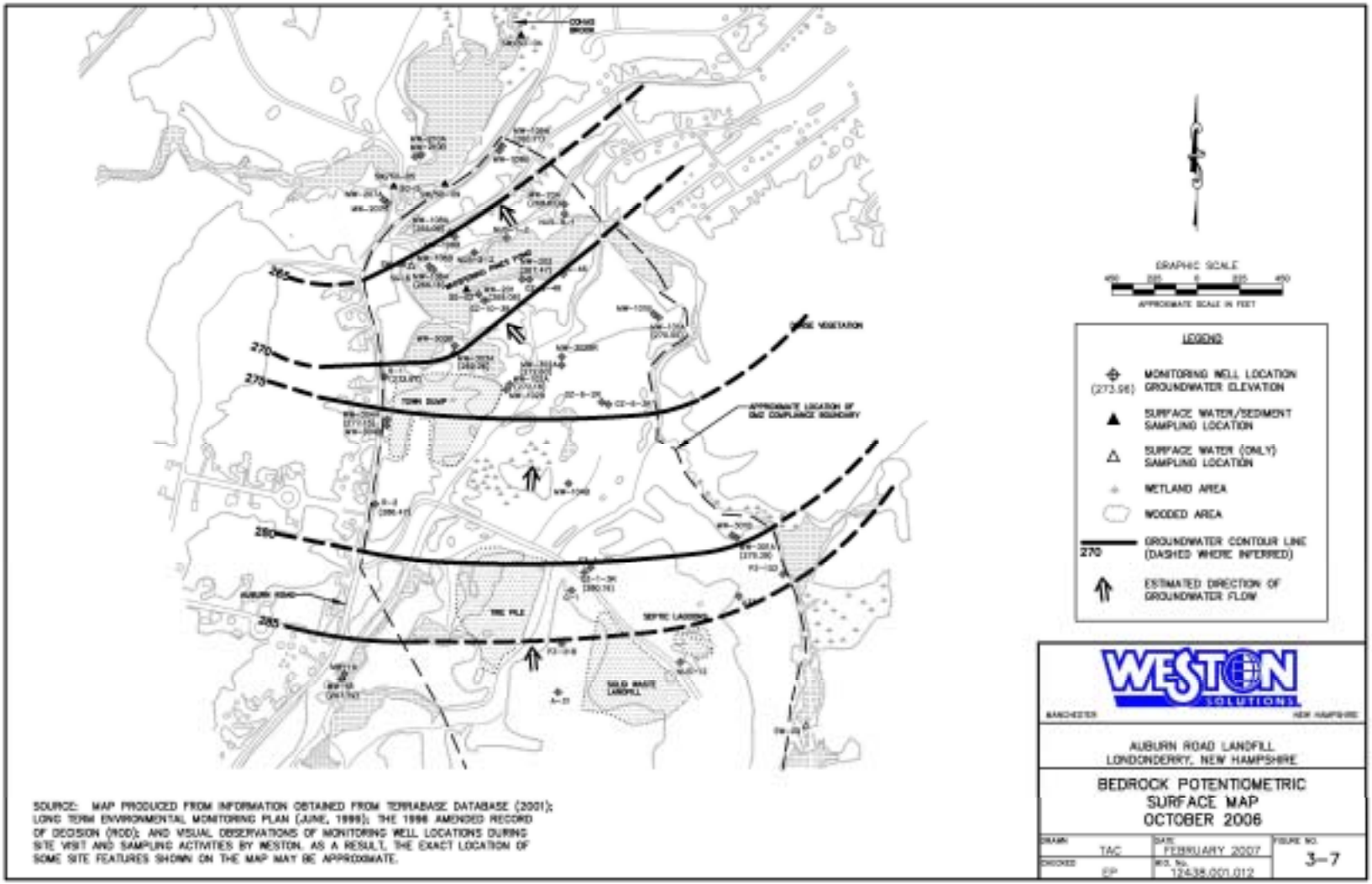

Figure 3b: Bedrock groundwater elevation contours.

The results of slug tests conducted in four bedrock wells indicate the hydraulic conductivity values for the bedrock range from 6.00E-06 cm/sec to 2.50E-03 cm/sec with a geometric mean hydraulic conductivity of 2.32E-04 cm/sec. These hydraulic conductivity values are typical for fractured metamorphic rock aquifers (SME, 1994). Reportedly, abandoned and in use bedrock residential drinking water wells west of the Site have low yields and depths on the order of 600 feet below ground surface (bgs) are required to generate a usable water supply. A hydrogeologic cross-section map and hydrogeologic cross-section A-A' and B-B' are provided as Figures 4a, 4b, and 4c, respectively (WESTON, 2007).

Horizontal and vertical hydraulic gradients were determined across the Site based on data collected during the additional hydrogeologic investigation conducted in Fall 2006. The 2006 data indicates that a downward vertical hydraulic gradient from the overburden to bedrock aquifer is more likely at the Site and is more common in the Fall than the Spring. The average downward vertical hydraulic gradients (-0.035 ft/ft) were approximately four times larger than the average upward hydraulic gradients (0.008 ft/ft) (WESTON, 2007). In addition to observed temporal variations, the 2006 data collected from the MW-102A/MW-102B, MW-302A/MW-302BR, and MW-303A/MW-303B couplets demonstrate the vertical hydraulic gradients between the overburden and bedrock aquifers is variable over relatively short distances.

Surface Water Hydrology

Surface water runoff from the landfills generally flows radially off the landfill caps. Runoff from the vicinity of the Town Dump and Tire Pile landfills is collected along constructed drainage swales directing runoff flow northward toward Whispering Pines Pond. Surface water runoff across the remainder of the Site (including the Solid Waste Landfill) generally flows north toward Whispering Pines Pond and to the east toward an unnamed stream. The unnamed stream flows north along the eastern Site property line and discharges into Whispering Pines Pond. The Pond discharges to Cohas Brook which flows north along Auburn Road.

The 2002 Five-Year Review noted that what appeared to be a series of beaver dams were causing Whispering Pines Pond water levels to be higher than normal. These beaver dams were not observed during the July 2007 Site Inspection and the drainage at the outlet of Whispering Pines Pond has improved, leading to lower pond surface water levels.

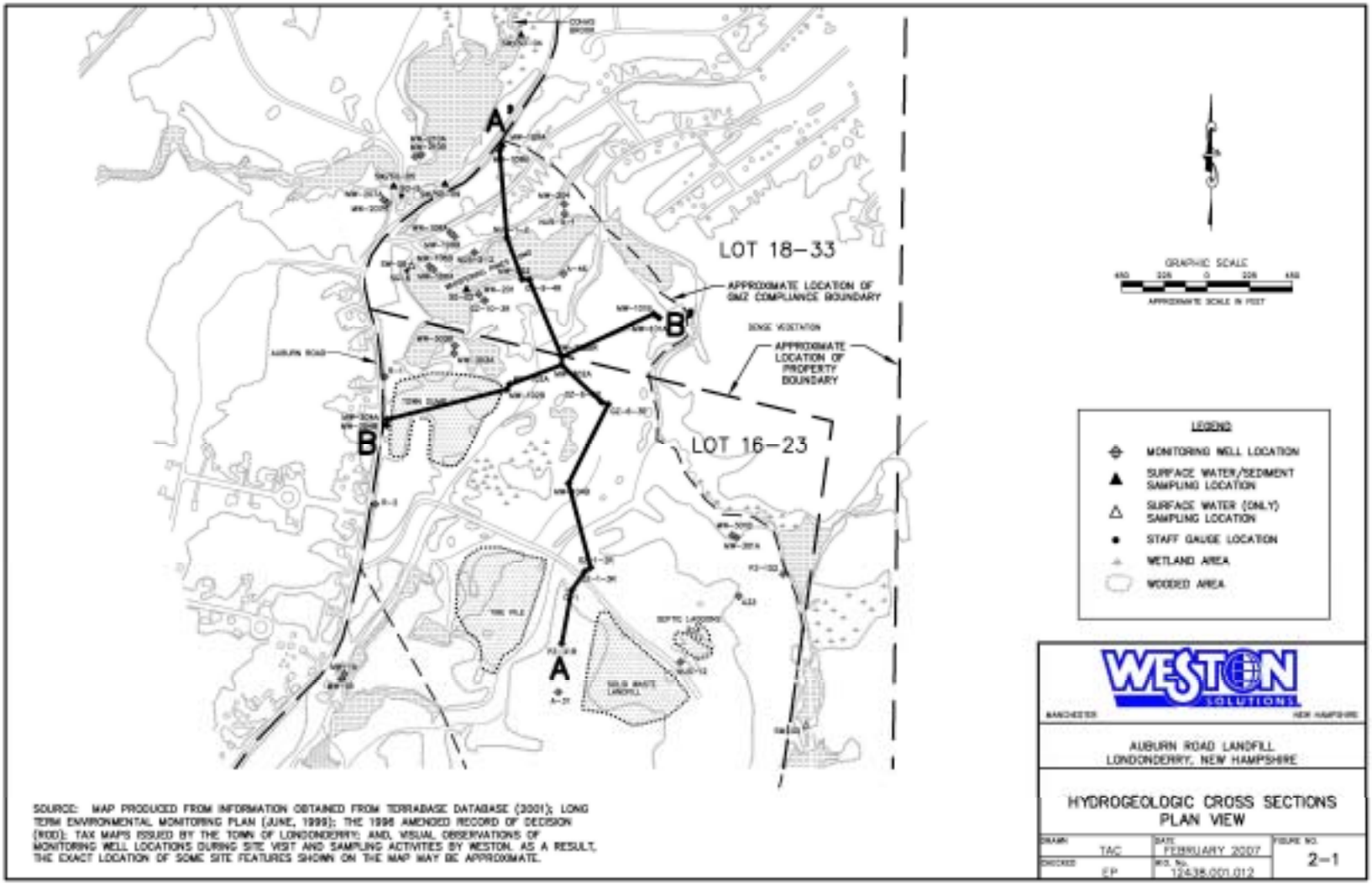

Figure 4a: Hydrogeologic cross-section location map (A-A' is south to north profile across the site; B-B' is west to east profile across the site).

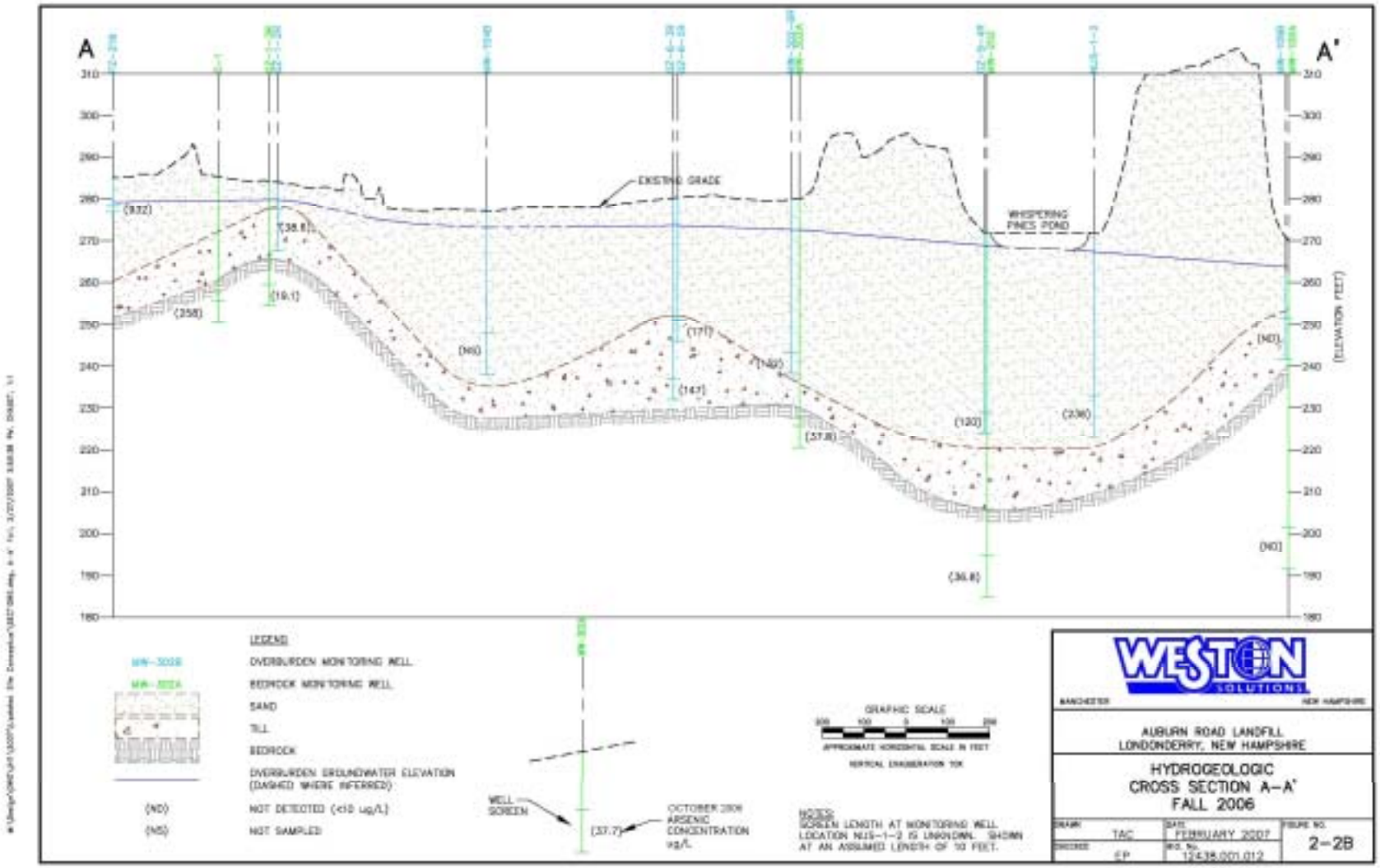

Figure 4b: Hydrogeologic cross-section A-A' (south to north profile).

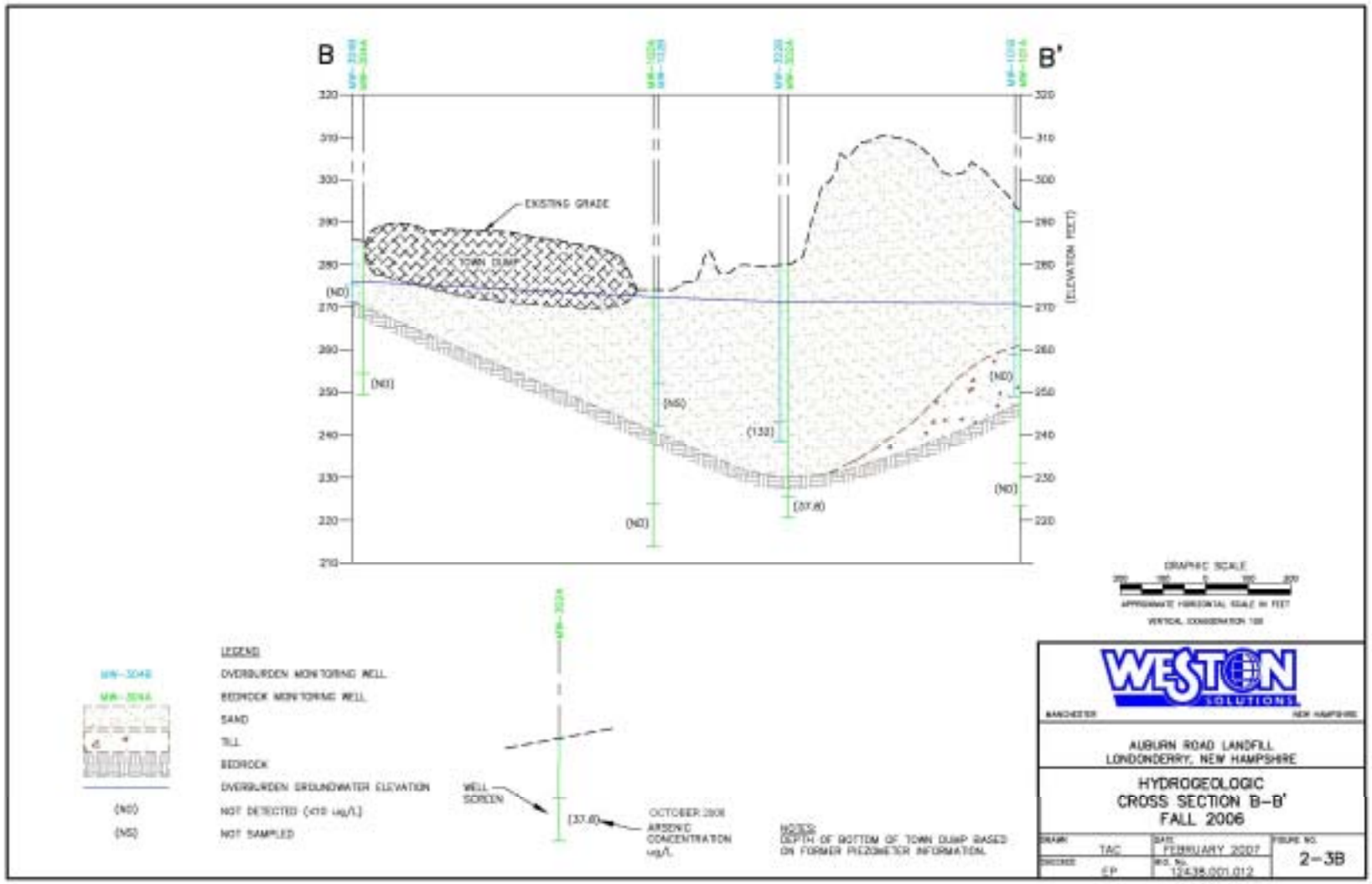

Figure 4c: Hydrogeologic cross-section B-B' (west to east profile).

Site Conditions/Land and Resource Use

Although the Site property consists of approximately 200 acres, the three disposal areas occupy only approximately 12 acres and are each approximately 4 acres in size. The disposal areas received a mix of domestic wastes and various hazardous wastes beginning in 1965 until the landfills were closed in 1980. The northernmost of the three disposal areas is the "Old Town Dump", which is the oldest of the disposal areas and has an approximate refuse thickness of 8 to 15 ft. The "Tire Pile" area is slightly larger than the "Old Town Dump", and has an approximate thickness of 10 to 20 ft. The "Solid Waste Landfill" has an approximate thickness of 8 to 10 ft (EPA, 1996a). Formerly, a septage disposal area existed to the north of the solid waste dump area; however, the Town excavated that area and disposed of it in the solid waste area in 1993 (see Figure 1b).

The disposal areas currently have a top cover consisting of a modified Resource Conservation and Recovery Act (RCRA)-type C cap, roughly 4 feet (ft) thick with a geotextile impermeable membrane, clay liner, and a vegetated (grass) cap. Each disposal area is also completely fenced on all sides.

Prior to 1987, all of the local residents used groundwater as a drinking water source. In 1987 the Town of Londonderry extended a public water supply line to potentially affected groundwater users in the area along portions of Auburn Road (including Whispering Pines Pond Mobile Home Park), Longwood Avenue, and Shady Lane. There are no known private wells within 0.25 mile of the contaminant plume. EPA and the State have mandated that institutional controls be put in place to preclude the use of contaminated groundwater from the Site until the groundwater is restored to drinking water standards.

The Site is currently vacant. The Town has recently allowed/negotiated a tenant (model airplane club) to utilize a portion of the Site for passive recreation activities. This passive use of a portion of the Site will not compromise the selected remedy or adversely affect the short- or long-term protectiveness of the remedy.

History of Contamination/Initial Response Actions

From 1965 to 1980, the Site operated as a municipal landfill. In August 1979, an investigation by the State of New Hampshire substantiated suspicions that industrial wastes were being accepted for disposal at the Site. The State then ordered that no more drums be accepted for disposal at the Site. Following that order, the EPA began investigations into conditions in groundwater and surface waters surrounding the Site. Contaminants uncovered during EPA and State of New Hampshire investigations included various classes of compounds such as PCBs, SVOCs, VOCs, and metal contaminants.

In 1982, based on preliminary assessment investigations, EPA proposed the Site for listing on the National Priorities List (NPL). The Site was included on the NPL in 1983.

In May and June of 1986, EPA conducted test pit investigations and removed 1,900 drums, primarily in the Town Dump area, from the Site. In July 1986, an endangerment assessment of the Site was completed, and a Record of Decision (ROD) for OU1 (waterline) was signed in September 1986.

In 1987, EPA issued an Administrative Order to the Town of Londonderry to connect potentially affected homes to a public water supply line and to fence the property to restrict access. In 1988, EPA removed an additional 316 drums from the Town Dump.

A second ROD for OU2 and OU3 (groundwater and landfill caps, respectively) was signed in September 1989. In 1990, EPA issued a second Administrative Order that directed the Town of Londonderry to cap the three disposal areas and perform other related landfill cap maintenance and monitoring tasks. The 1990 Administrative Order also directed a separate group of PRPs to begin design and construction of a groundwater pump and treat remedy.

Based on investigations over the previous five years and then-current Site conditions, in 1996, EPA issued an Amended ROD (AROD) outlining the decision not to implement the pump and treat groundwater remedy and to utilize an alternative remedy of monitored natural attenuation (MNA) for restoration of the groundwater. The 1996 AROD acknowledged the overall decline in VOC contaminants at the Site, relieving the PRPs from having to build the original groundwater remedy; however, a provision was retained for performing a contingency groundwater remedy under specific circumstances. The PRPs and the Town agreed to the provisions in the 1996 AROD in the 1999 Consent Decree.

Basis for Taking Action

Contaminants at the Site have included semi-volatile organic compounds (SVOCs) and poly-chlorinated biphenyls (PCBs) in drums and soils, and VOCs as well as metals in groundwater. The EPA's, State's, and Town of Londonderry's response actions at the Site have either removed or encapsulated contaminants in the soils. The EPA established the following interim clean up levels for groundwater in a 1989 Record of Decision (ROD) and retained these clean up levels in the 1996 Amended ROD:

Table 2:
Interim Cleanup Levels set in the 1989 Record of Decision and retained in 1996 Amended ROD

Contaminant of Concern	Cleanup Level (parts per billion)
Inorganic compounds	
Arsenic	MCL of 50 (10 effective as of 22 February 2002)+
Lead	MCL of 50 (Action Level of 15)
Volatile Organic Compounds	
Vinyl chloride	MCL of 2
trans 1,2 dichloroethylene	MCL of 70*
2-Butanone	Health Advisory of 172
Trichloroethene	MCL of 5
Tetrachloroethene	MCL of 5
Toluene	MCL of 1,000
Benzene	MCL of 5

Notes:
MCL = Maximum Contaminant Level
+ = The change in the MCL for arsenic from 50 ppb to 10 ppb will require that a decision document be published in the near future to address this change in the interim cleanup level for the Site.
* = The interim clean up level of 70 parts per billion for trans 1,2 dichloroethylene (as stated in 1996 Amended Record of Decision) is not consistent with the MCL for this compound (100 parts per billion) and a decision document will be published in the near future to address and correct this interim cleanup level for the Site.

The arsenic contamination plume at the Site from the 1999 Consent Decree, Appendix A, is shown in Figure 5. The arsenic plume is from data representing Site conditions in 1995 (EPA, 1996a). No distinction between the overburden and bedrock contaminant plume was made at that time.

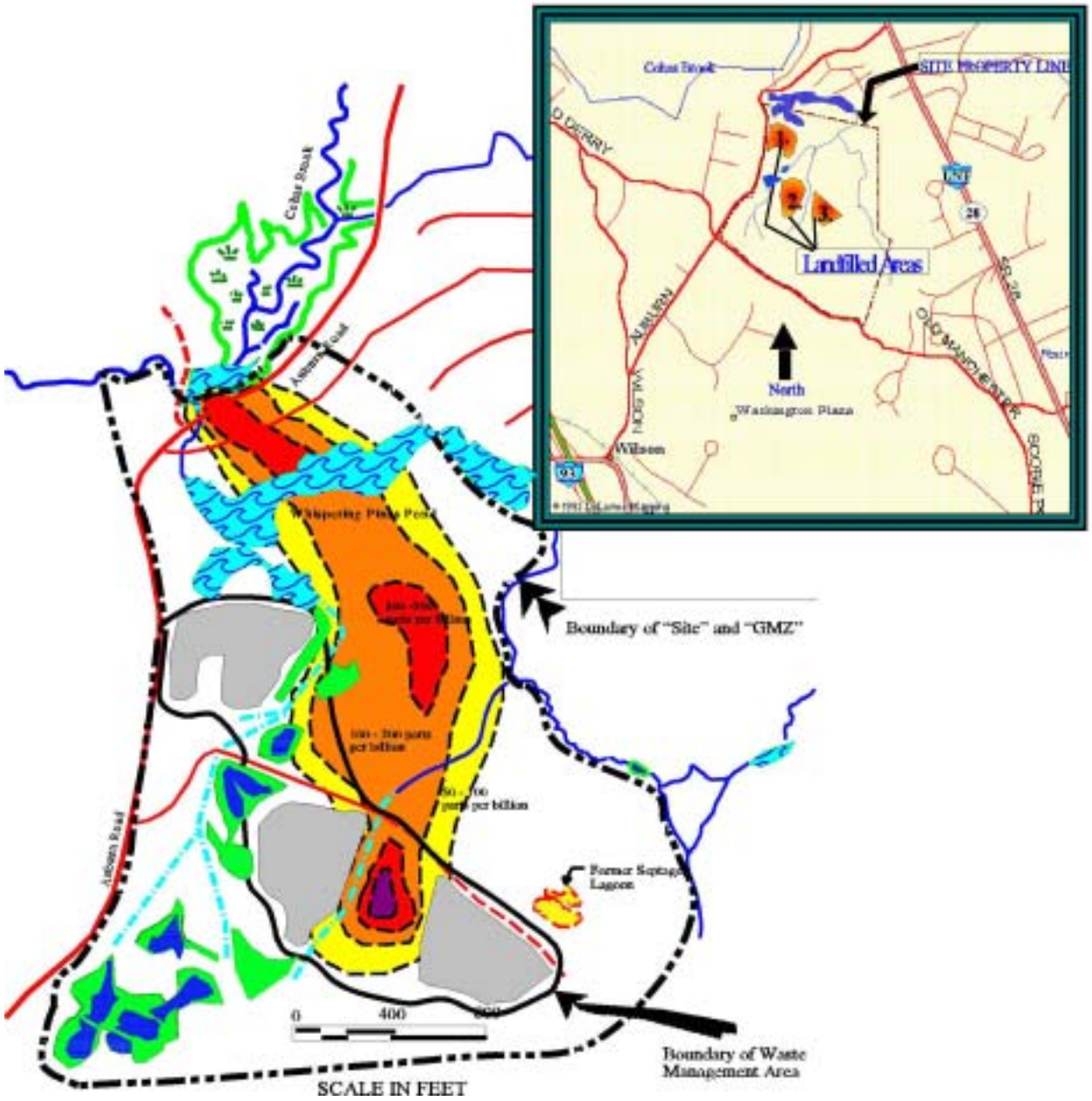

Figure 5: Figure from 2002 Five-Year Review showing arsenic plume based on 1999 Consent Decree.

IV. Remedial Actions

Remedy Selection

Three Records of Decision (ROD) have been recorded for this Site. Following additional investigation at the Site by EPA and its contractors in 1986, the first ROD was completed on 17 September 1986 (EPA, 1986), that directed the installation of a 9,000-foot (ft) municipal waterline to supply drinking water to the residents surrounding the landfill. The remedial action objective was to eliminate the potential for abutting residents to drink groundwater contaminated from the Site.

After the Town installed the waterline in 1987, and EPA had removed over 2,000 drums of hazardous wastes from the Site between 1986 and 1988, EPA believed that conditions had changed sufficiently to re-evaluate the Site. Based on the additional investigations, EPA signed a 29 September 1989 ROD that directed the construction of a groundwater treatment plant to remove metals and VOCs from groundwater, and caps over three disposal areas to prevent direct contact with wastes and reduce flushing of contaminants through the landfill wastes. On 31 August 1990, EPA issued an Administrative Order to two groups of potentially responsible parties (PRPs) to perform the remedies outlined in the 1989 ROD (EPA, 1989). The Administrative Order directed the Town to perform the Source Control component of the remedy, which was to cap the three landfills and perform drainage improvements to minimize the contact of groundwater with waste materials in the landfills. The landfills were subsequently capped with modified Resource Conservation and Recovery Act (RCRA)-type C caps by the Town in 1994.

The second half of the Administrative Order directed a group of PRPs, known as the Auburn Road Management of Migration PRP Group, to design and build a groundwater treatment plant. In 1991, the PRPs began pre-design investigations in order to build the groundwater extraction and treatment facility; however, groundwater data from the pre-design investigations caused EPA to reconsider the necessity for constructing the groundwater pump and treat system. Based on the observations of declining concentrations and the belief, based on groundwater modeling at the time, that capping the landfills would eventually halt the groundwater contamination, the EPA issued an Amended ROD in 1996. The 1996 AROD determined that no active groundwater remedy would be implemented except as a contingency and that institutional controls over the use of groundwater would be established throughout the area of contamination.

More specifically, the selected remedy in the 1996 AROD included the following components (EPA, 1996a):

1. Natural Attenuation of Contaminated Groundwater.
2. Establishment of a Groundwater Management Zone ("GMZ…").
3. Implementation of Long Term Monitoring Plan. If the monitoring program detects significant events, additional investigation will be performed. Significant events are:
    a. Groundwater contamination by the Site moves northward, in either the bedrock or overburden aquifers from Cohas Brook.
    b. A violation of the surface water standards contained in New Hampshire's Surface

Water Quality Regulations, Env-Ws 430-438 for the compounds with cleanup levels listed in the AROD and the 1989 ROD in either Whispering Pines Pond or Cohas Brook. The specific cases that are significant events are:

1. Surface water quality violations occur if arsenic concentrations in Cohas Brook or Whispering Pines Pond are significantly elevated over the up-gradient samples or if arsenic concentrations exceed the standards contained in Env-Ws 430-438.
2. Surface water quality standards for VOCs are exceeded.
3. If arsenic contaminated sediments are found to be toxic to aquatic life.

4. Maintenance of Existing Site Controls (cap and drainage system).
5. Establishment of Institutional Controls.
6. Five Year Reviews.

Remedy Implementation

The Town completed construction of the waterline (OU1) in 1987 and three landfill caps (OU3) in 1994. Since that time the Town has performed air monitoring and other maintenance activities to protect the integrity of the cap and all other associated remedy components.

According to Mr. John Trottier, Assistant Director of Public Works and Engineering for the Town of Londonderry, SEA Consultants, Inc. (SEA) of Concord, New Hampshire performs bi-annual visual inspections of the Site. SEA is also in charge of the gas monitoring and settlement monitoring at the three landfills. Upon completion of the visual inspection by SEA, a report is submitted to Mr. Trottier outlining maintenance that is recommended at the Site (i.e., cleaning out of drainage swales, repairs to damaged fencing or gates, etc.). Mr. Trottier then assembles a crew to complete the maintenance outlined in the SEA report.

Mr. Trottier indicated that the landfills are mowed twice a year in accordance with the Site Operations and Maintenance (O&M) Plan. Primary rodent control involves the occasional trapping of beavers; no spraying of pesticides or herbicides is conducted at the Site. In addition, Mr. Trottier visits the Site approximately once per month to personally perform visual inspections and assess any potential maintenance needs. Current site conditions were observed during a 31 July 2007 Site Inspection by EPA and NHDES and they are discussed further in Section V and Appendices B and C.

With respect to groundwater (OU2), the 1996 AROD held that lowering the water table through capping would help reduce the flushing of contamination into the groundwater at the Site. Since the issuance of the 1996 AROD, a group of responsible parties has been monitoring the environment surrounding the Site. A Long-Term Environmental Monitoring Program (LTEMP), including the submission of annual reports, has been in place since 1999. Monitoring consists of groundwater, surface water, and sediment samples taken at and near the landfills and Cohas Brook. A summary table of LTEMP sampling locations and analytical parameters is included in Appendix D, Technical Assessment Summary, Table 7.

The plume is well delineated and delineation has been further refined by two new monitoring well couplets (MW-207A/207B and MW-210A/B) installed outside the proposed GMZ boundary in 2006 which were non-detect (< 10 ppb) for arsenic. There has been no migration of arsenic outside of the proposed GMZ boundary. Several monitoring wells within the downgradient edge of the proposed GMZ boundary have also been non-detect (< 10 ppb) for arsenic (MW-109A/109B, MW-106A/106B, and MW-108A). An analysis of trends in groundwater, surface water and sediments is provided in the detailed Technical Assessment attached as Appendix D to this document.

In addition, the 1996 AROD states that "institutional controls, either deed restrictions or implementation of New Hampshire's Groundwater Protection Rules…" will be necessary to prohibit the use of contaminated groundwater for drinking water purposes. The AROD requires the establishment of a groundwater management zone (GMZ) "which in combination with establishment of institutional controls within the GMZ will allow for protection of public health…."

The 1999 consent decree governing the cleanup of the Site also requires certain actions on the part of the settling defendants. More specifically, for property owned or controlled by a settling defendant where access and land use restrictions are needed to implement the response action, the settling defendant must provide access and must refrain from using the property in any manner that interferes with the integrity or protectiveness of the remedy. If necessary, EPA and/or the State of New Hampshire may require the settling defendant to execute and record easements running with the land granting access and the right to enforce the land use restrictions.

For property owned or controlled by someone other than a settling defendant, the settling defendants must use best efforts to secure enforceable agreements to: (1) provide access for the purpose of conducting the cleanup; (2) ensure non-interference with or the protectiveness of the remedy; and (3) execute and record easements running with the land granting access and the right to enforce the land use restrictions.

Currently, the ARPPG submitted a GMZ permit application to NHDES on 15 May 2007. After receiving comments from NHDES on 24 July 2007, a revised GMZ permit application was submitted to NHDES on 15 August 2007. The revised permit application is still under review at the NHDES.

V. Progress Since the Last Review

The last Five-Year Review was completed in September 2002. The EPA found that the water line (OU1) and the capping of the disposal areas (OU3) to be protective of human health and the environment. The EPA also determined that the MNA groundwater remedy (OU2) was protective of human health and the environment in the short-term. The EPA recommended that in order for the groundwater remedy to be protective in long-term, several actions needed to be undertaken at the Site.

A summary of the recommendations from the 2002 Five-Year Review and actions implemented to date are shown in Table 3.

Table 3: Actions Taken Since the Last Five-Year Review

Recommendations from the Last Five-Year Review	Actions Implemented Since Last Five-Year Review
1. Assess apparent surface water violation (high arsenic concentration at surface water sample location SW-9 along Cohas Brook in 2001).	1. The surface water sample location has been monitored during semi-annual LTEMP sampling. Arsenic concentrations at SW-9 have consistently been below New Hampshire Surface Water Quality Criteria in 11 samples collected since 2001.
2. Determine water levels Site-wide.	2. An expanded sampling round in October 2006 included recording water levels in 43 monitoring wells Site-wide. Surface water staff gages were installed and surveyed in Whispering Pines Pond (SG-6) and Cohas Brook (SG-5).
3. Add wells to be sampled for arsenic.	3. Monitoring well GZ-1-3R was added to the LTEMP sampling. An expanded sampling round in October 2006 included sampling an additional 16 monitoring wells for arsenic and MNA parameters. GMZ groundwater monitoring will likely include an additional 9 wells to be sampled for arsenic annually.
4. Assess surface water and sediment arsenic concentrations at Whispering Pines Pond.	4. One surface water sample and one sediment sample are collected from Whispering Pines Pond as part of the LTEMP. Results are discussed in Appendix D.
5. Migration of groundwater outside the GMZ needs to be assessed.	5. Two new monitoring well couplets were installed on an adjacent property located downgradient just northwest of Auburn Road and outside of the proposed GMZ boundary: MW-207A/207B, near the former location of MW-205; and MW-210A/210B, north of Cohas Brook. These wells were sampled in January 2007 and April 2007 and analytical results from both rounds were < 10 ug/l for arsenic.

Table 3: Actions Taken Since the Last Five-Year Review

Recommendations from the Last Five-Year Review	Actions Implemented Since Last Five-Year Review
6. The Groundwater Annual Report needs to be modified.	6. Tables and plots of arsenic concentrations (since landfill capping, where available) in each sampled well are included in the LTEMP Annual Report. Additional modifications, including more discussion/explanation of trends will be implemented for future reports.
7. Report field parameters in Groundwater Annual Report.	7. Field water quality parameters are included in the LTEMP annual reports.
8. Assess arsenic-iron hydroxide stability in sediments.	8. An ongoing EPA-funded grant with the University of Connecticut is being conducted on the groundwater-surface water interface along Cohas Brook (MacKay, 2005). Preliminary findings are presented in Appendix D.
9. Better manage water levels at the Site.	9. Beaver dams have been removed and were not observed during the July 2007 Site Inspection. A culvert pipe has been installed in the outlet of Whispering Pines Pond.

VI. Five-Year Review Process

Administrative Components

The Remedial Project Manager, Mr. Byron Mah, conducted the Auburn Road Landfill Superfund Site Five-Year Review with assistance from Mr. Thomas Andrews, NHDES Project Manager and WESTON, consultants to the ARPPG. The Five-Year Review consisted of:

- Reviewing relevant documents listed in the reference section of this document;
- Conducting a review and technical assessment of data collected during implementation of the selected remedy, and;
- Performing interviews and a Site inspection.

Community Notification and Involvement

No public meetings are required and, therefore, none were held regarding the Five-Year Review for this Site. However, the EPA did publish a notice regarding the initiation of the Five-Year Review in the local newspaper, the Londonderry Times, on 19 July 2007 noting that the Five-Year Review process will be completed and publicly available in September 2007. A copy of the public notice is included in Appendix A.

Document Review

This Five-Year Review consisted of a review of relevant documents including O&M Records and monitoring data. The 1996 Amended Record of Decision and various literature sources were also consulted. A Reference Section is provided at the end of this Five-Year Review. A more complete analysis of Site conditions and a bibliography is also attached to the Technical Assessment provided in Appendix D to this Five-Year Review.

Site Inspection

Mr. Mah (USEPA), Mr. Andrews (NHDES), and Mr. Dean Brammer (WESTON) conducted a Site visit on 31 July 2007. The three disposal areas, fences, and drainage systems were inspected. Minor general maintenance issues were noted (damaged fencing and missing signage at the Tire Pile, and vegetation in the stone drainage swales); however, no unusual or problematic issues were found on-Site. At the dam at Whispering Pines Pond, a beaver dam was noted in the Site Inspection conducted for the last Five-Year Review. However, no beaver dams were observed and a black polyethylene culvert pipe drain was installed in the outlet of Whispering Pines Pond by the property owner, which has helped to maintain lower pond water levels.

EPA also conducted a review of the Site health and safety plan and OSHA-certification and medical monitoring for sampling personnel at the WESTON Manchester, NH office.

The Site inspection activities are documented in a checklist and photolog included as Appendix B and C, respectively.

Interviews/Meeting

An interview was conducted as part of this Five Year Review between the Town of Londonderry, New Hampshire and EPA. Additionally, a meeting was held between Mr. Al Simard (adjacent property owner of Whispering Pines Pond Mobile Home Park), NHDES, and EPA.

Mr. Al Simard's Meeting

On June 29, 2007, the following attended a meeting/conference call at the NHDES Facility regarding Auburn Road Landfill Superfund Site:

Mr. Al Simard, Whispering Pines Pond Mobile Home Park
Mr. Jack Robertson, Consultant Hydrogeologist for Mr. Simard (by telephone)
Mr. Richard Pease, NHDES
Mr. Tom Andrews, NHDES
Mr. Mike Jasinski, EPA
Mr. Darryl Luce, EPA
Mr. Byron Mah, EPA

The main point of this meeting was to discuss the status of the Site, the draft GMZ Application, and any concerns that Mr. Simard and Mr. Robertson wished to address with regards to the Site and the Five Year Review being conducted by EPA. A summary of these concerns was detailed in letters which are attached to this Five Year Review as Appendix E. In essence, Mr. Simard believes that the remedy that was selected in the 1996 Amended ROD needs to be changed.

Town of Londonderry, NH Interview

On August 30, 2007, Mr. Dave Caron, Town Manager for the Town of Londonderry and Mr. Byron Mah, EPA, discussed the progress on the Five Year Review and any input from the Town relative to the Site. The Town did not have further input other than that the NH Flying Tigers Radio Control Club Lease was in effect. Mr. Mah noted that there were some areas of fencing that needed to be addressed and that this request has been forwarded to Mr. John Trottier.

Risk Information and ARARs Review

Data provided and analyzed in Appendix D indicate no change in Site conditions which would warrant a re-evaluation of risk. In February 2002, EPA revised the Maximum Concentration Level (MCL) for arsenic from 50 parts per billion to 10 parts per billion. This change will not affect the risk calculated at the Site; however, it is a relevant and appropriate requirement. EPA will need to prepare the appropriate decision document to formally document this change to the 1996 AROD.

EPA has endorsed the State Comprehensive State Groundwater Protection Program embodied in RSA 485C. New Hampshire law holds that all groundwater should be drinking water quality. The exception is for areas in which GMZ permits have been issued to address contamination and, in that case, the purpose of the permit is to regulate the restoration of the aquifer to drinking water quality. The GMZ permits establish areas within which it is acknowledged that groundwater is contaminated above drinking water standards and includes mechanisms to prevent the use of groundwater for any purpose. Within a GMZ, actions are required to eventually return groundwater to drinking water standards. The ARPPG submitted a GMZ permit application to NHDES on 15 May 2007. After receiving comments from NHDES on 24 July 2007, a revised GMZ permit application was submitted to NHDES on 15 August 2007. The revised GMZ permit application is still under review by NHDES.

Data Review

The EPA analyzed trends in groundwater, surface water, and sediment monitoring data collected from 1993 to the present in Appendix D. The MNA data collected in October 2006 was also reviewed including: conductivity; pH; turbidity; iron; methane; hydrogen sulfide; alkalinity; dissolved oxygen; oxidation-reduction potential; total organic carbon; nitrite; nitrate; and ammonia. Additional environmental data, including groundwater elevations and precipitation data, was reviewed with respect to trends in the arsenic concentrations. A summary of the general trends in contamination levels are:

- Since 1993, most wells (8 of 11) have shown a statistical and graphical decrease in arsenic concentration over time. More recent (2002-Spring 2007) data indicates arsenic concentrations are graphically decreasing in 6 out of 11 monitoring wells, though some wells are showing increasing or no trend. However, concentrations in wells showing increasing trends in the 2002-2007 timeframe are still within the historical range of concentrations (1993-2002). See Appendix D, Technical Assessment, Section IV. A. The arsenic contamination plume in the overburden and bedrock aquifers, based on data collected in the October 2006 expanded LTEMP sampling round, are shown in Figures 6a and 6b, respectively (WESTON, 2007).

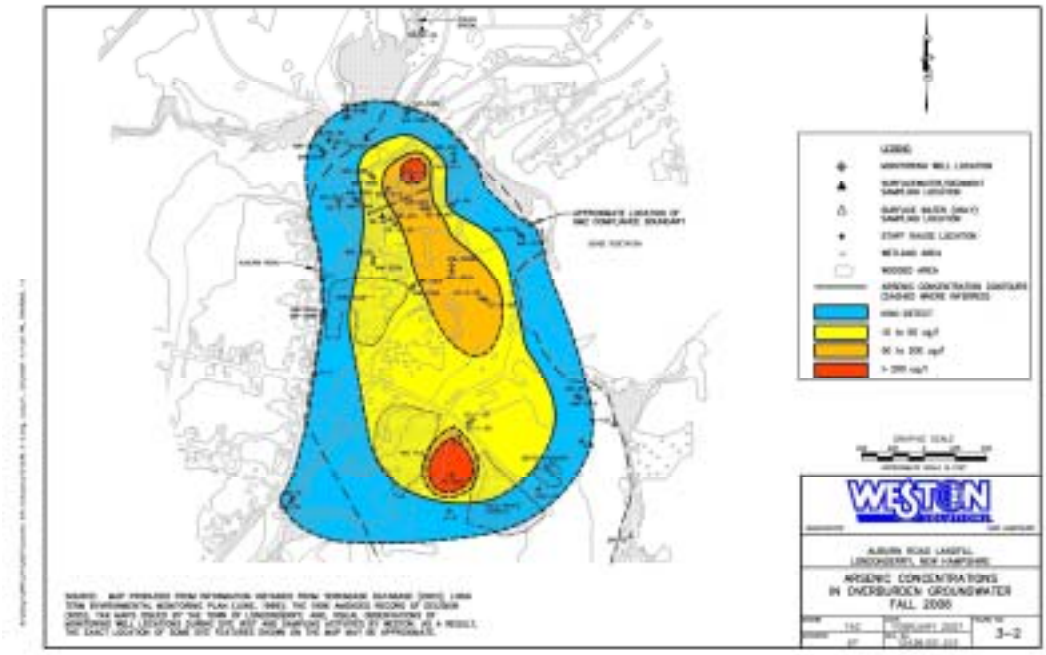

Figure 6a: Overburden arsenic concentrations October 2006.

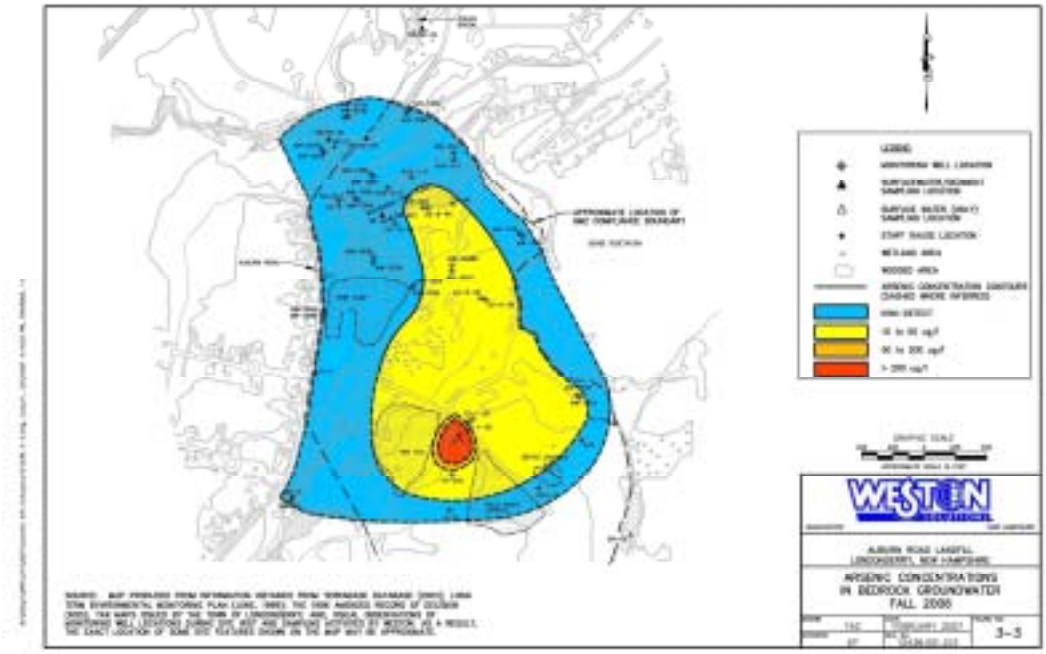

Figure 6b: Bedrock arsenic concentrations October 2006.

- Analysis of wells lying along the center-line of the arsenic plume show a declining trend over the period 1993 to 2007, as shown in Figure 7. The average concentrations shown are the result of averaging wells C-1, GZ-1-2R, GZ-6-2R, GZ-6-3R, 302A, 302BR, GZ-9-4R, NUS 1-2 and NUS 2-2. However, this analysis may be skewed in some instances because not all wells were sampled in each year. For instance, in 2007 there was only one sampling round and NUS 2-2 was not sampled, likely

biasing the analysis low. Also, well PZ-218 was excluded from the analysis provided in Figure 7 because of well construction concerns and it is also periodically dry, rendering results suspect. A replacement well/well cluster is planned for PZ-218. Regardless, Figure 7 demonstrates an overall decline in mass of the plume as well as lower maximum concentrations. The error bars on the "Average Concentration" represent one standard deviation of the average of the wells cited above.

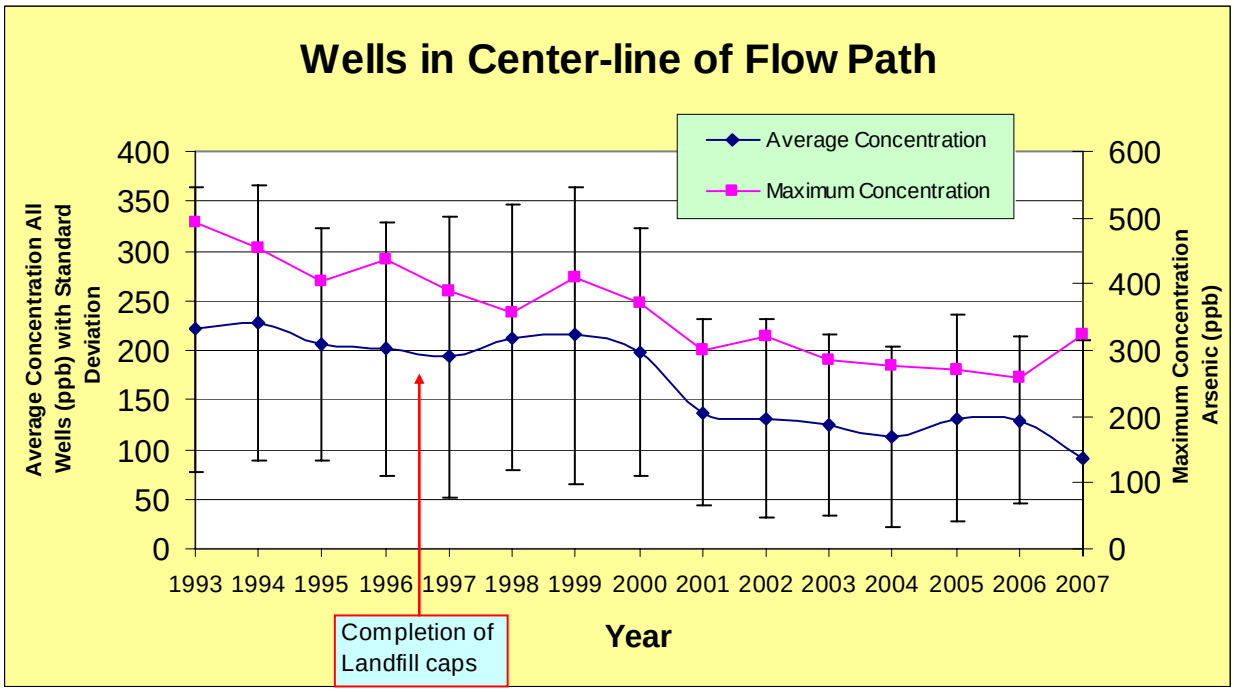

Figure 7: Average concentration of arsenic within wells along the center-line of the plume.

- Sediment concentrations of arsenic also appear to be declining and sediment toxicity testing indicates that the arsenic in the sediments does not impair the environment or benthic community. See Appendix D, Technical Assessment, Section IV. B.

- Surface water concentrations of arsenic are stable and below New Hampshire Surface Water Quality Criteria [the "Fresh Water Acute" and "Fresh Water Chronic" surface water quality criteria for arsenic (340 µg/L and 150 µg/L, respectively), as identified by NHDES Env-Ws 1700 (12/10/99)]. As noted in the last Five-Year Review, the area where groundwater is estimated to discharge to Cohas Brook, SW-9, a single sample collected in 2001 had surface water concentrations of arsenic that appeared to violate New Hampshire Surface Water Quality Criteria. However, the subsequent 11 samples collected from 2002 to 2007 found surface water at SW-9 to be below the limit. The ARPPG continues to monitor arsenic concentrations in downgradient surface water at sample location SW-9 and other locations as part of the LTEMP. See Appendix D, Technical Assessment, Section IV. B.

VII. Technical Assessment

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

NO - The 1996 AROD predicted that the then, 50 parts per billion (ppb) interim cleanup level for arsenic in off-Site groundwater would be attained within five-years after capping was completed at the Site. This five-year period expired six years ago, yet arsenic concentrations have not attained the 50 ppb cleanup level in all off-Site wells or the new interim cleanup level for arsenic of 10 ppb. A preliminary assessment of Site data in Appendix D indicates that the interim cleanup levels for the Site will not be attained in the near future. However, decreasing trends in arsenic concentrations have been observed in the majority of monitoring wells and there is no evidence of arsenic plume expansion. Further data collection in support of an updated modeling effort is required to determine more accurate cleanup times. Additionally, institutional controls for restricting groundwater use at the Site are not currently in place. While a GMZ permit application is in progress, approval of the GMZ application and recordation of the GMZ boundary is not expected to occur until after submission of this Five-Year Review.

Finally, however, it should be noted that installation of the waterline and capping of the three on-Site disposal areas are functioning as intended by the appropriate decision documents.

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

YES - Data provided and analyzed in Appendix D indicate no change in Site conditions which would warrant a re-evaluation of risk. However, in February 2002, EPA revised the MCL for arsenic from 50 parts per billion to 10 parts per billion. This will likely further extend the estimated timeframe for reaching cleanup levels at the Site.

Table 4: Changes in Chemical-Specific Standards*

Contaminant	Media	Cleanup Level	Standard		Citation/Year
Arsenic	groundwater	10 ug/L	Previous	50 ug/L	SDWA 1988
			New	10 ug/L	SDWA 2002

NOTE:
* = The interim clean up level of 70 parts per billion for trans 1,2 dichloroethylene (as stated in 1996 Amended Record of Decision) is not consistent with the MCL for this compound (100 parts per billion). A decision document will need to be published in the near future to address and correct this interim cleanup level for the Site.

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

NO - None are known at this time. However, an evaluation of the potential VOC vapor intrusion pathway should be conducted for the Site to confirm that there are no issues with vapor intrusion (see Section IX, Recommendations and Follow-up Actions).

Technical Assessment Summary

The primary contaminant at the Site is arsenic in groundwater, surface water and sediments. A smaller occurrence of trichloroethylene and tetrachloroethylene exists in one ground water well adjacent to the old Town Dump. The arsenic is present as a narrow ground water plume, six to sixty feet below the ground surface, originating between the Solid Waste Dump and Tire Dump and flowing northward to Cohas Brook. No ground water is being extracted or used in or near the plume, and nearby residents are provided with municipal water that was installed in 1987. The arsenic-contaminated ground water plume discharges to Cohas Brook forming a red to orange sediment that contains iron and some arsenic. This sediment is tested on an annual basis and has been found to be non-toxic to test organisms. Moreover, the concentrations of arsenic in the sediment do not pose a hazard to people or animals that come into contact or ingest it. The surface water has arsenic concentrations consistent with background concentrations, and at concentrations which do not exceed the NH Surface Water Quality Criteria.

A more detailed analysis of the progress toward cleanup levels in presented in the Technical Assessment in Appendix D.

VIII. Issues

In February 2002, the Drinking Water Standard for arsenic was lowered from 50 parts per billion to 10 parts per billion at both the Federal and State levels. Groundwater at the Site has not yet attained the 10 part per billion standard. It also appears that it will take additional time for the groundwater to attain the interim cleanup levels, as specified in the 1996 AROD, Site-wide. Based on projections from linear trend lines for LTEMP monitoring wells used to monitor the arsenic plume, it will likely take in excess of 20 years to reach the 10 ppb MCL for arsenic in all LTEMP monitoring wells (see Appendix D, Technical Assessment, Section IV., A. for further discussion).

Table 5 summarizes the issues for this Five-Year Review.

Table 5: Summary of Issues

Issues	Affects Protectiveness (Y/N)	
	Current	Future
1) Timeframe to reach clean up levels requires updating.	N	Y
2) Groundwater Institutional Controls are not in-place yet.	N	Y
3) Potential VOC vapor intrusion pathway requires assessment.	N	Y
4) Damaged fencing around landfill caps.	N	Y
5) Assess arsenic-iron hydroxide stability in sediments.	N	Y
6) Current arsenic MCL changed from 50 ppb to 10 ppb; trans 1,2-dichloroethylene cleanup level incorrect in AROD	N	Y

IX. Recommendations and Follow-up Actions

Table 6 summarizes the recommendations and follow up actions for this Five-Year Review.

Table 6: Recommendations and Follow-up Actions

Issue	Recommendations and Follow-up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness (Y/N)	
					Current	Future
1)	Update groundwater and solute transport modeling, including: ▪ Additional LTEMP monitoring parameters; evaluate MAROS software package and implement, as appropriate. ▪ Install replacement monitoring wells for PZ-218 and C-1, and perform other investigatory field work in this area as determined necessary. ▪ Evaluate surface water/groundwater interaction in vicinity of Whispering Pines Pond. ▪ Evaluate MNA remedy and alternative groundwater response actions to achieve and maintain performance standards.	ARPPG	EPA	12/2008	N	Y
2)	Obtain approval of revised GMZ Permit from NHDES.	ARPPG	NHDES	12/2007	N	Y
3)	Evaluate potential VOC vapor intrusion pathway.	ARPPG	EPA	12/2008	N	Y
4)	Repair fencing and continue maintenance of landfill caps, fencing, and drainage swales.	Town	EPA	12/2007	N	Y
5)	Follow up on University of Connecticut arsenic study of Cohas Brook sediments to obtain current observations and results.	ARPPG	EPA	12/2007	N	Y
6)	Prepare ESD to document change in arsenic and trans 1,2-dichloroethylene cleanup levels at the Site.	EPA	-	12/2008	N	Y

X. Protectiveness Statement(s)

All immediate threats at the Site have been addressed.

A public water supply line, implemented as Operable Unit 1 (OU1) in accordance with the 1986 ROD, provides drinking water to residences in the affected area and is protective of human health. This water supply from the Manchester, New Hampshire Water Works was installed in 1987.

The source control remedy, Operable Unit 3 (OU3), which includes the three (3) landfill caps, encapsulates contaminated materials at the Site; thereby preventing direct contact with these materials. The landfill caps also reduce flushing of contaminants from the landfill wastes. Based on observations made during the July 2007 Site inspection, OU3 is protective of human health and the environment since ongoing operation, maintenance and monitoring will ensure that the source control remedy is functioning properly.

The management of migration remedy, Operable Unit 2 (OU2), relies on the three landfill caps to function properly together with abiotic natural attenuation mechanisms to reduce the concentration of contaminants (primarily arsenic) in groundwater. EPA's analysis of Site data and conditions at the Site indicate that the remedy under OU2, monitored natural attenuation, is protective in the short-term because no current risks are present at the Site in either groundwater, surface water or sediment. However, in order to be protective in the long-term, a number of follow-up actions are recommended. These actions include, but are not limited to: installation of replacement monitoring wells; additional geochemical analyses during LTEMP; updated, more accurate groundwater modeling; and implementation of institutional controls (e.g., an approved GMZ, at a minimum).

Overall, the remedial actions at the Site are protective in the short-term, but follow-up actions at OU2 are required in order for all remedial actions to be protective in the long-term.

XI. Next Review

This Site requires on-going, statutory, five-year reviews. The next review will be conducted and issued before September 2012, five years from the date of signature of this report.

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APPENDIX A

PUBLIC NOTICE TO START FIVE-YEAR REVIEW

EPA Starts 'Five-Year Review' of Auburn Road Superfund Site

The U.S. Environmental Protection Agency (EPA) is beginning its fourth Five-Year Review of the Auburn Road Superfund Site, Londonderry, NH. Five-Year Reviews are required by law and occur every five years. The reviews determine if the cleanup is protective of human health and the environment. This Five-Year Review will be completed by Sept. 2007 and the results will be publicly available.

The Auburn Road Superfund Site cleanup plan included installing a water-line, capping of three disposal areas, establishing institutional controls, and performing monitored natural attenuation of arsenic-contaminated ground water.

Contaminants at the site included Semi-Volatile Organic Compounds, PCBs in drums and soil, and Volatile Organic Compounds as well as metals in ground water. Cleanup actions have either removed or encapsulated contaminants in soil. There are no longer any know users of the contaminated ground water.

More information about the cleanup can be found on-line at www.epa.gov/superfund/sites/auburnroad or at the Leach Public Library, 276 Mammoth Road, Londonderry.

EPA
United States
Environmental Protection
Agency New England

For more information, contact:
Byron Mah
Toll Free 1-888-372-7341,
ext.81249 mah.byron@epa.gov
www.epa.gov/superfund/sites/
auburnroad

APPENDIX B

INSPECTION CHECKLIST

Site Inspection Checklist

I. SITE INFORMATION	
Site name: Auburn Road Landfill	**Date of inspection:** 31 July 2007
Location and Region: Londonderry, NH; EPA Region I	**EPA ID:** NHD980524086 **NH Site ID:** 0101137
Agency, office, or company leading the five-year review: EPA Region I	**Weather/temperature:** Sunny, warm and humid, temperature approximately 85° Fahrenheit

Remedy Includes: (Check all that apply)

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

Attachments: ☑ Inspection team roster attached ☑ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** John R. Trottier, P.E. (Name) Asst Dir. of Public Works and Eng. (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

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

Site Inspection Checklist (Continued)

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

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

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

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

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

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

Site Inspection Checklist (Continued)

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

Site Inspection Checklist (Continued)

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
   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 During the Site Inspection visit on 31 July 2007, a section of fence at the Tile Pile was down (see photolog Appendix C).

B. Other Access Restrictions

1. **Signs and other security measures** ☐ Location shown on site map ☐ N/A
   Remarks During the Site Inspection visit on 31 July 2007, the signage at gate to Tire Pile was missing. (see photolog Appendix C).

Site Inspection Checklist (Continued)

C. Institutional Controls (ICs)

1. **Implementation and enforcement**

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

Type of monitoring (*e.g.*, self-reporting, drive by) Visual inspections
Frequency Periodic
Responsible party/agency PRPs
Contact Joanne Wallach (Name) | Project Manager, ExxonMobil (Title) | 1-703-846-3354 (Phone no.)
John Trottier (Name) | Town of Londonderry (Title) | 1-603-432-1100 (Phone no.)

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

Specific requirements in deed or decision documents have been met ☑ Yes ☐ No ☐ N/A
Violations have been reported ☐ Yes ☑ No ☐ N/A
Other problems or suggestions: ☐ Report attached
Institution controls have been in place through the Consent Decree that binds the Town in maintaining ICs on the property (Site). The groundwater PRP have established a Groundwater Management Zone (GMZ) on the Site and affected adjacent property to the north.

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

D. General

1. **Vandalism/trespassing** ☐ Location shown on site map ☑ No vandalism evident
Remarks Previous trespassing at the Site was limited to accessing with off-road vehicles; however no evidence of trespassing was noted during the 31 July 2007 Site Inspection. The three landfill areas are individually fenced and vehicles have not accessed the landfill cap areas. No damage was noted.

2. **Land use changes on site** ☐ N/A
Remarks Town has lease agreement with a tenant (model airplane club) to utilize the property for passive recreational activities.

3. **Land use changes off site** ☑ N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☑ Applicable ☐ N/A

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

Site Inspection Checklist (Continued)

B. Other Site Conditions

Remarks _ The 2002 Five-Year Review Site Inspection noted potential impacts from beaver dams. During the 31 July 2007 Site Inspection, no damming that impacted the landfill areas was noted. In addition, the dam at the outlet of Whispering Pines Pond had the stop logs removed, no vegetation impeding flow, and a black polyethylene piping installed to maintain minimal outflow from the pond (see photolog in Appendix C). _____

_____

_____

VII. LANDFILL COVERS ☑ Applicable ☐ N/A

A. Landfill Surface

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

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

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

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

5. **Vegetative Cover** ☑ Grass ☑ Cover properly established ☑ No signs of stress
☐ Trees/Shrubs (indicate size and locations on a diagram)
Remarks_During the 31 July 2007 Site Inspection, the landfill caps appeared to be in good condition and recently mowed._____
_____

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

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

Site Inspection Checklist (Continued)

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_____

Site Inspection Checklist (Continued)

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 ☑ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____
_____

2. **Gas Monitoring Probes**
☑ Properly secured/locked ☑ Functioning ☐ Routinely sampled ☑ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks Monitoring is performed at the vents._____
_____

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

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

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

Site Inspection Checklist (Continued)

E. Gas Collection and Treatment ☐ Applicable ☑ N/A

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

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

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

F. Cover Drainage Layer ☑ Applicable ☐ N/A

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

2. **Outlet Rock Inspected** ☑ Functioning ☐ N/A
   Remarks Drainage layer outlets to crushed rock apron which is functioning as designed.
   _____

G. Detention/Sedimentation Ponds ☐ Applicable ☑ N/A

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

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

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

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

Site Inspection Checklist (Continued)

H. Retaining Walls ☐ Applicable ☑ N/A

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

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

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

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

2. **Vegetative Growth** ☑ Location shown on site map ☐ N/A
   ☑ Vegetation does not impede flow
   Areal extent Approx. 2,000 linear feet of swales Type Misc. shrubs, grasses
   Remarks The vegetation does not appear to impede drainage flow. No debris or water marks were noted that indicated restriction of flow. Some additional maintenance by the Town is required. _____
   _____

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

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

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☑ N/A

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

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

Site Inspection Checklist (Continued)

C. Treatment System ☐ Applicable ☑ N/A

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

   Remarks_____
   _____

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

   Remarks_____
   _____

3. **Tanks, Vaults, Storage Vessels**
   ☑ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance

   Remarks_____
   _____

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

   Remarks_____
   _____

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

   Remarks_____
   _____

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

   Remarks_____
   _____

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

Site Inspection Checklist (Continued)

D. Monitored Natural Attenuation

1. **Monitoring Wells** (natural attenuation remedy)
☑ Properly secured/locked ☑ Functioning ☑ Routinely sampled ☑ Good condition
☑ All required wells located ☑ Needs Maintenance ☐ N/A
Remarks Technical assessment of the remedy is located in Appendix D of the Five-Year Review Report.

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.).

The remedy is designed to reduce contact of groundwater and vadose water with the wastes contained in the capped landfill areas and minimize the leaching of arsenic. The contaminant concentrations have declined in many of the monitoring wells; however, there are wells exhibiting no significant change an increasing trend in arsenic concentration over the last five years.

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.

The attached technical assessment finds that there are several data gaps that make assessment of long-term progress and determination of groundwater interaction with waste material under the landfill caps difficult. The ROD interim cleanup level for arsenic of 50 parts per billion has decreased to 10 parts per billion. As noted in the last Five-Year Review, the lowering of the standard will lengthen the time required to meet cleanup levels.

Site Inspection Checklist (Concluded)

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. _None_
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. _The attached technical assessment identifies recommendations regarding the collection of additional data._

APPENDIX C

PHOTOGRAPHS DOCUMENTING 2007 SITE CONDITIONS

PHOTOGRAPHY LOG SHEET
Auburn Road Landfill ● Londonderry, New Hampshire

SCENE: View of drainage swale between Tile Pile and Town Dump (facing south).
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

SCENE: View of drainage swale between Tire Pile and Town Dump (facing north).
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

PHOTOGRAPHY LOG SHEET
Auburn Road Landfill ● Londonderry, New Hampshire

SCENE: View of western side of Tire Pile landfill cap (facing south).
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

SCENE: View of eastern side of Tire Pile landfill cap (facing south).
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

PHOTOGRAPHY LOG SHEET
Auburn Road Landfill ● Londonderry, New Hampshire

SCENE: View of access gate to Tire Pile landfill cap (facing southwest). Note missing signage.
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

SCENE: View of damage to Tire Pile landfill perimeter fencing (facing southeast).
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

PHOTOGRAPHY LOG SHEET
Auburn Road Landfill ● Londonderry, New Hampshire

SCENE: View of Solid Waste landfill cap (facing southeast).
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

SCENE: View of access gate to Solid Waste landfill cap (facing southeast).
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

PHOTOGRAPHY LOG SHEET
Auburn Road Landfill ● Londonderry, New Hampshire

SCENE: View of access road to Town Dump (facing north).
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

SCENE: View of access gate and signage to Town Dump landfill (facing north).
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

PHOTOGRAPHY LOG SHEET
Auburn Road Landfill ● Londonderry, New Hampshire

SCENE: View of perimeter fencing and signage along north side of Town Dump landfill from Auburn Road (facing east).
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

SCENE: View of Town Dump landfill cap from Auburn Road (facing southeast).
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

PHOTOGRAPHY LOG SHEET
Auburn Road Landfill ● Londonderry, New Hampshire

SCENE: View of outlet of Whispering Pines Pond and installed drainage pipe (facing southeast).
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

SCENE: View of outlet of Whispering Pines Pond and installed drainage pipe (facing northwest).
DATE/TIME: 31 July 2007 **PHOTOGRAPHY BY:** D. Brammer

APPENDIX D

TECHNICAL ASSESSMENT

Appendix D
Technical Assessment of Contaminant Status

Auburn Road Landfill
Londonderry, New Hampshire
September 2007

ABSTRACT

Overall, indications are that the groundwater at the Site is trending towards attaining the interim cleanup levels. However, these interim cleanup levels are being attained at a slower rate than anticipated by the 1996 Amended Record of Decision (AROD). The AROD predicted that the interim cleanup level, at the time, of 50 parts per billion (ppb) would be attained in off-Site groundwater within five years of capping in 1996, based on contaminant modeling. In February 2002, EPA revised the Maximum Concentration Level (MCL) for arsenic from 50 ppb to 10 ppb which will likely increase the timeframe to meet this new interim cleanup level for arsenic at the Site. Monitoring of sediments indicates that no ecological impairment occurs. Presently, no risk is posed to public health or the environment from contaminants at the Site. A review of the Site documents and current literature indicate that there are data gaps that make a complete assessment of Site progress difficult at this time. As such, this document recommends that the monitoring program needs to be modified to better assess water levels and geochemical conditions in the aquifer, and previous modeling efforts need to be updated to determine a more accurate estimate of cleanup times.

CONTENTS

Figures

Tables

I. Introduction

The purpose of this 2007 Technical Assessment document is to define the basis and progress of the cleanup of the Auburn Road Landfill Superfund Site. The issues discussed within this analysis will outline the scientific basis of the actions taken at the Site and the technical requirements to achieve the cleanup goals for the Site. To evaluate the conditions at this Site, this document will:

- List the primary contaminants and exposure routes as well as the risks associated with each;
- Assess current Site conditions with respect to attaining cleanup goals;
- Evaluate progress towards meeting the cleanup goals; and
- Recommend improvements in assessing Site conditions.

Site remedy decision documents include a 1986 Record of Decision (ROD) for a waterline, a 1989 ROD for the landfill caps and a groundwater remedy, and a 1996 Amended ROD that changed the groundwater remedy based on new data. Previous Five-Year Reviews include those conducted in 1992, 1997, and 2002. Table 1 provides a list of past conditions and responses to those conditions at the Site.

Table 1 Conditions and Responses at the Site

Condition	Response
Three disposal areas totaling 12 acres are within the 200 acre Site.	The disposal areas were capped in 1995. Drainage improvements finished in 1996.
Groundwater is contaminated with arsenic and volatile organic compounds.	Groundwater is monitored twice a year. Public drinking was provided via the waterline along Auburn Road.
Sediments in Whispering Pines Pond and Cohas Brook are contaminated with arsenic.	The sediments are monitored by testing with organisms for toxicity once a year.

II. Risk

Table 2 lists the current and potential risks posed by contaminants at the Site. The highest current, potential human health and ecological risks are associated with the arsenic contamination of sediment and surface water in Cohas Brook. Sediment contamination is present in Whispering Pines Pond; however, not at the same concentrations as in Cohas Brook. This arsenic likely results primarily from the discharge of groundwater from the contaminated aquifer. If the contaminated groundwater at the Site were used as a drinking water source it would generate an unacceptable risk primarily due to arsenic concentrations above its MCL of 10 ppb.

Table 2 Status of Contamination		
Contaminant & media	**Potential exposure route**	**Status**
Arsenic in sediments and surface water in Cohas Brook and Whispering Pines Pond.	Human Health via incidental skin contact and drinking. Environment via contact.	Acceptable public health risk. Environmental risk assessed through yearly sediment toxicity testing, no adverse effects observed since inception of testing in 1996.
Arsenic in groundwater. Volatile Organic Compounds in groundwater.	Future drinking water.	Groundwater usage of any type is expected to be restricted in area of contaminated plume. Water line installed by the Town in 1987.

There are other potential risk factors at the Site such as minor emissions of gas from the landfill gas vents; however, annual monitoring performed by the Town's contractor demonstrates no risk from landfill gases such as methane. Direct contact with solid waste is prevented by the caps and fencing of the three disposal areas (Old Town Dump, Tire Pile, Solid Waste Landfill). The layered, low-permeability caps over each of the three disposal areas are periodically inspected by the Town's contractor, as well as the EPA and State project managers.

The primary questions with respect to the arsenic-contaminated sediment and surface water are: first, is there a hazard to the public that may swim, wade or accidentally contact the sediment; and second, do the concentrations impair the environment? With respect to the first question, risks were calculated with the following assumptions:

- Adolescents, between the ages of 6 and 15 years old, will visit Cohas Brook 20 days per year and the sediment they contact or incidentally ingest contains 218 to 1,340 parts per million (EPA, 1996a).

The risk calculated from such arsenic exposure averages 9×10^{-7} and results in a reasonable maximum risk of 2.2×10^{-5} which is within EPA's acceptable risk range. In addition, since the fall of 2000 the maximum detected arsenic concentration in sediment has been 156 mg/kg in Cohas Brook. Therefore, sediment contact and ingestion is not a concern. Contact with surface water was not calculated as the concentrations were too low (EPA, 1996a).

The second question, ecological risks, has been assessed through toxicity testing. Higher concentrations of arsenic in the sediment became evident in the mid 1990s. Since the Amended ROD in 1996 the PRP group has been conducting toxicity tests. In 1998, the toxicity testing expanded to two organisms to assess impacts on the environment. Toxicity sampling using the two test organisms *Hyalella azteca* and *Chironomous tentans* has shown no impairment from the inception of testing through 2006 (WESTON, 2007).

III. Assessment of Contamination

A. Origin of Arsenic Contamination

Arsenic contamination in the groundwater, on-Site and off-Site, can be landfill-derived, naturally-occurring, and/or have other anthropogenic sources (Table 3).

Table 3
Potential Sources of Arsenic in Groundwater

Source Category	Source Type
Landfill-Derived	Disposal Area Waste Materials
	Arsenical Pesticides/Herbicides
Naturally-Occurring	Lithogenic - Overburden
	Lithogenic - Bedrock
	Atmospheric Deposition
Other Anthropogenic	Point and Non-Point Run-Off
	Atmospheric Deposition

Arsenic contamination in the groundwater, on-Site and off-Site, may originate in the landfill. The strongest piece of evidence for this alternative is the higher concentrations in the vicinity of the landfills. In particular, well PZ-218 is the most highly contaminated well at the Site. Water that infiltrates the landfill and discharges to this point travels only 200 feet through the aquifer matrix. The occurrence of arsenic in PZ-218 more strongly supports a landfill source rather than the arsenic source being the mobilization of naturally occurring arsenic (driven by leaching of TOC from the landfill and the generation of reducing conditions which solubilizes the arsenic).

Previous LTEMP reports have discussed the mobilization of native arsenic from the aquifer matrix; however, there have been no analysis or testing of this hypothesis. There is some historical information, though, which indicates that the leaching potential from the Tire Pile and Solid Waste Landfill is limited and that the concentration of arsenic leaching from the landfills is low and below concentrations measured in a number of wells, as discussed below.

Soil sample results from early site investigations suggest that the landfill areas may not be directly contributing arsenic to the groundwater; and do not necessarily indicate the landfill areas are the only potential source of arsenic in the groundwater. Groundwater data collected in 1992 and 1993 from piezometers installed in the three disposal areas prior to capping, indicated arsenic concentrations in shallow groundwater in the disposal areas ranged from 7 ug/l to 80 ug/l (SME, 1993).

Early site investigations also indicated that waste in the Tire Pile and the Solid Waste Landfill remained essentially unsaturated throughout the year. Conversely, the Town Dump was reported to be historically saturated throughout the year. A comparison of 2006 groundwater elevations extrapolated beneath the Town Dump with the bottom of waste elevations at former piezometer locations suggests that the groundwater was in contact with the waste during the spring and fall 2006 sampling events.

Following the same procedures utilized by EPA in the 2002 consistent with current conditions, the arsenic in the entire aquifer is of limited quantity, about 40 pounds presently in the ground water, and could be the result of disposal in the landfill, the use of arsenical pesticides, or both.

Assume a mean concentration of arsenic of 100 ug/l which over a plume that has a volume of (800 meters long x 15 meters thick x 100 meters wide x 15% porosity) = 180 million liters gives a mass of 18,000 g of arsenic or about 40 pounds.

The above calculation is for arsenic dissolved in ground water in the aquifer now (i.e. April 2007) and does not account for the flow over the years that has discharged to surface water or that remains sorbed to portions of the aquifer material.

Based on an evaluation of the current overburden arsenic concentration contour map (see Figure 6a within the Five Year Review report), the center of mass of the overburden arsenic plume is located approximately midway between piezometer PZ-218 and monitoring well NUS-1-2 along the central axis of the plume (in the area between monitoring wells MW-102A/B and GZ-6-2R/3R. Based on an evaluation of the current bedrock arsenic concentration contour map (see Figure 6b within the Five Year Review report), the center of mass of the bedrock arsenic is located approximately in the area between monitoring wells GZ-1-2R/3R and MW-104B. Both estimates of the arsenic plume mass and center locations will be further refined during the upcoming evaluation of the MAROS software during LTEMP sampling in 2007 and 2008.

B. Processes in Groundwater

A summary of typical groundwater geochemistry values at the Site is provided below in Table 4.

Table 4
Summary of Typical Site Groundwater Geochemistry

Parameter	Overburden	Bedrock
	Average or Range	
Dissolved Oxygen (mg/l)[1]	1.0	2.4
pH (SU)[1]	6.5	7.5
Oxidation-Reduction Potential (mV)[1]	14	40
Conductivity (uS/cm)[1]	376	385
Turbidity (NTU)[1]	5	5
Alkalinity (mg/l)[1]	184	177
Ferrous Iron (mg/l)[2]	0.0 to 4.0	
Methane (ug/l)[3]	10 to 3,460	
Hydrogen Sulfide (ug/l)[3]	Non-Detect to 1,040	
Sulfate (mg/l)[2]	< 5.0 to 36	
Sulfide (mg/l)[3]	< 1	
Total Organic Carbon (mg/l)[3]	150 to 180 (under landfills) 10 to 80 (downgradient of landfills)	
Nitrate (mg/l)[3]	< 5.7	
Nitrite (mg/l)[3]	< 0.05	
Ammonia (mg/l)[3]	< 21	

Notes:
1. Data from spring 2000 through fall 2006
2. Data from fall 2006
3. Data from 1992-1993

For the period Spring 2000 through Fall 2006, the average dissolved oxygen (DO) values indicate the overburden groundwater is generally anoxic (<2 mg/l DO_2); whereas, the bedrock groundwater is typically oxic (>2 mg/l DO). Eh measurements generally found reduced conditions but not decidedly so. Eh values are typically of limited utility in evaluating redox conditions within an aquifer.

Also, one of the primary components of the remedy, lowering the water table within the landfills remains difficult to monitor adequately. An increase in water level monitoring, both in additional wells and in nearby surface water bodies has been conducted. However, water levels under the Town Dump may be inferred, and a lack of monitoring well density in the vicinity of the Tire Pile and Solid Waste landfill areas did not allow a determination of groundwater elevations under these former disposal areas.

Based on 1992 data, total organic carbon concentrations (TOC) were highest (150 to 180 mg/l) in samples collected from former landfill piezometers. Downgradient of the landfills, the historic TOC concentrations were lower (10 to 80 mg/l). Therefore, the landfills were concluded to be a source of organic carbon which could be used to support microbial reductive dissolution to mobilize arsenic in the groundwater. No TOC data has been collected since 1992.

1. Arsenic Concentrations and Environmental Data

The total arsenic concentrations and groundwater elevations for the period Spring 2000 through Fall 2006 were reviewed and graphically analyzed (WESTON, 2007). Examination of these data indicates the following patterns between 2000 and 2006:

- The highest total arsenic concentration at any individual well is usually associated with a fall sample. To a lesser extent the lowest total arsenic concentration at any individual well is usually associated with a spring sample.

- An increase in total arsenic concentration in any well is commonly associated with the fall samples (and a relative lowering of the groundwater table). Repeated total arsenic spikes associated with fall samples and lower groundwater elevations are most strongly shown in monitoring wells GZ-6-2R and MW-303B.

Daily total precipitation data was obtained for the period beginning 1 January 2000 to 31 January 2007 (Weather Resource, 2006). The precipitation data was collected from the weather station (No. 19986) at the Manchester Airpark located approximately 4.5 miles west of the Site. An evaluation of 30-day precipitation totals prior to individual sampling events and total arsenic concentrations was conducted for selected monitoring wells for the period Spring 2000 to Fall 2006. The results do not indicate there is any correlation between 30-day precipitation totals and the resultant total arsenic concentrations in either the overburden or bedrock aquifer at the Site.

C. The Fate of Arsenic in Groundwater

Arsenic is primarily present in groundwater as inorganic oxyanions of arsenite (+3) and arsenate (+5). Under reducing conditions the more soluble arsenite form predominates; whereas, the less soluble arsenate form is more prevalent under oxidizing conditions. Furthermore, arsenite is expected to be less strongly sorbed to oxides and clays within the aquifer.

Under the circumneutral pH values of the groundwater at the Site the solubility of arsenic is expected to be primarily controlled by co-precipitation with iron oxides. Both arsenite and arsenate adsorb strongly most notably to iron oxides and oxyhydroxides. The contaminated groundwater plume contains significant amounts of iron which is in the reduced or soluble ferrous form (+2) because the groundwater is anaerobic. Once this iron and arsenic-contaminated groundwater discharges to the oxygenated surface waters of Cohas Brook and Whispering Pines Pond, the iron rapidly changes valence state to the ferric (+3) insoluble form and precipitates as an amorphous iron hydroxide (Hounslow, 1980). The iron hydroxide rapidly scavenges the arsenic reducing the concentration of arsenic in surface waters to close to detection limits. The sorption of arsenic into the sediments creates sediments with a higher concentration of arsenic (historically concentrations up to 1,550 parts per million or mg/kg were measured in 1996). Sediment arsenic concentrations have been generally stable and consistently lower than 20 mg/kg the last 3 years (see Figure 12b).

D. Processes in Sediments in the Area Adjacent to the Site

The primary questions with respect to the arsenic-contaminated sediments are:

- Are there conditions under which arsenic may be mobilized out of the sediment and create human health or ecological hazard?
- Is the arsenic bio-available to organisms in the sediment?

As explained earlier, the sediment in its present form does not appear to pose a human health or ecological risk that is unacceptable according to EPA guidelines. A summary of the potential biotic and abiotic arsenic cycling processes within the Site sediments is presented below as Table 5.

Table 5
Summary of Potential Arsenic Cycling Processes in Site Sediments

	PROCESSES		DESCRIPTION
REDUCTION ($As5+ \rightarrow As3+$)	Reductive Dissolution	Sorbed phases	• Initial dissolution of Fe(III)-oxide releases As5+; followed by • Subsequent rapid As5+ reduction biotically or abiotically
		Solid phases	• Initial reduction of As5+ on surface; followed by • Release of As3+ to environment via dissolution of Fe(III)-oxide
	Microbial Reduction	Dissimilatory	• As5+ respired by microbe (i.e. terminal electron acceptor); in conjunction with • Use of electron donor (i.e. carbon source) by microbe • As3+ released to environment
		Detoxification	• Microbial As5+ uptake; followed by; • As5+ reduced within cell; followed by • Excretion of As3+ to environment
	Abiotic Reduction	Dissolved sulfide	• Dissolved sulfide serves as an electron donor • As3+ release to environment; which may be followed by • Precipitation of arsenite sulfide (low pH)or arsenosulfite compounds (high pH)
OXIDATION ($As3+ \rightarrow As5+$)	Chemical (Abiotic)	Oxidation	• As3+ oxidized using various oxidants (e.g. OH^- radical, H_2O_2, Fe(III), MnO_2, O_2)
	Microbial Oxidation	Detoxification	• Microbial As3+ oxidized at cell membrane; followed by • Release of As5+ to environment
		Chemolitho-autotrophs	• Microbe uses As3+ as electron donor for the • reduction of oxygen or nitrate for cell growth

(Table developed primarily from Inskeep, 2002)

The questions posed above ask what is the long-term stability and availability of the arsenic locked into the iron-arsenic hydroxide that forms on the banks of Cohas Brook and Whispering Pines Pond. Recent research has found that iron hydroxides convert to iron oxides, principally goethite and hematite with half-lives on the order of 300 days or less. During the conversion the concern is that the arsenic will be ejected or desorbed from the mineral complex as transformation progresses. However, the results of the research indicate that transformation occurs much faster under biotic conditions and that the arsenic remains sorbed despite the mineral symmetry changing (Ford, 2002). Therefore, it appears that the iron-arsenic complex is stable and remains unavailable for contact or ingestion as a dissolved species by people or organisms.

There is also the concern regarding anoxic events in the aquatic environment. These could occur in the hypolimnion of an impoundment during the summer, under the ice in winter, or during times of high biological oxygen demand. Essentially, any environment or condition that lowers oxygen concentrations in surface waters is suspect to the re-mobilization of arsenic in the more toxic arsenite form. The notion is that in an anoxic environment the valence state for iron will change from the insoluble +3 to the soluble +2. Once the iron has dissolved, there is nothing left to bind the arsenic. In a reducing environment arsenic goes from a valence state of +5, arsenate, to the more toxic +3, arsenite. Under an anoxic environment the potential exists for the arsenic to become more mobile and toxic, and for concentrations in the surface water to increase.

Recent work has shown that in anoxic sedimentary environments the arsenic and iron are mobilized temporarily; however, the presence of nitrate quickly changes the valence state back to the particle-reactive forms of +3 and +5, for iron and arsenic respectively (Ford, 2002). In the literature reference cited, Upper Mystic Lake had concentrations of up to 2100 µg/kg of arsenic controlled by concentrations of 40 µM of nitrate. The implications for the Auburn Road Site are that bioavailability may be limited in a similar fashion and that iron-arsenic mobility in sediments should be limited.

Other work has found that arsenic mobility from sediment depends greatly on the ligand species that arsenic is sorbed to. Arsenic can be sorbed via ionic bonds which may be dissolved by the addition of various salts. Strongly sorbed arsenic in humic acids or oxides may be liberated by the addition of phosphates such as in the case of agricultural runoff. Arsenic complexed with sulfides may be mobilized through the addition of oxygenated water or high concentrations of nitrates (Keon, 2001). However, in New England, the predominance of iron-rich metamorphic and igneous rocks generates iron-rich surface water environments where iron oxyhydroxides and other iron minerals are the predominant ligand and sediment component. The iron minerals, as cited above, scavenge arsenic and other metals controlling their concentration in surface waters.

Inherent in the implications of the articles cited above, are that arsenic concentrations in sediment may not pose a problem. The current sampling of sediments is being performed to ensure that the arsenic is indeed immobile and unavailable to humans and biota. The above discussions point to the fact that although it is unlikely that the arsenic in sediments in Cohas Brook or Whispering Pines Pond is mobile, there are conditions where arsenic may become mobile or increase in bio-availability. The literature indicates that toxicity and mobility of arsenic in the hyporheic zone of Cohas Brook and Whispering Pines Pond is a function of a number of parameters including specific ligands, redox state, and nutrients.

IV. Overall Progress in Attaining Cleanup Levels

The 1996 Amended ROD incorporated the interim groundwater cleanup levels established in the 1989 ROD. However, all of the contaminants of concern except one (arsenic) were either no longer found or were confined to a single well, MW-102A, which directly abuts the Old Town Landfill. Trans 1,2 dichloroethylene, 2-butanone, toluene and lead were all an order-of-magnitude or greater *below* their cleanup levels. Although vinyl chloride and benzene were both reported in the 2002 Five-Year Review as being detected in MW-102A at 6 parts per billion, which was slightly above their respective New Hampshire Ambient Groundwater Quality Standard (AGQS), vinyl chloride and benzene have not been detected in MW-102A for the

period Spring 2000 through Spring 2006. In MW-102A, for this same time period only trichloroethylene (TCE) and tetrachloroethylene (PCE) have been detected in concentrations which exceed the AGQS. From 2000 to 2006, no other wells sampled for VOCs have shown exceedence of AGQS. Arsenic concentrations in well MW-102A have been below 10 ug/l since 1993.

Most recently (2005 through 2007), arsenic exceedances of the New Hampshire AGQS (10 ug/l) have remained in 11 of the 17 monitoring wells currently sampled as part of the long-term monitoring program at the Site. The potential risk that arsenic generates if the groundwater is used as a drinking water source makes it a concern at the Site, although a water line was installed to residents along portions of Auburn Road in 1987 (including Whispering Pines Mobile Home Park, Longwood Avenue, and Shady Lane). The 1996 Amended ROD chose monitored natural attenuation as the groundwater remedy. At that time it was believed that capping the disposal areas would alter the subsurface environment and that off-Site groundwater would attain the previous interim cleanup level of 50 ug/l arsenic within five years. It was also believed that the natural cleanup of groundwater would also facilitate the natural recovery of the sediments and surface waters in Cohas Brook and Whispering Pines Pond.

In the eleven years since the 1996 Amended ROD the groundwater concentrations of arsenic are generally declining (but slowly); however, they remain above the new interim cleanup level of 10 ug/l in most LTEMP wells.

It is encouraging that as of Fall 2007, four of the monitoring wells monitored as part of the LTEMP have arsenic concentrations which have decreased from historic levels greater than 50 ug/l to levels below the previous interim clean up level of 50 ug/l. However, to date the 2002 EPA revised Maximum Concentration Level for arsenic of 10 ug/l has not been met in these wells. It is apparent that attaining the 10 ug/l interim cleanup level for arsenic will take additional time.

Straight line regression of the contaminant trends in each well demonstrates that most cleanup levels may not be attained before the next five-year review. However, a simple regression should not be used to define trends unless the controls on that trend indicate that it is useful. Arsenic concentrations should be controlled primarily by redox and it is unknown if the relationship between the two is linear. Additionally, other controls may affect arsenic concentrations as well, rendering a simple regression analysis of limited value. Asymptotic behavior of arsenic concentrations could either greatly shorten or lengthen, depending on kinetics, the time to attain cleanup levels. Additional monitoring and analysis has been performed in an attempt to determine the controls on arsenic concentrations; however, more work is needed in order to update and develop more accurate estimates of cleanup times.

The use of the landfill covers and surface water management at the Site to lower the water table and limit anaerobic zones or leaching zones that solubilize arsenic into the groundwater may significantly minimize further mobilization of arsenic. In the following subsections the behavior of arsenic in individual wells will be analyzed with respect to attaining cleanup levels, the status of organic contaminants will be discussed, and the nature and status of sediment and surface water contamination by arsenic will be outlined.

A. Arsenic Contaminated Groundwater

Arsenic-contaminated groundwater flows from the three disposal areas at the Auburn Road landfill, northward and discharges to Cohas Brook, although a minor component discharges to Whispering Pines Pond. The 1996 Amended ROD stated that natural attenuation would attain cleanup levels in off-Site groundwater within five years of capping the disposal areas. However, currently, the interim cleanup levels set for the Site have not been obtained in all wells.

The 1996 Amended ROD contained a number of trip-wires for arsenic groundwater contamination which, if met, would require further investigation and potential, active remedial action. In essence, the triggering mechanisms for investigation and potential active remedies are: 1) groundwater contaminated by the Site moves northward from Cohas Brook; 2) a violation of New Hampshire Surface Water Quality Regulations Env-Ws 430-438; and, 3) if arsenic-contaminated sediments are found to be toxic to aquatic life.

EPA modified the monitoring of groundwater at the Site in 1997 to account for the presence of over a decade of data on many wells. The Agencies believed that monitoring at a limited number of specific wells would be more indicative of trends at the Site. The simple and homogenous Site geology enabled the use of far fewer wells to develop a model of Site contamination. Site geology consists of glacial outwash sands that thicken from 0 feet in the southern part of the Site to over 75 feet in the northern part of the Site. Lying beneath the outwash sand is a thin layer of till that varies from 0 to 20 feet in depth, and then the top of bedrock. Almost all flow, and contamination, is in the overburden material that has transmissivities as high as 140 ft^2 per day.

As part of this Five-Year Review, eleven LTEMP monitoring well locations were evaluated for trends in arsenic concentrations and are listed in Table 6. Monitoring wells GZ-1-2R, GZ-6-2R, GZ-6-3R, MW-302BR, NUS-1-2, NUS-2-2, PZ-218, C-1, and MW-302A were selected to evaluate the approximate centerline of the current arsenic plume. Monitoring well MW-303B was selected to evaluate groundwater conditions downgradient of the Town Dump (between the Dump and Whispering Pines Pond). Monitoring well MW-109B was selected to evaluate groundwater downgradient of the plume. The remaining LTEMP monitoring wells have a limited data set (GZ-9-4R data only since 2000) or have met/consistently been below the interim cleanup level of 10 ppb (MW-102A, MW-303A, MW-1A, and MW-1B). Since 1993, most wells (8 of 11) have shown a statistical and graphical decrease in arsenic concentration over time (Table 6, and Figure 1-11, respectively).

Table 6
Arsenic Statistical Summary

Well ID	Available Data Set (1993-spring 2007)							Recent Data (2002-spring 2007)	
	Arsenic Concentrations (ug/L)				Arsenic Trends			Arsenic Trends	
	Minimum	Maximum	Arithmetic Mean	Median	Mann-Kendall Test	Linear Graphs		Linear Graphs	
					Trend	Trend	R^2	Trend	R^2
Overburden Wells:									
GZ-1-2R	34.1	122	66.1	54.8	D	D	0.6456	D	0.3374
GZ-6-2R	12.9	436	251.3	269	D	D	0.7493	D	0.2423
GZ-6-3R	131	366	166.9	155	I	NT	0.0091	NT	0.0107
MW-109B	1.6	268	116.5	160	D	D	0.529	D	0.5522
MW-302BR	1.4	248	146.1	199.5	D	D	0.6181	I	0.1758
MW-303B	9	52.8	30.3	28.8	NT	I	0.0773	D	0.5273
NUS-1-2	55.3	392	304	312	D	D	0.5006	D	0.4008
NUS-2-2	105	173	128.5	124	D	D	0.172	D	0.3828
PZ-218	72.1	976	565.8	569.5	NT	D	0.1365	I	0.3899
Bedrock Wells:									
C-1	33.3	494	318.7	362	D	D	0.4753	I	0.9064
MW-302A	10.1	67.2	42.6	43.7	D	D	0.6326	I	0.0244

Notes:
D = Decreasing over time
I = Increasing over time
NT = No Trend over time
Trends determined by Mann-Kendall Test are at 90% confidence

Based on projections of linear trend lines for LTEMP monitoring wells used to monitor the arsenic plume, it will likely take in excess of 20 years to reach the 10 ppb MCL for arsenic in all LTEMP monitoring wells. However, the problems with linear regression have been point out previously in this Appendix. In a like sense, Mann-Kendall statistical analysis should not be blindly applied with respect to the data either. The Mann-Kendall analysis does not examine the magnitude of the resulting decrease or increase, or if the concentrations exceed cleanup levels, or when cleanup levels will be attained. In Table 6 above, the Mann-Kendall analysis does find that concentrations in 8 of 11 wells are decreasing, yet only 1 of those 8 wells has a mean concentration that is below the previous, 50 ppb, interim cleanup level. However, examining the individual plots for wells GZ-1-2R, MW-302BR, MW-109B and MW-303B that follow, one finds that the concentrations are mostly all below 50 ppb and, in some cases, at or below the new interim cleanup level of 10 ppb during the last 3 years. One item of concern that does warrant additional investigation is the variability of groundwater concentrations in some wells.

Statistical analysis like that shown above should not be considered without further analysis of other parameters such as location, water quality parameters, and other factors to determine the significance of such trends. Additional monitoring and analysis still needs to be performed to determine the controls on arsenic concentrations and to update and develop more accurate cleanup times for the Site.

In the following subsections the selected monitoring wells will be listed, the trend of concentrations of arsenic in various wells will be analyzed, a comparison to the trip-wires in the 1996 AROD will be evaluated, and the potential engineered remedies for this Site will be evaluated. A summary of the current groundwater long-term environmental monitoring program (LTEMP) is shown in Table 7.

Table 7:
Groundwater Monitoring Program as of 2006

Monitoring Well ID	Sampling Rationale	TotalDepth (ft bgs)	Depth to Bedrock (ft bgs)	Screened Interval (ft bgs)	Spring			Fall		
					Arsenic	VOCs	Water Level	Arsenic	VOCs	Water Level
LTEMP Overburden Monitoring Wells										
GZ-1-2R	Plume monitoring	17.5	Unknown	7.5 - 17.5	X	-	X	X	-	X
MW-109B	Downgradient location	29	Unknown	19 - 29	-	-	X		-	X
MW-302BR	Plume monitoring	41.5	49.5	36.5 - 41.5	X	-	X	X	-	X
MW-303B	Plume monitoring	13.8	18	8.5 - 13.8	X	-	X	X	-	X
NUS-1-2	Plume monitoring	47.5	47.5	Unknown - 47.5	X	-	X	X	X	X
NUS-2-2	Plume monitoring	25	Unknown	15 - 25	-	-	X	X	X	X
GZ-9-4R	Plume monitoring	47	Unknown	42 - 47	X	-	X	X	-	X
GZ-6-2R	Plume monitoring	35.5	40.8	30.5 - 35.5	X	-	X	X	-	X
GZ-6-3R	Plume monitoring	50	50.6	45 - 50	X	-	X	X	-	X
PZ-218	Plume monitoring	6	Unknown	4.5 - 6	X	-	X	X	-	X
MW-104B	Water level only	40	45	29 - 40	-	-	X	-	-	X
MW-304B	Cross gradient	14.6	17	10.6 - 14.6	-	-	X	X	-	X
A-33	Cross gradient	9.2	Unknown	1 - 9.20	-	-	X	-	-	X
PZ-102	Cross gradient	13	12.5	10 - 13	-	-	X	-	-	X
MW-301B	Cross gradient	21.2	29.5	16.2 - 21.2	-	-	X	X	-	X
MW-1B	Background/Upgradient location	14.6	Unknown	9.6 - 14.6	X	-	X	X	-	X
MW-102B		34.5	Unknown	24 - 34	-	-	X	-	-	X
Overburden Monitoring Wells – Fall 2006 ONLY										
A-31	Plume delineation	8.1	Unknown	3.1 to 8.1	-	-	-	X	-	X
A-46	Plume delineation	16.4	Unknown	1.4 to 16.4	-	-	-	X	-	X
GZ-10-3R	Plume delineation	29.6	33.8	24.6 to 29.6	-	-	-	X	-	X

Table 7:
Groundwater Monitoring Program as of 2006

Monitoring Well ID	Sampling Rationale	TotalDepth (ft bgs)	Depth to Bedrock (ft bgs)	Screened Interval (ft bgs)	Spring			Fall		
					Arsenic	VOCs	Water Level	Arsenic	VOCs	Water Level
Overburden Monitoring Wells – Fall 2006 ONLY (Concluded)										
MW-101B	Plume delineation	45	45.8	35 to 45	-	-	-	X	-	X
MW-106B	Plume delineation	27	27.7	17 to 27	-	-	-	X	-	X
MW-108B	Plume delineation	51	49.5	48 to 51	-	-	-	X	-	X
MW-207B	Plume delineation	35	35.2	25 to 35	-	-	-	X	-	X
MW-210B	Plume delineation	16	16.1	6 to 16	-	-	-	X	-	X
NUS-9-1	Plume delineation	38	Unknown	13 to 38	-	-	-	X	-	X
LTEMP Bedrock Monitoring Wells										
GZ-1-3R	Plume monitoring	30	18.5	25 - 30	X	-	X	X	X	X
MW-102A	Plume monitoring	61.5	34	51.5 - 61.5	X	X	X	X	X	X
MW-109A	Down gradient	78	29.0	68.1 - 78	-	-	X	X	-	X
MW-302A	Plume monitoring	59.3	49.5	54.5 - 59.3	X	-	X	X	-	X
MW-303A	Plume monitoring	37	18	32 - 37	X	X	X	X	X	X
R-1	Cross gradient	400	Unknown	open bore hole	-	-	X	-	-	X
R-2	Cross gradient	400	Unknown	open bore hole	-	-	X	-	-	X
MW-1A	Background/Upgradient location	30.4	14.0	25.4 - 30.4	X	-	X	X	-	X
C-1	Plume monitoring	34.5	24.5	29.5 - 34.5	X	-	X	X	-	X
MW-205	-	85	35	75 - 85	DESTROYED (replaced by MW-207A/207B couplet)					
Bedrock Monitoring Wells – Fall 2006 ONLY										
MW-101A	Plume delineation	70.1	45.8	60 to 70.1	-	-	-	X	-	X
MW-106A	Plume delineation	58.7	27.7	48.7 to 58.7	-	-	-	X	-	X
MW-108A	Plume delineation	72.9	49.5	62.9 to 72.9	-	-	-	X	-	X
MW-201	Plume delineation	75	19.3	65 to 75	-	-	-	X	-	X

Table 7:
Groundwater Monitoring Program as of 2006

Monitoring Well ID	Sampling Rationale	TotalDepth (ft bgs)	Depth to Bedrock (ft bgs)	Screened Interval (ft bgs)	Spring			Fall		
					Arsenic	VOCs	Water Level	Arsenic	VOCs	Water Level
Bedrock Monitoring Wells – Fall 2006 ONLY (Concluded)										
MW-202	Plume delineation	86	10.5	76 to 86	-	-	-	X	-	X
MW-204	Plume delineation	98.9	67.9	88.9 to 98.9	-	-	-	X	-	X
MW-207A	Plume delineation	87	35.2	77 to 87	-	-	-	X	-	X
MW-210A	Plume delineation	62	16.1	52 to 62	-	-	-	X	-	X
MW-301A	Plume delineation	41.5	29.5	36.5 to 41.5	-	-	-	X	-	X
MW-303A	Plume delineation	37	18.5	32 to 37	-	-	-	X	-	X
MW-304A	Plume delineation	37.4	17	32.4 to 37.4	-	-	-	X	-	X

Notes:
"-" = Not Sampled
"X" = Sampled
VOCs = volatile organic compounds
ftbgs = feet below ground surface

1. Arsenic Behavior in Individual Wells

The first monitoring well to consider at the Site is actually a piezometer. PZ-218 is positioned directly between the Tire Dump and the Solid Waste Pile. The screened interval for this piezometer is shallow at 4.5 to 6 feet below ground surface (bgs) (see Table 7). The well bottom is approximately 8 feet from the top of the casing. Because of its shallow depth, this well has been dry several times in the past during sampling rounds. As demonstrated by a Mann-Kendall test there is no definable trend in arsenic concentrations (see Table 6). The graph of all available arsenic data indicates a decrease (but with a poor correlation factor, R^2) in PZ-218. There have been some increases in concentration in PZ-218 in the 2002 - 2007 timeframe (dashed trend line), but concentrations were within the historical range (1993 - 2002) of concentrations for this well. PZ-218 is shallow and is periodically found to be dry. Because the construction of PZ-218 is questionable for monitoring purposes, the data are not consistent and may not be representative of groundwater conditions, the installation of a shallow overburden monitoring well (and/or well couplet) is recommended to replace PZ-218.

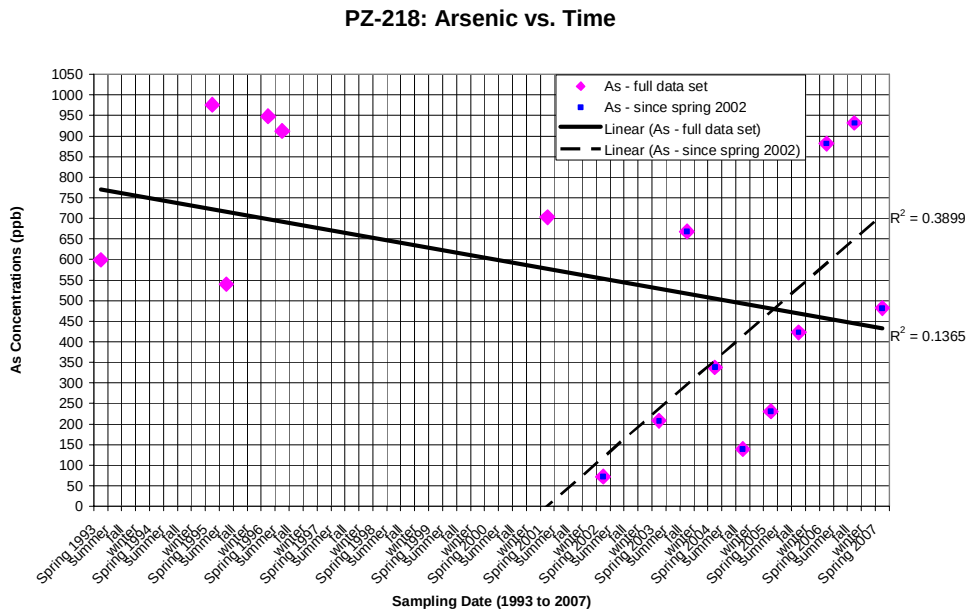

Figure 1: Piezometer PZ-218 arsenic concentrations 1993 to 2007.

The bedrock well C-1 is a located immediately downgradient of the Tire Pile and Solid Waste Landfill. Based on a Mann-Kendall test and the graphed complete data set, the arsenic concentrations are decreasing in C-1. However, the recent graphed data show increases in arsenic concentrations, but concentrations in the 2002 -2007 timeframe (dashed trend line) are still well below the historical maximum (1993 - 2002). A review of the well construction indicates that this well is installed only 5 feet into bedrock with a screened interval of 29.5 to 34.5 feet bgs (see Table 7). If the seal is not adequate at the overburden-bedrock interface, it is possible that this well is influenced by deep overburden groundwater. Installation of a deeper, replacement bedrock well at this location is recommended.

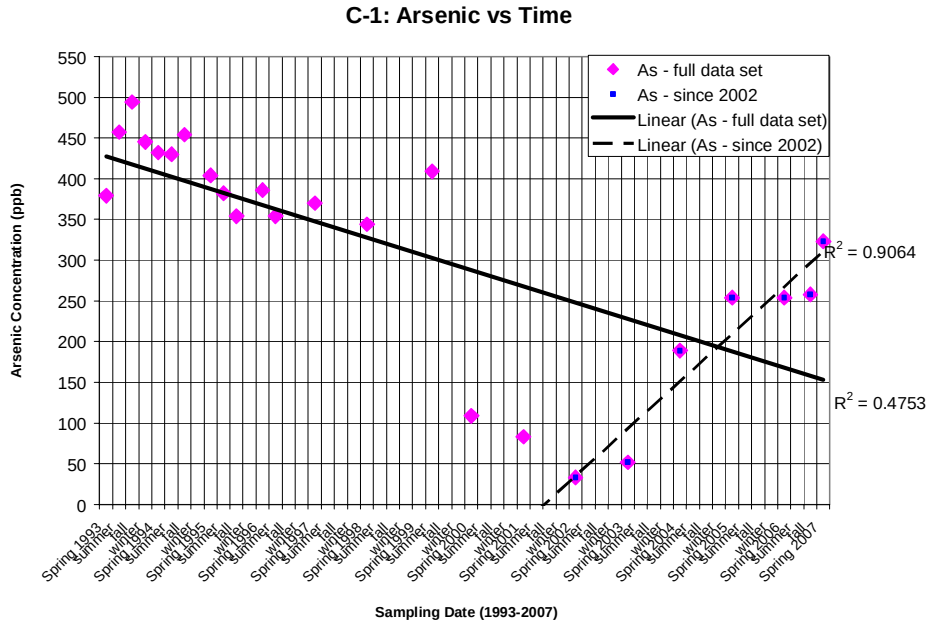

Figure 2: Bedrock well C-1 arsenic concentrations 1993 to 2007.

Well GZ-1-2R is a shallow overburden well that lies approximately 100 feet north (downgradient) of Well C-1. The screened interval of GZ-1-2R is 7.5 to 17.5 feet bgs (see Table 7). Based on a Mann-Kendall test and graphical analysis, well GZ-1-2R consistently shows a downward trend in concentration. Additionally, the previous interim cleanup level (50 ug/l) for arsenic has been attained in this well during 6 out of the last 8 sample events. Well GZ-1-3R is a deeper, couplet well that was sampled in fall 2006 with an arsenic concentration of 19.1 ug/l. Continued sampling of this well is recommended.

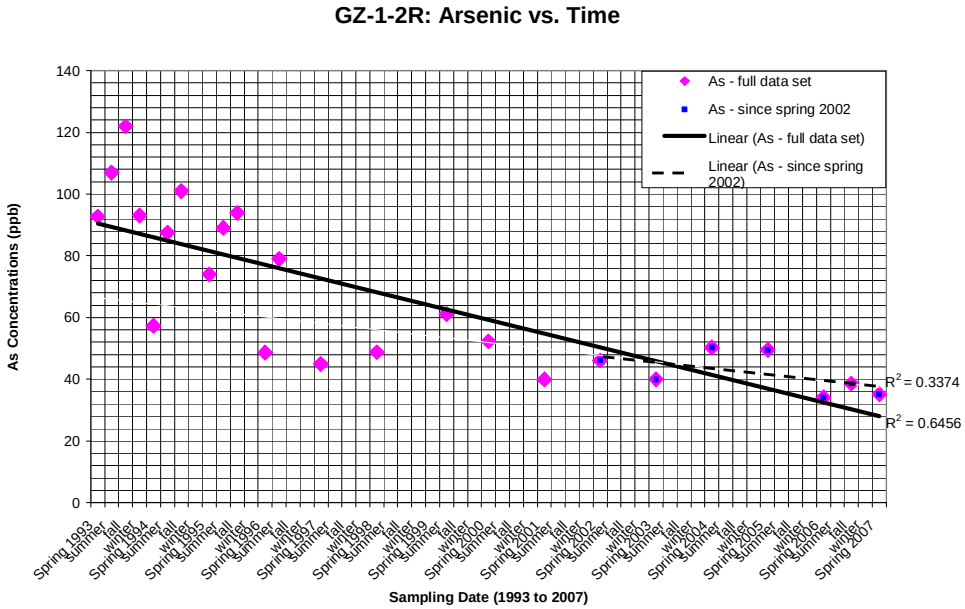

Figure 3: Overburden well GZ-1-2R arsenic concentrations 1993 to 2007.

Wells GZ-6-2R and GZ-6-3R is an overburden well couplet approximately 800 feet down-gradient of well GZ-1-2R. Shown below, well GZ-6-2R is statistically and graphically declining in arsenic concentrations, while GZ-6-3R appears to be statistically increasing or graphically showing no trend in arsenic concentrations. Visual inspection of the GZ-6-3R trend indicates any statistical upward trend is driven by one or two points. Current concentrations are within the historical range and concentrations appear stable. Both wells are still above the previous interim cleanup level of 50 ppb.

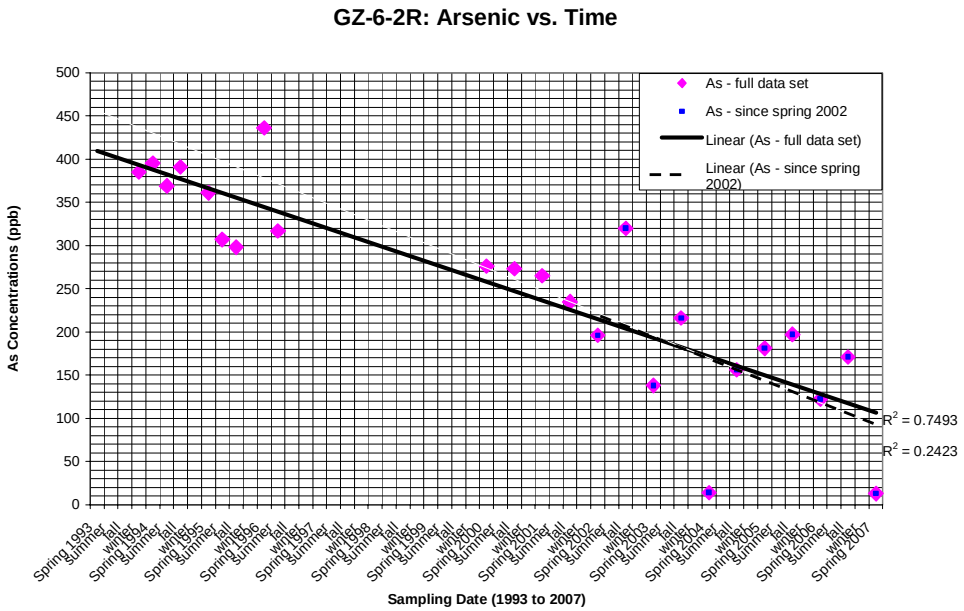

Figure 4: Overburden well GZ-6-2R arsenic concentrations 1993 to 2007.

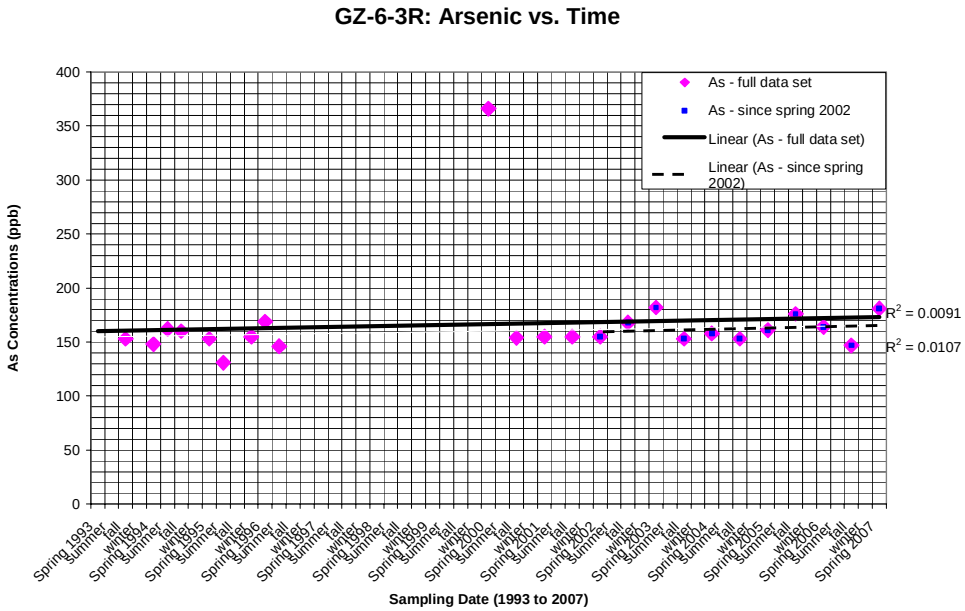

Figure 5: Overburden well GZ-6-3R arsenic concentrations 1993 to 2007.

The screened intervals for GZ-6-2R and GZ-6-3R are 30.5 to 35.5 feet bgs (5 feet above top of bedrock) and 45 to 50 feet bgs (on top of bedrock), respectively (see Table 7). This may indicate that in this area, estimated to be near the center of the plume, the arsenic plume may be narrowing in thickness and that the concentrations in GZ-6-3R may be driven primarily by diffusion from fine-grained materials in the aquifer.

The well couplet MW-302A and MW-302BR lie approximately 300 feet downgradient of the GZ-6-2R and GZ-6-3R couplet. The screened intervals for MW-302A and MW-302BR are 54.5 to 59.3 feet bgs and 36.5 to 41.5 feet bgs, respectively (see Table 7). Based on the entire data set, MW-302A, the bedrock well, shows a statistical and graphical decline in arsenic concentration. Since fall 1995, the arsenic concentrations have been below 50 ug/l. However, to date the arsenic concentrations have not reached below 10 ug/l. Well MW-302BR, the shallow overburden well, shows a trend that appears to be increasing until spring 2001. With the exception of fall 2006 (132 ug/l), arsenic has not been detected in MW-302BR since spring 2001. The reason for the sudden arsenic increase during fall 2006 is unclear. Future investigation may better explain the behavior of contaminant concentrations at this well.

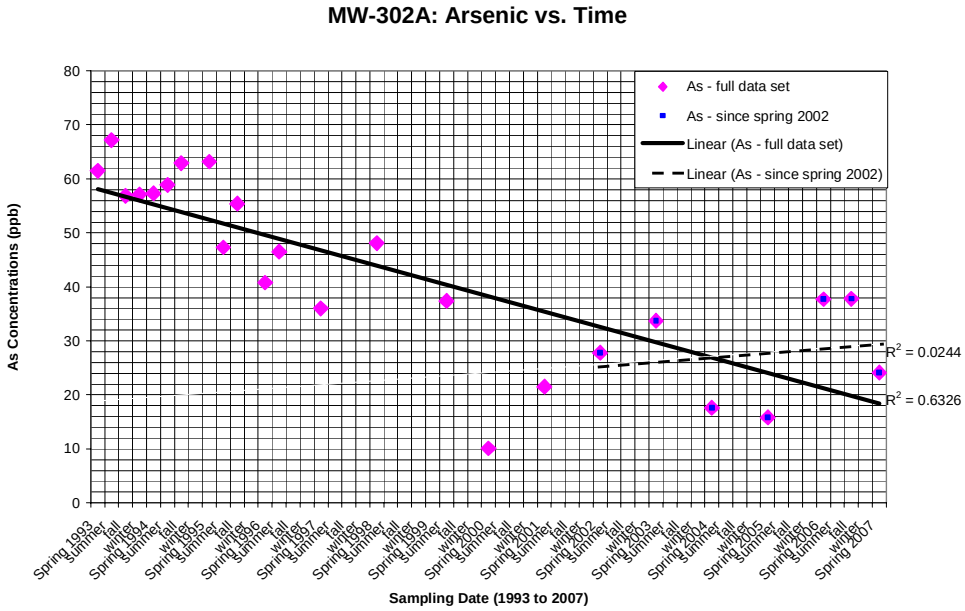

Figure 6: Bedrock well MW-302A arsenic concentrations 1993 to 2007.

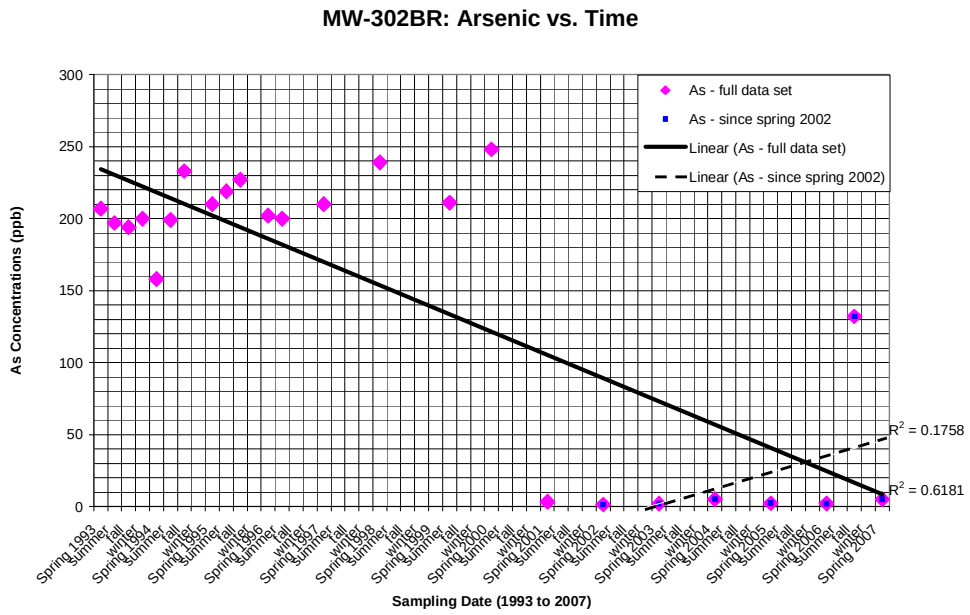

Figure 7: Overburden well MW-302BR arsenic concentrations 1993 to 2007.

NUS-1-2 and NUS-2-2 are not well couplets but are, in fact, separate wells located on the north bank of Whispering Pines Pond approximately two hundred feet apart. The screened intervals for NUS-1-2 and NUS-2-2 are unknown to 47.5 feet bgs (on top of bedrock), and 15 to 25 feet bgs, respectively (see Table 7). Based on recent plume maps, both wells are close to the centerline of the arsenic plume and they demonstrate only slowly declining concentrations over time as the plume weakens. However, it should be noted that well GZ-9-4R, located just 300 feet upgradient of NUS 1-2, is screened at a similar depth and in similar aquifer materials as NUS 1-2. Arsenic concentrations in GZ-9-4R have consistently been half the concentrations found in NUS 1-2. Also, well MW-109B, which may be off the center-line of the arsenic plume, has declined drastically in concentration since 1993. These factors indicate that further work is still needed to determine the effect of Whispering Pines Pond on the behavior of arsenic in the aquifer in this area of the Site.

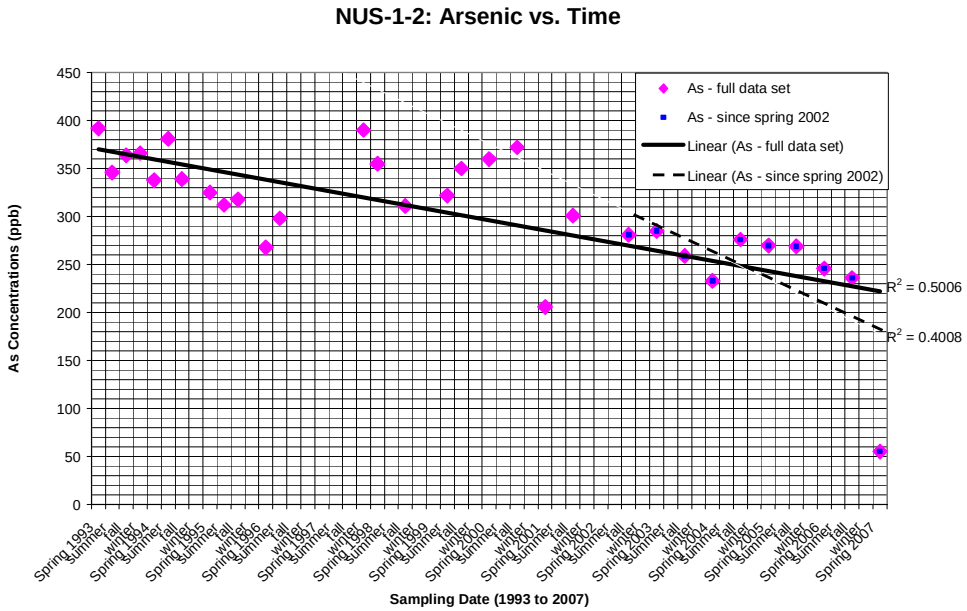

Figure 8: Overburden well NUS-1-2 arsenic concentrations 1993 to 2007.

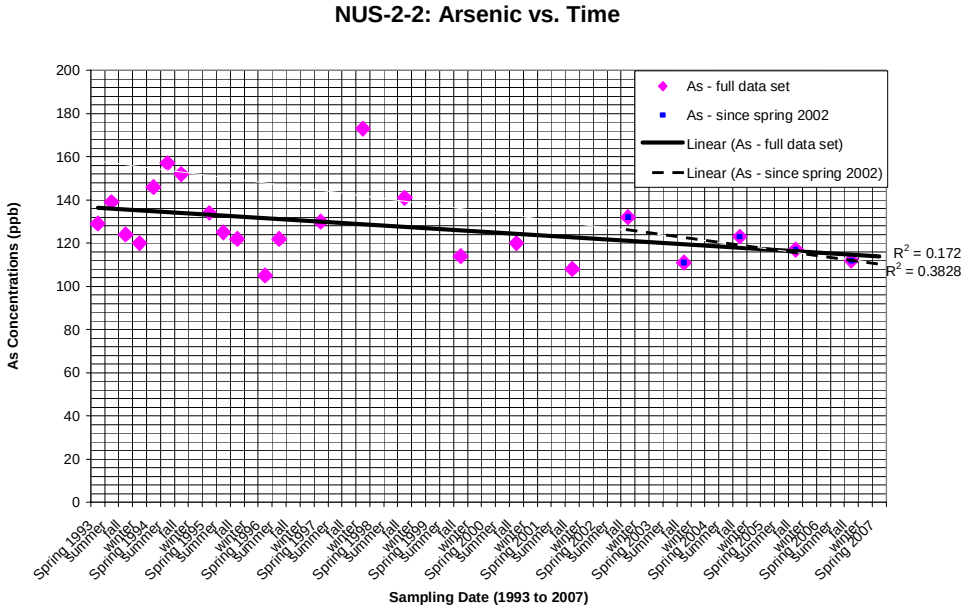

Figure 9: Overburden well NUS-2-2 arsenic concentrations 1993 to 2007.

The overburden well MW-109B is located along Auburn Road on the Whispering Pines Mobile Home Park property, at the northern edge of the proposed GMZ boundary. The screened interval for MW-109B is 19 to 29 feet bgs (see Table 7). Based on a Mann-Kendall test and graphical analysis of the complete data set, the arsenic concentrations have decreased significantly in MW-109B. The total arsenic concentrations have decreased from levels above 200 µg/L to non-detect (≤10 µg/L) during the last three LTEMP sampling rounds.

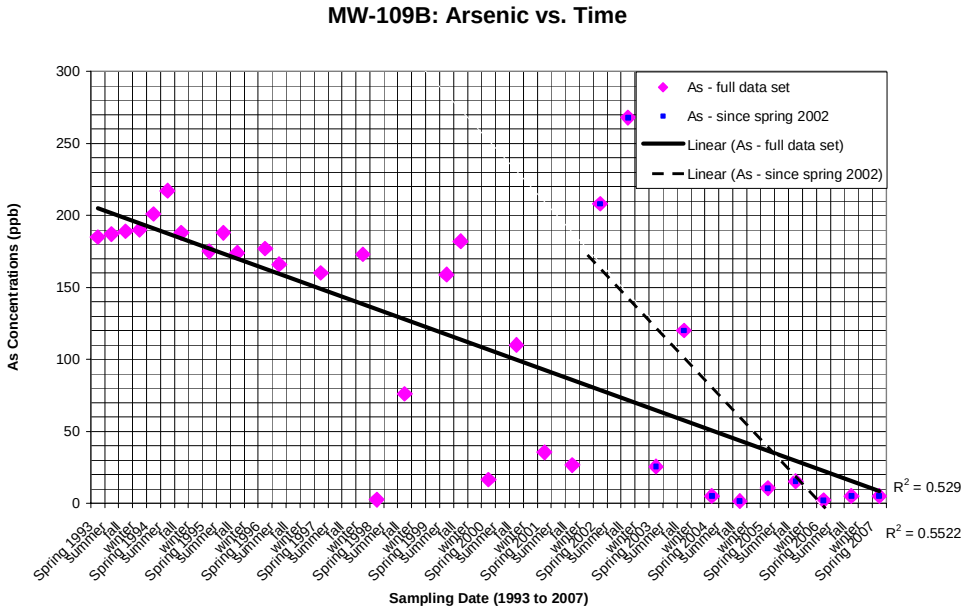

Figure 10: Overburden well MW-109B arsenic concentrations 1993 to 2007.

The overburden well MW-303B is located immediately north and downgradient of the Town Dump (between the Town Dump and Whispering Pines Pond). The screened interval for MW-303B is shallow at 8.5 to 13.8 feet bgs (see Table 7). Based on a Mann-Kendall test and graphical analysis of the complete data set, the arsenic concentrations show an increasing or no trend; however, the recent trend since 2002 (dashed trend line) shows a generally decreasing trend. The concentrations of arsenic in this well have never exceeded 55 µg/L (maximum concentration was 52.8 µg/L in 2001) and have ranged between 20 and 30 µg/L the last two years.

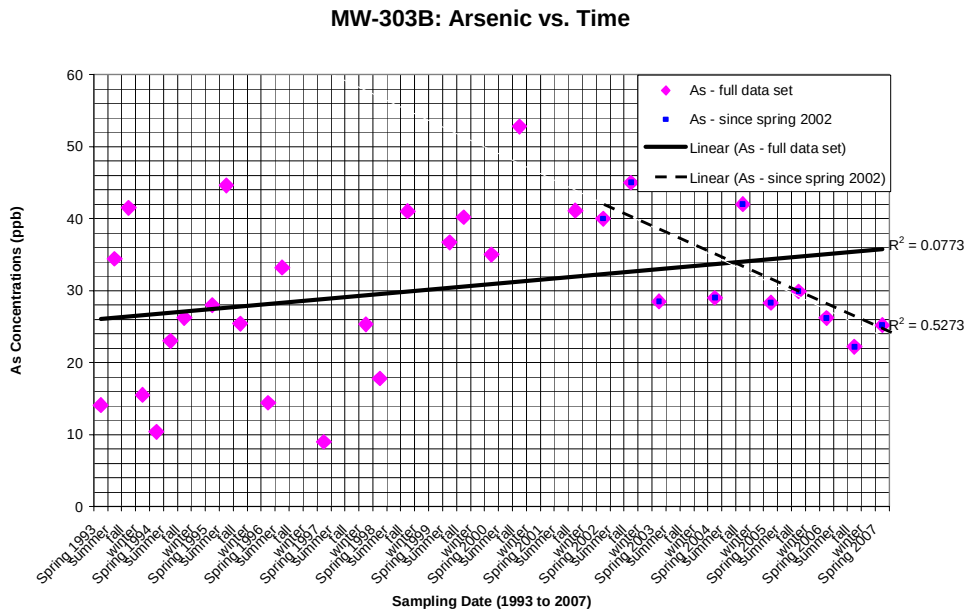

Figure 11: Overburden well MW-303B arsenic concentrations 1993 to 2007.

B. Arsenic Contaminated Sediments and Surface Water

No cleanup standards were established for sediments or surface water at the Auburn Road Landfill. When the 1996 Amended ROD was in preparation, testing indicated that the surface water did not violate New Hampshire Water Quality Standards and that sediments were not toxic to organisms. However, concentrations of arsenic in both sediment and surface water were recognized to be a function of the environmental variables present and the input of arsenic from groundwater discharging to Cohas Brook and, to a lesser extent, Whispering Pines Pond. To that end, contingencies for anomalous events were included in the 1996 Amended ROD and the 1997 Consent Decree, and a specialized monitoring program was instituted.

Monitoring consists of a background location (SW-03 in unnamed stream), estimated groundwater discharge points (SD-02 in Whispering Pines Pond and SW/SD-09 in Cohas Brook), and at locations downstream of the Site (SW-06 in Whispering Pines Pond and SW/SD-04 in Cohas Brook). Background locations were selected upgradient of the discharge of groundwater.

Figures 12a and 12b show arsenic concentrations in sediment (SD) sample locations since 1993 and from 2000 to 2006, respectively. Figure 12c and 12d show arsenic concentrations in surface (SW) sample locations since 1993 and from 2000 to 2006, respectively. The general trend in surface water monitoring concentrations of arsenic are stable and below New Hampshire Surface Water Quality Criteria [the "Fresh Water Acute" and "Fresh Water Chronic" surface water quality criteria for arsenic (340 µg/L and 150 µg/L, respectively), as identified by NHDES Env-Ws 1700 (12/10/99)]. Sediment arsenic concentrations have also been generally stable and consistently below 50 mg/kg the last 3 years.

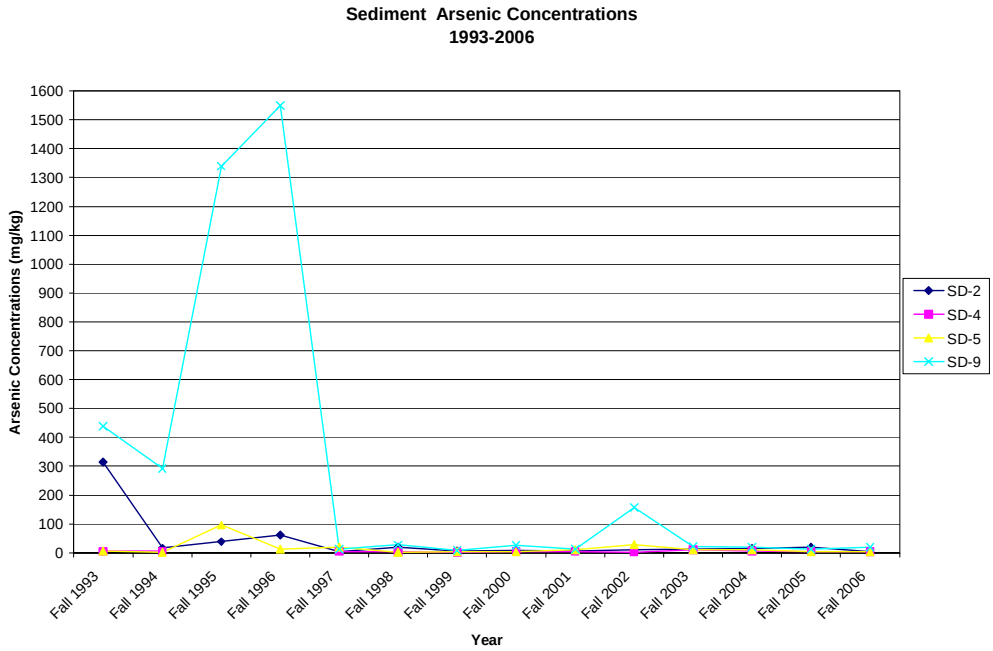

Figure 12a. Sediment arsenic concentrations 1993 to 2006.

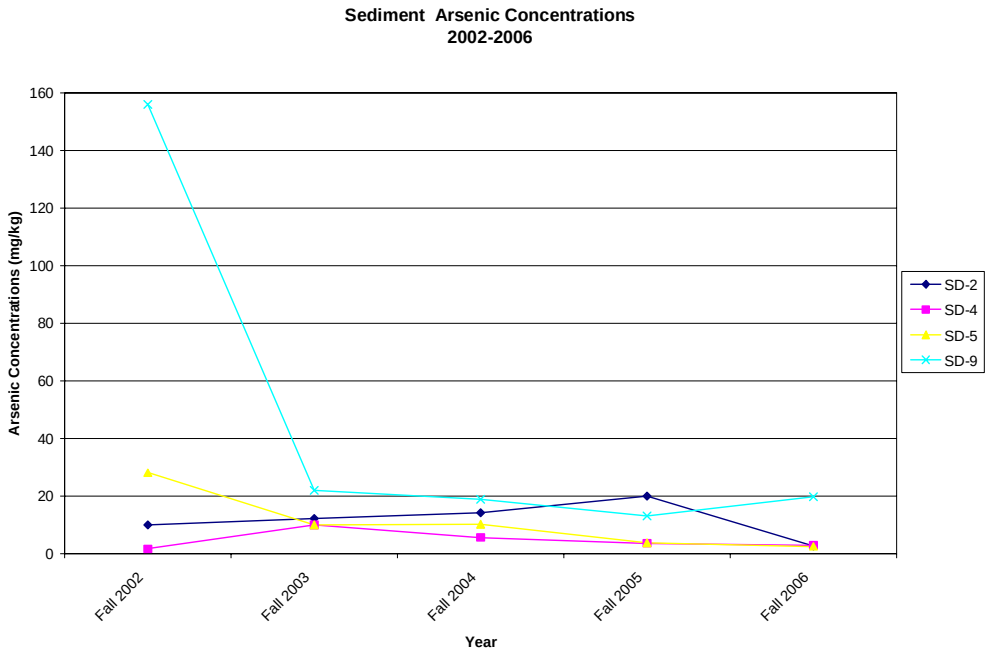

Figure 12b. Sediment arsenic concentrations 2002 to 2006.

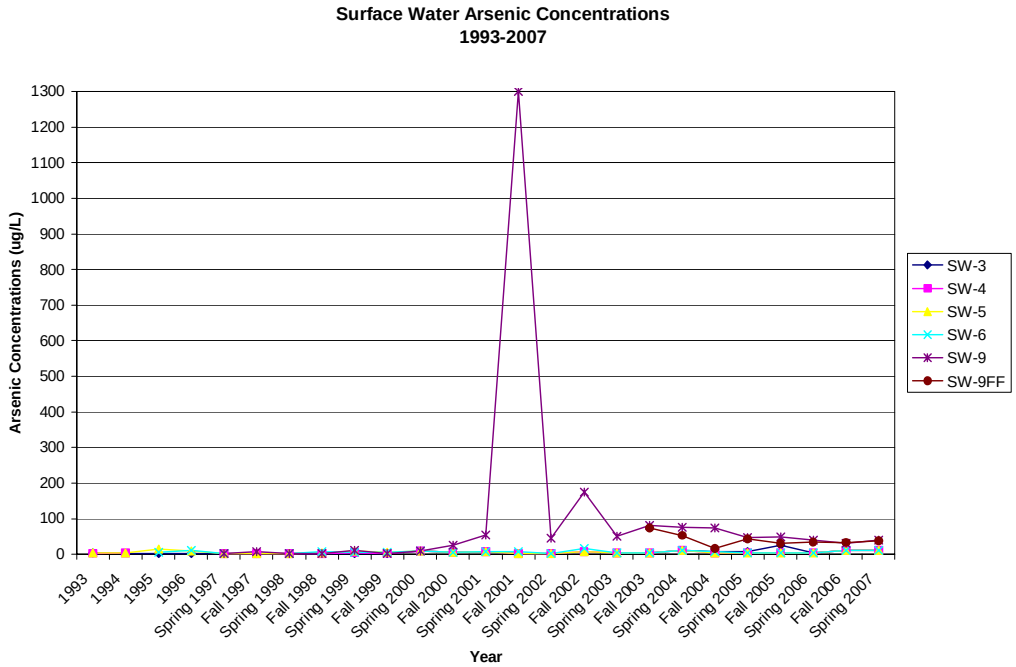

Figure 12c. Surface water arsenic concentrations 1993 to 2007.

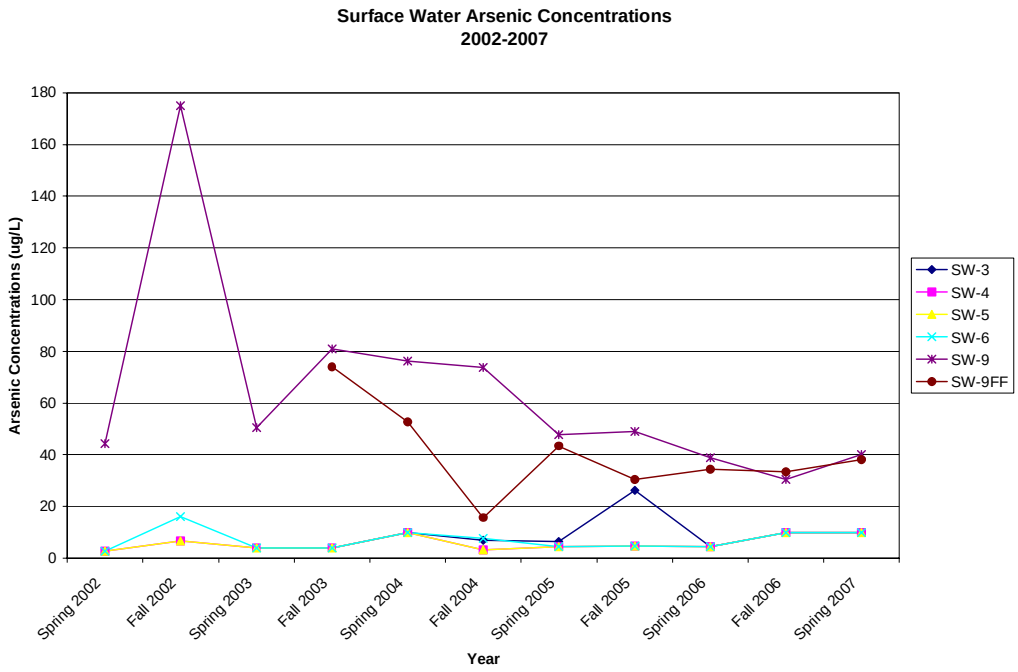

Figure 12d. Surface water arsenic concentrations 2002 to 2007.

The high arsenic concentration in surface water at location SW-9 in 2001 was discussed in the 2002 Five-Year Review and may have been an anomalous result due to sediment in the sample. Surface water samples at this location have been field-filtered since 2003. Arsenic concentrations in filtered and unfiltered surface water samples from this location have not exceeded NHDES Surface Water Quality Criteria since 2002.

An ongoing EPA grant-funded University of Connecticut study of seasonal controls on arsenic transport across the groundwater-surface water interface is being conducted on sediment along Cohas Brook in the vicinity of LTEMP sampling location SW/SD-09 (MacKay, 2005). Preliminary results suggest that groundwater arsenic transport to Cohas Brook is controlled by the formation of iron oxides in the sediments.

It was noted in the July 2007 Site Inspection that beaver dams were not observed and that drainage at the outlet of Whispering Pines Pond has improved, leading to lower pond surface water levels.

C. Volatile Organic Compounds-Contaminated Groundwater

Since 2000, VOC samples have been collected as part of the LTEMP from monitoring well locations GZ-1-3R (annually), MW-102A (semi-annually), NUS-1-2 (annually), NUS-2-2 (annually), and MW-303A (semi-annually) (see Table 7). The LTEMP VOC analytical results since 2000 are summarized in Tables 8 through 14. The VOCs shown in the tables are the contaminants of concern listed in the 1996 AROD (vinyl chloride, trans 1-2 dichloroethene, 2-butanone, trichloroethene, tetrachloroethene, toluene, and benzene).

Table 8
Summary of Vinyl Chloride Concentrations in LTEMP Monitoring Wells 2000 - 2006

Well ID	NHDES AGQS	2000		2001		2002		2003		2004		2005		2006		2007
		Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
GZ-1-3R	2	--	1 U	--	0.40 J	--	1 U	--	1 U	--	0.40 J	--	0.60 J	--	1.0 U	--
MW-102A	2	2.9 U	2.6 U	2.3 U	1.7 U	2.2 U	1.6 U	1.0 U	1.0 U	1.0 U	3.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-205	2	--	1 U	--	destroyed	--	--	--	--	--	--	--	--	--	--	--
NUS-1-2^	2	--	1 U	--	0.55 J	--	1.0 U	--	0.51 J[1]	--	0.31 J	--	0.32 J	--	1.0 U (37)/ 1.0 U (42)	--
NUS-2-2	2	--	1 U	--	1 U	--	1.0 U	--	1.0 U	--	1.0 UJ[1]	--	1.0 U	--	1.0 U	--
MW-303A*	2	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:
-- = Not sampled or data not available. Data collected prior to the 2000 sampling event is as reported in the Draft 1999 Annual Report by Sevee & Maher Engineers, Inc., 16 February 2000.
Groundwater samples collected in November 2005 were re-collected in December 2005 (for VOC analysis only) due to laboratory issues.
U = The compound was not detected at the associated numerical sample quantitation limit.
J = The associated numerical value is an estimated quantity.
UJ^1/J^1 = Estimate results due to surrogate recovery below quality control limits.
AGQS = Ambient Groundwater Quality Standards
NHDES = New Hampshire Department of Environmental Services
All values shown in units of micrograms per liter (parts per billion).
*Well MW-303A is not part of the Long Term Environmental Monitoring Plan; however, is being sampled at the request of the U.S. Environmental Protection Agency.
Monitoring well NUS-1-2 was sampled at more than one depth during the Fall 2006 sampling round. The data is reported as the concentration followed by the sample depth [i.e., 1.0 U (37) / 1.0 U (42)].

Table 9
Summary of Trans 1,2-Dichloroethene Concentrations in LTEMP Monitoring Wells 2000 - 2006

Well	NHDES	2000		2001		2002		2003		2004		2005		2006		2007
ID	AGQS	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
GZ-1-3R	100	--	1 U	--	1 U	--	1 U	--	1 U	--	1.0 U	--	1.0 U	--	1.0 U	--
MW-102A	100	2.9 U	2.6 U	2.3 U	1.7 U	2.2 U	1.6 U	1.0 U	1.0 U	1.0 U	3.5 U	0.21 J	1.0 U	1.0 U	1.0 U	1.0 U
MW-205	100	--	1 U	--	destroyed	--	--	--	--	--	--	--	--	--	--	--
NUS-1-2^	100	--	1 U	--	1 U	--	1.0 U	--	1.0 U	--	1.0 U	--	1.0 U	--	1.0 U (37)/ 1.0 U (42)	--
NUS-2-2	100	--	1 U	--	1 U	--	1.0 U	--	1.0 U	--	1.0 UJ[1]	--	1.0 U	--	1.0 U	--
MW-303A*	100	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:
-- = Not sampled or data not available. Data collected prior to the 2000 sampling event is as reported in the Draft 1999 Annual Report by Sevee & Maher Engineers, Inc., 16 February 2000.
Groundwater samples collected in November 2005 were re-collected in December 2005 (for VOC analysis only) due to laboratory issues.
U = The compound was not detected at the associated numerical sample quantitation limit.
J = The associated numerical value is an estimated quantity.
UJ^1/J^1 = Estimate results due to surrogate recovery below quality control limits.
AGQS = Ambient Groundwater Quality Standards
NHDES = New Hampshire Department of Environmental Services
All values shown in units of micrograms per liter (parts per billion).
*Well MW-303A is not part of the Long Term Environmental Monitoring Plan; however, is being sampled at the request of the U.S. Environmental Protection Agency.
Monitoring well NUS-1-2 was sampled at more than one depth during the Fall 2006 sampling round. The data is reported as the concentration followed by the sample depth [i.e., 1.0 U (37) / 1.0 U (42)].

Table 10
Summary of 2-Butanone Concentrations in LTEMP Monitoring Wells 2000 - 2006

Well ID	NHDES AGQS	2000		2001		2002		2003		2004		2005		2006		2007
		Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
GZ-1-3R	170	--	5 U	--	5 U	--	5 U	--	5 U	--	5.0 U	--	5.0 U	--	5.0 U	--
MW-102A	170	14 U	13 U	12 U	8.5 U	11 U	8 U	5.0 U	5.0 U	5.0 U	18 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
MW-205	170	--	5 U	--	destroyed	--	--	--	--	--	--	--	--	--	--	--
NUS-1-2^	170	--	5 U	--	5 U	--	5.0 U	--	5.0 U	--	5.0 U	--	5.0 U	--	5.0 U (37)/ 5.0 U (42)	--
NUS-2-2	170	--	5 U	--	5 U	--	5.0 U	--	5.0 U	--	5.0 UJ[1]	--	5.0 U	--	5.0 U	--
MW-303A*	170	5 U	5 U	5 U	5 U	5 U	5 U	5.0 U	5 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U

Notes:
-- = Not sampled or data not available. Data collected prior to the 2000 sampling event is as reported in the Draft 1999 Annual Report by Sevee & Maher Engineers, Inc., 16 February 2000.
Groundwater samples collected in November 2005 were re-collected in December 2005 (for VOC analysis only) due to laboratory issues.
U = The compound was not detected at the associated numerical sample quantitation limit.
J = The associated numerical value is an estimated quantity.
UJ^1/J^1 = Estimate results due to surrogate recovery below quality control limits.
AGQS = Ambient Groundwater Quality Standards
NHDES = New Hampshire Department of Environmental Services
All values shown in units of micrograms per liter (parts per billion).
*Well MW-303A is not part of the Long Term Environmental Monitoring Plan; however, is being sampled at the request of the U.S. Environmental Protection Agency.
Monitoring well NUS-1-2 was sampled at more than one depth during the Fall 2006 sampling round. The data is reported as the concentration followed by the sample depth [i.e., 1.0 U (37) / 1.0 U (42)].

Table 11
Summary of Trichloroethene Concentrations in LTEMP Monitoring Wells 2000 - 2006

Well ID	NHDES AGQS	2000		2001		2002		2003		2004		2005		2006		2007
		Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
GZ-1-3R	5	--	2	--	2.2	--	2.6 J	--	2.0 J[1]	--	0.75 J	--	0.96 J	--	1.0 U	--
MW-102A	5	**40**	**43**	**42**	**52**	**45**	**47 J**	**34 J**	**39 J[1]**	**38**	3.1 J	**45**	**38**	**79.8**	**70.6**	**67.5**
MW-205	5	--	1 U	--	destroyed	--	--	--	--	--	--	--	--	--	--	--
NUS-1-2^	5	--	1 U	--	1 U	--	1.0 U	--	1.0 U	--	1.0 U	--	0.25 J	--	1.0 U (37)/ 1.0 U (42)	--
NUS-2-2	5	--	1 U	--	1 U	--	1.0 U	--	1.0 U	--	1.0 UJ[1]	--	1.0 U	--	1.0 U	--
MW-303A*	5	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:
-- = Not sampled or data not available. Data collected prior to the 2000 sampling event is as reported in the Draft 1999 Annual Report by Sevee & Maher Engineers, Inc., 16 February 2000.
Groundwater samples collected in November 2005 were re-collected in December 2005 (for VOC analysis only) due to laboratory issues.
U = The compound was not detected at the associated numerical sample quantitation limit.
J = The associated numerical value is an estimated quantity.
UJ^1/J^1 = Estimate results due to surrogate recovery below quality control limits.
AGQS = Ambient Groundwater Quality Standards
NHDES = New Hampshire Department of Environmental Services
All values shown in units of micrograms per liter (parts per billion).
*Well MW-303A is not part of the Long Term Environmental Monitoring Plan; however, is being sampled at the request of the U.S. Environmental Protection Agency.
Values shown in **BOLD** indicate that the compound was detected in excess of NHDES AGQS.
Monitoring well NUS-1-2 was sampled at more than one depth during the Fall 2006 sampling round. The data is reported as the concentration followed by the sample depth [i.e., 1.0 U (37) / 1.0 U (42)].

Table 12
Summary of Tetrachloroethene Concentrations in LTEMP Monitoring Wells 2000 - 2006

Well ID	NHDES AGQS	2000		2001		2002		2003		2004		2005		2006		2007
		Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
GZ-1-3R	5	--	1 U	--	1 UJ[1]	--	1 U	--	1 U	--	1.0 U	--	1.0 U	--	1.0 U	--
MW-102A	5	**68**	**65**	**51 J**	**63 J[1]**	**64**	**52**	**22**	**27.0 J[2]**	**36**	4.5	**37**	**45**	**96.9**	**88.2**	**82**
MW-205	5	--	1 U	--	destroyed	--	--	--	--	--	--	--	--	--	--	--
NUS-1-2^	5	--	1 U	--	1 UJ[1]	--	1.0 U	--	1.0 U	--	1.0 U	--	1.0 U	--	1.0 U (37)/ 1.0 U (42)	--
NUS-2-2	5	--	1 U	--	1 UJ[1]	--	1.0 U	--	1.0 U	--	1.0 UJ[1]	--	1.0 U	--	1.0 U	--
MW-303A*	5	1 U	1 U	1 UJ	1 UJ[1]	1 U	1 U	1.0 U	1 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:
-- = Not sampled or data not available. Data collected prior to the 2000 sampling event is as reported in the Draft 1999 Annual Report by Sevee & Maher Engineers, Inc., 16 February 2000.
Groundwater samples collected in November 2005 were re-collected in December 2005 (for VOC analysis only) due to laboratory issues.
U = The compound was not detected at the associated numerical sample quantitation limit.
J = The associated numerical value is an estimated quantity.
UJ^1/J^1 = Estimate results due to surrogate recovery below quality control limits.
J^2 = Value is estimated since continuing calibration criteria was not met.
AGQS = Ambient Groundwater Quality Standards
NHDES = New Hampshire Department of Environmental Services
All values shown in units of micrograms per liter (parts per billion).
*Well MW-303A is not part of the Long Term Environmental Monitoring Plan; however, is being sampled at the request of the U.S. Environmental Protection Agency.
Values shown in **BOLD** indicate that the compound was detected in excess of NHDES AGQS.
Monitoring well NUS-1-2 was sampled at more than one depth during the Fall 2006 sampling round. The data is reported as the concentration followed by the sample depth [i.e., 1.0 U (37) / 1.0 U (42)].

Table 13
Summary of Toluene Concentrations in LTEMP Monitoring Wells 2000 - 2006

Well ID	NHDES AGQS	2000		2001		2002		2003		2004		2005		2006		2007
		Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
GZ-1-3R	1,000	--	1 U	--	0.34 J	--	1 U	--	1 U	--	0.21 J	--	2.1	--	1.0 U	--
MW-102A	1,000	2.9 U	2.6 U	2.3	1.7 U	2.2 U	1.6 U	1.0 U	1.0 U	1.0 U	3.5 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
MW-205	1,000	--	1 U	--	destroyed	--	--	--	--	--	--	--	--	--	--	--
NUS-1-2^	1,000	--	1 U	--	1 U	--	1.0 U	--	1.0 U	--	1.0 U	--	1.0 U	--	1.0 U (37)/ 1.0 U (42)	--
NUS-2-2	1,000	--	1 U	--	1 U	--	1.0 U	--	1.0 U	--	1.0 UJ[1]	--	1.0 U	--	1.0 U	--
MW-303A*	1,000	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U

Notes:
-- = Not sampled or data not available. Data collected prior to the 2000 sampling event is as reported in the Draft 1999 Annual Report by Sevee & Maher Engineers, Inc., 16 February 2000.
Groundwater samples collected in November 2005 were re-collected in December 2005 (for VOC analysis only) due to laboratory issues.
U = The compound was not detected at the associated numerical sample quantitation limit.
J = The associated numerical value is an estimated quantity.
UJ^1/J^1 = Estimate results due to surrogate recovery below quality control limits.
AGQS = Ambient Groundwater Quality Standards
NHDES = New Hampshire Department of Environmental Services
All values shown in units of micrograms per liter (parts per billion).
*Well MW-303A is not part of the Long Term Environmental Monitoring Plan; however, is being sampled at the request of the U.S. Environmental Protection Agency.
Monitoring well NUS-1-2 was sampled at more than one depth during the Fall 2006 sampling round. The data is reported as the concentration followed by the sample depth [i.e., 1.0 U (37) / 1.0 U (42)].

Table 14
Summary of Benzene Concentrations in LTEMP Monitoring Wells 2000 - 2006

Well ID	NHDES AGQS	2000		2001		2002		2003		2004		2005		2006		2007
		Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
GZ-1-3R	5	--	1.1	--	1.4	--	1.2	--	1.1	--	0.81 J	--	1.7	--	1.2	--
MW-102A	5	2.9 U	2.6 U	2.3	1.7 U	2.2 U	1.6 U	1.0 U	1.0 U	1.0 U	3.5 U	1.0 U	1.0 U	0.5 U	0.50 U	0.50 U
MW-205	5	--	1 U	--	destroyed	--	--	--	--	--	--	--	--	--	--	--
NUS-1-2^	5	--	1.6	--	1.4	--	1.3	--	1.5	--	0.89 J	--	0.77 J	--	0.57 (37)/ 0.54 (42)	--
NUS-2-2	5	--	1 U	--	1 U	--	0.29 J	--	1.0 U	--	0.70 J	--	0.48 J	--	0.63	--
MW-303A*	5	1 U	1 U	1 U	1 U	1 U	1 U	1.0 U	1 U	1.0 U	1.0 U	1.0 U	1.0 U	0.5 U	0.5 U	0.50 U

Notes:
-- = Not sampled or data not available. Data collected prior to the 2000 sampling event is as reported in the Draft 1999 Annual Report by Sevee & Maher Engineers, Inc., 16 February 2000.
Groundwater samples collected in November 2005 were re-collected in December 2005 (for VOC analysis only) due to laboratory issues.
U = The compound was not detected at the associated numerical sample quantitation limit.
J = The associated numerical value is an estimated quantity.
AGQS = Ambient Groundwater Quality Standards
NHDES = New Hampshire Department of Environmental Services
All values shown in units of micrograms per liter (parts per billion).
*Well MW-303A is not part of the Long Term Environmental Monitoring Plan; however, is being sampled at the request of the U.S. Environmental Protection Agency.
Monitoring well NUS-1-2 was sampled at more than one depth during the Fall 2006 sampling round. The data is reported as the concentration followed by the sample depth [i.e., 1.0 U (37) / 1.0 U (42)].

As shown in Tables 8 through 14, only one well, MW-102A, a bedrock well that is located at the northeastern toe of the Old Town Landfill, shows VOC concentrations that are above the interim cleanup levels established in the 1996 AROD. The screened interval for MW-102A is 51.5 to 61.5 feet bgs, approximately 17 feet within bedrock (see Table 7). Trichloroethene (TCE) concentrations appear to be stable within this well (*i.e.* do not show a statistical or graphical trend between 1994 and spring 2007). However, tetrachloroethene (PCE) data for the same time period demonstrate a statistical and graphical downward trend. Figures 13a and 13b show PCE and TCE concentrations from 1993 to 2007, respectively.

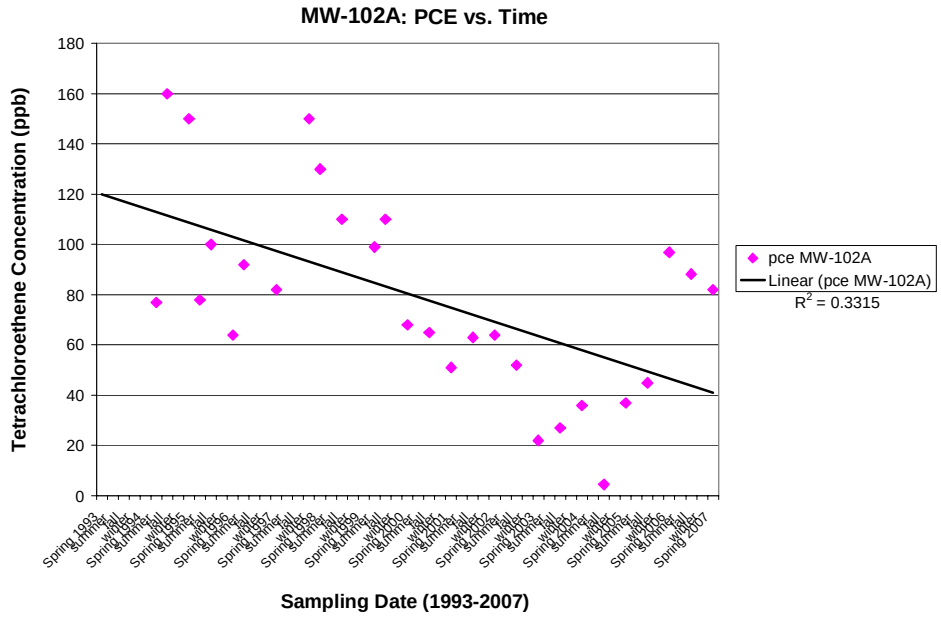

Figure 13a: Bedrock well MW-102A PCE concentrations 1993 to 2007.

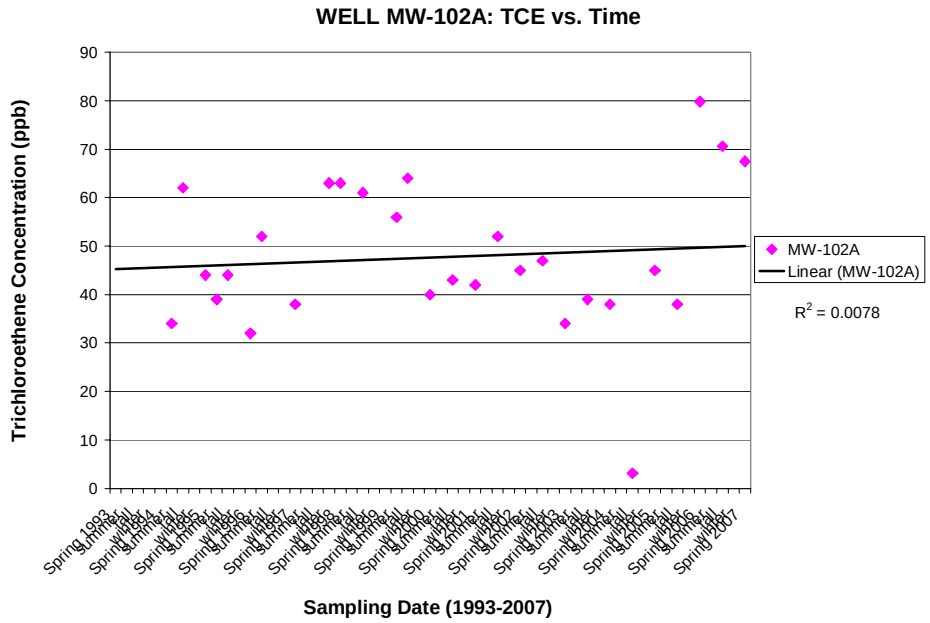

Figure 13b: Bedrock well MW-102A TCE concentrations 1993 to 2007.

Based on the groundwater flow direction at the Site being north, toward Whispering Pines Pond, and previous and ongoing LTEMP VOC sampling results, the data does not indicate a VOC plume migrating northward into or under the Pond. However, the VOC vapor intrusion pathway has not been specifically investigated at the Site and it is recommended that this potential pathway be evaluated; particularly along Auburn Road and near the Whispering Pines Pond area.

VI. Potential Remedy Changes

A. Contingent Remedy in 1996 ROD

Monitored natural attenuation is the current groundwater remedy at this Site. However, natural attenuation remedies are subject to contingent remedies based on the performance of the natural attenuation remedy. With respect to assessing the progress of monitored natural attenuation at the Site, the key components are the lowering of the water table in the vicinity of the disposal areas and halting the migration of arsenic contaminated groundwater.

The 1996 Amended ROD and the 1997 Consent Decree embodied a number of criteria to evaluate in assessing whether natural attenuation is an effective remedy at the Site or that an alternative, engineered remedy should be deployed to address arsenic contamination. The criteria or trip wires were:

1. Groundwater contaminated by the Site moves northward from Cohas Brook.

2. A violation of New Hampshire Surface Water Quality Regulations Env-Ws 430-438. This includes either surface water that has arsenic at concentrations that significantly exceed background concentrations or concentrations that exceed numerical standards set by the State that parallel Federal statutes.

3. If arsenic-contaminated sediments are found to be toxic to aquatic life.

The installation of monitoring wells north of Cohas Brook (MW-210A and MW-210B) in 2006 has generally demonstrated arsenic does not exceed the New Hampshire AGQS of 10 ppb. In addition, to date, the surface water and sediment data do not demonstrate a risk to human health or the environment. However, if any of the three criteria listed above are violated, a plan of action detailing an investigation of the problem is to take place. If those investigations find that the ARARs are violated or that an unacceptable risk to public health or the environment is present, a plan shall be developed to address that problem.

VII. Suggested Follow-up Actions

1. Installation of additional/replacement monitoring wells: Two monitoring well locations with higher arsenic concentrations are a piezometer PZ-218, with suspect construction, and C-1, a shallow bedrock well, that may be influenced by deep overburden groundwater. It is recommended that these locations be replaced with a shallow overburden and deeper bedrock well couplets. During installation of the replacement wells, soil samples may be collected to determine if there is a potential source of contamination that should be further evaluated.

2. Update of groundwater modeling: An updated geochemical and groundwater flow model needs to be developed to better understand arsenic concentrations in groundwater. The modeling would also attempt to update and establish more accurate timeframes for groundwater arsenic concentrations to reach cleanup goals for the Site.

3. Additional geochemical/chemical analyses during LTEMP: In order to better explain observed arsenic concentrations in groundwater, the follow modifications to the LTEMP sampling is suggested:

    i. Additional parameters to be developed for the updated groundwater modeling, including total organic carbon (TOC).
    ii. Sample monitoring well MW-104B, and other well locations as appropriate, located along the estimated center line of the arsenic plume between the Tire Pile and Solid Waste Landfills and Whispering Pines Pond.
    iii. Redevelop monitoring wells to clear out sedimentation and well screens. Many of the LTEMP wells are greater that 10 years old and may not have been developed since installation.
    iv. Evaluate surface water/groundwater interaction in and around Whispering Pines Pond.

References

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APPENDIX E

SUPPLEMENTAL INTERVIEW ATTACHMENTS

John B. (Jack) Robertson, P.G.
Consulting Hydrolgeologist and Environmental Scientist
40107 North 3rd Street Desert Hills, AZ 85086
Telephone/Fax: 623-742-0300 Email: jeanjack@aaip.net

June 27, 2007

New Hampshire Department of Environmental Services
Waste Management Division
Site Remediation Programs
Groundwater Management Permit Coordinator
PO Box 95
29 Hazen Drive
Concord, NH 03302-0095

Re: Groundwater Management Zone Permit Application
Auburn Road Landfill Superfund Site, Londonderry, NH

Dear Coordinator:

I am writing this letter on behalf of Mr. Al Simard of the Simard Family Trust which owns property abutting the Auburn Road Landfill Superfund Site (Site) in Londonderry, NH. Mr. Simard is the proprietor of Whispering Pines Mobile Home Park immediately north of the Site. The purpose of this letter is to provide official comment on the Application for Groundwater Management Permit submitted to your office on May 15, 2007, by Weston Solutions, Inc., (Weston) for the Auburn Road Performing Parties Group (ARPPG), regarding the proposed boundary location for the groundwater management zone (GMZ) for the Site. Please give these comments serious consideration as you review the GMZ application.

In summary, I urge you to set the location of the northern boundary of the GMZ at the northern boundary of the Site (at the northern boundary of lot 016-023), as shown on Attachment D of the Application, rather than at the proposed boundary in the Application, depicted by the portion of the red line extending north of lot 016-023 (Attachment D of the Application). The portion of the proposed GMZ that extends into lot 018-033 is on the Simard property. Groundwater and surface water on the Simard property is currently being impacted by arsenic from the Site, and has been since the contamination was first discovered in 1982. The time for taking action to mitigate adverse impacts to the Simard property is long over-due. The groundwater remedy selected by the US Environmental Protection Agency (EPA) more that 10 years ago in the Amended Record of Decision (ROD) is clearly not working as intended. The basis for moving the proposed northern GMZ boundary is presented below.

Approval of the GMZ proposed by Weston would amount to nothing less than approval to allow CERCLA sites to cause contamination of off-site private or public property with no cleanup action ever required. That is clearly not consistent with the National

Contingency Plan nor with the intent of CERCLA. Although some Superfund site sites have been approved for natural attenuation/long-term monitoring remedies, those that I am aware of have demonstrated a reduction trend in the magnitude and extent of contamination with time, and/or the contamination is contained on PRP property and is expected to remain so. The Auburn Road site does not fit those criteria. The Weston-proposed GMZ is simply a line drawn around the historic groundwater contamination plume with the implicit declaration that it is acceptable to allow this much contamination on private and public property in perpetuity without having to take any mitigation actions. That simply is not right. The correct GMZ should not extend beyond the PRP's property.

I have been providing technical assistance and advice to Mr. Simard since the mid-1990s regarding the Site. Before EPA's issuance of the Amended ROD in 1996, I submitted detailed comments to EPA urging it not to adopt the proposed natural attenuation remedy, because it was very doubtful that it would work as predicted (see Attachment A of this letter). I again urged EPA to reconsider the proposed ROD Amendment in November of 1996 (see Attachment B of this letter). More recently, I asked EPA to revert back to the original groundwater remedy in light of the evidence that natural attenuation has achieved no discernable improvement in 10 years (see Attachment C of this letter).

The long-term groundwater monitoring data presented in the Application proves my point. Of the 12 monitoring wells listed, only one (MW 109B) has reflected a definitive declining trend in arsenic concentration. In contrast, 3 wells show an *increasing trend* in arsenic concentrations (C-1, MW 302A, and PZ 218). The remaining 8 wells show no consistent trend in arsenic concentrations. Thus, it is clear that natural attenuation has provided no measurable improvement in groundwater contamination levels; if anything, the situation has worsened. Well PZ 218 (one of the three upward-trending wells) is near the landfill, indicating that the capping of the landfill has been ineffective and that the landfill will likely continue to release unacceptable levels of arsenic to groundwater.

The arsenic plume in groundwater beneath the Simard property has shown no improvement in 10 years. EPA justified the 1996 Amended ROD by concluding that natural attenuation would reduce arsenic concentrations in groundwater to target levels in 5 to 10 years. EPA was clearly wrong and it is time to revert back to the original remedy of capturing and treating the contamination at the Site boundary.

In addition, volatile organic compounds (VOCs) continue to be present in one area of the site groundwater (near well MW 102A), indicating that the Old Town Dump still poses a long-term threat to groundwater beneath the Simard property. It is also time to reconsider the source control part of the remedy, for both VOC and arsenic releases. The capping remedy has clearly not achieved intended objectives.

In addition to these major points, there are some other problems and deficiencies in the Application which I to call to your attention. These include:

- The Application does not include a map showing groundwater level contours (an implied requirement under section V. E. of the Application Form).
- On Attachment D of the Application, one of the two wells labeled MW 109A should apparently be MW 109B.
- There is no well location indicated for PZ 218 on Attachment D.
- Well MW 201 erroneously lists the ground elevation at 2272.4 ft (Attachment D).

In conclusion, the 1996 natural attenuation remedy has failed. Time is long over-due to begin arresting the contaminant migration at the Site boundary and to stop the continual contamination of groundwater and surface water on the Simard property. The Simard Family Trust is an innocent land owner and Mr. Simard is an innocent business proprietor adversely impacted too long by the failure to adequately address the off-site migration of contaminants. The only justifiable location for the northern boundary of the GMZ is the northern boundary of the Site (for 016-023). That is where groundwater should be restored to meet Ambient Groundwater Quality Standards.

I would appreciate a written reply to these comments before you issue a final decision on the Application. I would be happy to discuss any of these points further with you and to answer any questions you might have.

Thank you for your consideration.

Sincerely,

John B. Robertson, PG
Consulting Hydrogeologist and Environmental Scientist

Attachments

Cc: Al Simard
Byron Mah (EPA)
Thomas C. Andrews, PE (NHDES)

John B. (Jack) Robertson, P.G.
Consulting Hydrolgeologist and Environmental Scientist
40107 North 3rd Street Desert Hills, AZ 85086
Telephone/Fax: 623-742-0300 Email: jeanjack@aaip.net

December 18, 2006

Byron Mah
USEPA - New England
1 Congress Street (HBO)
Boston, MA 02114-2023

Dear Mr. Mah:

I appreciated the opportunity to speak to you by telephone today. I look forward to speaking with you and your team in the scheduled conference call Thursday. As I explained in our call, I am an independent consulting hydrogeologist retained by Mr. Alan Simard, owner of Whispering Pines Mobile Home Village and Sales, in Derry, New Hampshire. I have provided technical assistance and advice to him periodically for more than 10 years regarding the Auburn Road Superfund site (Site), which is adjacent to his property. I first became involved while I was Executive Vice President for HydroGeoLogic, Inc., who is still assisting Mr. Simard with field sampling and related issues. I previously had considerable interaction with Chet Janowski and Diane Luce of your office.

Recently, Mr. Simard has re-engaged me to advise him regarding some fundamental issues pertaining to the impacts, or potential impacts, of contaminants from the Site, the effectiveness of the remedy selected for the Site, and monitoring activities associated with the Site and remedy. One of the questions Mr. Simard has asked me to look at is your recent request to install three additional monitoring wells on his property (I believe that these are proposed wells MW208, MW209A and MW209B). I have reviewed the monitoring data over the past 6 years (including the most recent October 2006 results), and, frankly, I fail to see a compelling need for additional monitoring wells on his property. Can you please provide me with the technical rationale that would justify the need for these wells? Constructing wells on his business property is disruptive to his business, disturbing to his tenants, calls undue attention to existing and potential tenants to the environmental harm that has been inflicted on his property, and potentially impacts property values and his ability to obtain and retain tenants and market-value rental rates. Mr. Simard desires to continue to be cooperative and non-obstructionistic with EPA and the PRPs in this process, but he also has a business to run and care for, which is his only significant asset.

The principle reason that I do not believe additional wells on his property are warranted is the fact that we now have 10 years of groundwater remedy monitoring data, since the issuance of the 1996 ROD amendment. It is clear that the remedy selected in 1996 (over

my strong objections) is not working, just as I had warned then. The ROD claims repeatedly that the natural attenuation remedy will achieve cleanup goals in 5 years, about the same time that the abandoned pump-and-treat remedy would have taken. The first 5 years came and went with no discernable progress toward cleanup goals on arsenic. Now, the second 5 years has passed, again with no discernable reduction in overall arsenic levels in groundwater. The remedy is not working and needs to be changed. Mr. Simard has continued to endure 5 more years of environmental insult to his property, unnecessarily, and faces an indefinite number of years in the future of continuing and increasing harm to his property. Arsenic-contaminated sediments have been continuously accumulating in his Whispering Pines Pond and groundwater beneath his property continues to be degraded to undrinkable conditions because of high contaminant levels.

I realize that a second 5-year review is now due. Please consider this letter official input to that review process. I am wondering how many 5-year reviews it might take for EPA to realize that the 1996 remedy selection was a mistake and is not performing as claimed in the ROD? It is time to admit the mistake and revert back to the original 1989 pump-and-treat remedy (or equally effective alternative). Not only is arsenic not being remediated, but TCE and PCE also continue to exceed cleanup goals in at least one area of groundwater (well MW102A).

It is time to set the compliance boundary back to the northern boundary of the Site and to halt the continuing migration of arsenic (and potentially TCE/PCE) onto Mr. Simard's property. We have wasted 10 years on an experiment that hasn't worked, just as I warned in my 1996 comments to EPA in response to the then-proposed Amended ROD (copies of those comments and related correspondence are attached).

I would like to be placed on your distribution list for any future reports and correspondence issued by EPA regarding this Site, as an agent for Mr. Simard. That, of course, would include the forthcoming second 5-year review.

I look forward to discussing these points further with you Thursday. Thank you in advance for your considerations and assistance.

Sincerely,

John B. Robertson, P.G.

Attachments. Written comments of John B. Robertson to USEPA re/ proposed 1996 Amended ROD, and two related letters to Daniel Luce, USEPA.

Cc: Al Simard

FROM : PA_MACDONALD FAX NO. : Dec. 15 2006 10:47AM P1

HYDRO GeoLogic

May 22, 1996

Mr. Darrell Luce
Remedial Project Manager
U.S. Environmental Protection Agency
Region 1 (HBO)
JFK Building
Boston, MA 02203

Dear Mr. Luce:

Attached are my comments regarding the "Proposed Plan to Amend the Cleanup Plan at the Auburn Road Landfill Site, Londonderry, NH", issued by your office April, 1996. Please incorporate these comments into the official comment record for this proposed change. I trust that my concerns and questions will be given serious consideration by the EPA before proceeding any further with the proposed change in the Record of Decision. I would appreciate an official response from EPA regarding each of my comments.

Thank you.

Sincerely,

John B. Robertson

Attachment

cc: Alan Simard

1165 Herndon Parkway, Suite 900, Herndon, Virginia 22070 USA
(703) 478-5186 FAX (703) 471-1180

STATEMENT OF JOHN B. ROBERTSON, REGISTERED PROFESSIONAL GEOLOGIST, REGARDING THE U.S. ENVIRONMENTAL PROTECTION AGENCY'S PROPOSED CLEANUP PLAN AMENDMENT FOR THE AUBURN ROAD LANDFILL SUPERFUND SITE, LONDONDERRY, NEW HAMPSHIRE

May 22, 1996

1.0 INTRODUCTION

This statement constitutes my formal comments to be entered into the official record for consideration by the U.S. Environmental Protection Agency (EPA) in making its final decision regarding the April 1996 Proposed Change in the Cleanup Plan for the Auburn Road Superfund Site (Site), Londonderry, New Hampshire. I submit these comments on behalf of the owners of the most directly and severely impacted private property adjacent to the site, Whispering Pines Mobile Home Village and Sales (Whispering Pines), directly north and downgradient of the Site.

I am a hydrogeologist and engineer with 35 years of experience in investigating and remediating sites with soils and groundwater contaminated by hazardous substances. I have written or coauthored more than 40 publications regarding soil and groundwater contamination and remedial methods, including one widely used textbook on cleanup methods for soil and groundwater, as well as portions of three other books published by the National Academy of Sciences/National Research Council. My experience includes 23 years with the U.S. Geological Survey, Water Resources Division, where I was Chief of the Office of Hazardous Waste Hydrology. I have served as the National Chairman of the Groundwater Committees for the American Society of Civil Engineers and for the American Geophysical Union. Currently, I am the Executive Vice President and Principal Hydrogeologist of HydroGeoLogic, Inc., in Herndon, Virginia.

My involvement with the Site began about five years ago. I have since visited the Site several times, conducted field and sampling investigations at the Site, reviewed thousands of pages of documents and technical data, and attended previous public hearings and meetings with the EPA representatives and Site investigators.

2.0 COMMENTS

2.1 GENERAL COMMENTS

I strongly object to the cleanup plan changes being proposed by the EPA and urge that this new proposal be withdrawn and reconsidered. Prompt remedial actions are needed to curtail the continuing outflow of arsenic and other site contaminants via groundwater to off-site properties. The proposed changes are based on insufficient information, unjustified assumptions, erroneous

interpretations of data, disregard of important and relevant site data, disregard of impacts on adjacent property owners, and are inconsistent with the EPA's own nine criteria for choosing a cleanup remedy. These problems are more specifically elaborated on in the following sections.

2.2 UNREASONABLE DELAYS IN CLEANUP

The Auburn Road Superfund Site exemplifies what has gone wrong in the EPA's implementation of the Superfund law. Superfund was intended to provide timely, effective, and reasonable cost remedies to our nation's worse toxic waste sites, such as the Auburn Road Superfund Site. Under Superfund, the National Priorities List (NPL) is used to identify sites having the highest priority for expenditure of resources to achieve timely cleanup. The Auburn Road Superfund Site was discovered as a contaminated toxic chemical waste dump site in 1979 and it was not added to the NPL until 1983. It took 15 years (1994) until the first phase of the permanent remedy was implemented (capping of the landfills). After 17 years of study, a groundwater remedy still has not been implemented, even though the pump-and-treat remedy was selected (but never implemented) seven years ago.

If readily implementable, relatively low-technology remedies would have been implemented when they should have been in the late 1980's, the site itself and off-site properties would probably have been remediated by now. It is no wonder that the public, the U.S. Congress, and adversely impacted citizens have lost faith in the EPA's Superfund Program.

2.3 NON-COMPLIANCE WITH NCP CRITERIA

The National Contingency Plan (NCP) specifies nine criteria that must be used to select Superfund site remedies. These criteria are listed in the EPA's proposed cleanup change for the Site and each of the three cleanup alternatives considered by the EPA were evaluated against the nine criteria. However, there are several problems with the EPA's evaluation including the following:

- The EPA states that Alternative #1 (monitoring only) "meets the 9 criteria, including protecting public health and the environment." This conclusion is clearly wrong and contradicts the EPA's own comparison table that shows that Alternative #1 does not reduce contaminant mobility toxicity and volume—one of the most important of the nine criteria.

- The EPA's own table also indicates that the remedy has not yet met two other criteria: state and public acceptance (criteria 8 and 9).

- The EPA erroneously concludes that Alternative #1 provides short-term protection. How can monitoring and slow natural attenuation provide short-term protection against an arsenic contamination plume in groundwater that extends 2,500 feet from the source areas and 1,000 feet off-site? This arsenic-contaminated groundwater is continuously discharging into Whispering Pines Pond on private off-site property. How will this no-action remedy provide short-term relief of this discharge?

- On page 30 of the EPA's 1989 Record of Decision (which the EPA is now trying to change), the groundwater monitoring remedy was rejected because " . . . this alternative

provides no reduction in toxicity, mobility or volume and does not meet ARARs, specifically Federal and state groundwater and drinking water standards. Nor does this alternative comply with the EPA's Groundwater Protection Strategy . . .". The ROD goes on to say that "In addition, since groundwater contamination levels would continue to exceed acceptable drinking water standards off-site, the alternative would not provide protection to public health or the environment." The EPA appears to have done an about-face on these positions. Nothing has changed regarding the level of arsenic contamination either off-site or on-site except that concentrations have increased somewhat. Why is it now alright to ignore ARARs and to allow continued off-site migration of arsenic above drinking water standards?

- The EPA's alternative comparison table states that the groundwater pump-and-treat remedy (Alternative #2) will not reduce contaminant mobility, toxicity, and volume and will not provide short-term protection (criterion 4). However, a pump-and-treat remedy, by definition, removes (reduces) contaminants from groundwater and also reduces mobility by changing the groundwater flow regime. The treatment phase of a pump-and-treat system reduces or eliminates toxicity. These benefits of a pump-and-treat system are almost instantaneous and subsequently, short-term protection is achieved, even though the system may have to be operated for a number of years to achieve remedial goals. An aggressive contaminant containment and removal system obviously has much better short-term protection benefits than the do-nothing remedy the EPA now proposes.

- Another problem with the EPA's alternative comparison chart is the unsupported conclusion or assumption that all three alternatives would achieve cleanup goals within 5 years. There is no technical basis or justification presented for this assumption and it is certainly contrary to reasonable logic and, therefore, lacking in credibility. The basis for determining that each of the three alternatives will equally achieve remedial goals in five years needs to be provided.

- The EPA's matrix chart comparing the three cleanup alternatives to the nine NCP criteria is therefore highly misleading, biased, and erroneous.

2.4 ADVERSE IMPACTS ON ADJACENT OFF-SITE PRIVATE PROPERTY

Approximately 600 people reside on the Whispering Pines property, a private residential and business property, that lies adjacent to the northern boundary of the Site. This location is immediately downgradient for groundwater flow and contaminant migration from the Site. Consequently, all of the contaminants of concern in groundwater from the Site, including volatile organic compounds and arsenic, have migrated under the Whispering Pines property and continue to do so. The owners of this property have sustained and continue to sustain considerable adverse impacts from the Auburn Road Superfund Site. These include but are not limited to:

- Increased costs of new water supply. Loss of their economical, on-site community water system and production wells due to contamination from the Site. Although the property has been provided a free connection to the municipal water system, the owners must now pay considerably higher costs for use of that water.

- Decreased property value. The presence and stigma of an adjacent unremediated Superfund site has greatly decreased the desirability and market value of the Whispering Pines property. Who would pay the same price for a piece of property next to an unremediated Superfund site when they could purchase a similar property a mile or more away? This problem has been well documented at many Superfund sites and is further evidenced by the fact that the owners have been unable to obtain a mortgage on the Whispering Pines business property. The loss of quality and access to the once-clean groundwater resource beneath the property has further devalued the property.

- Loss of business. The Whispering Pines property is primarily a residential rental business. Who would choose to live next to an unremediated Superfund site when they can live somewhere else in the area for similar price? The appeal of this property for rental residents has clearly been adversely impacted by the continued presence of the Site.

- Aesthetic and natural resource impacts. Whispering Pines Pond is a scenic water body teeming with biota and wildlife. However, over the past few years its scenic appeal has been severely impacted by the discharge of iron-contaminated groundwater from the Site into the pond, causing an unsightly bloom of orange iron oxide and iron hydroxide precipitate in the water. In addition, high levels of arsenic from the site plume are discharging continuously into the pond through springs and seeps, exposing biota to elevated arsenic levels and raising arsenic levels in sediments on the pond floor. These elevated arsenic levels have permanently degraded the environmental quality of the pond and are exposing the entire population of biota associated with the pond—from microorganisms to shellfish to fish to water fowl to mammals to humans—to potential risks from arsenic ingestion and direct contact. These risks have not been acknowledged by the EPA. We have collected samples of spring water discharging into the pond as well as pond bottom sediments near springs and seeps in the pond. Analysis of these samples indicates that arsenic concentrations in the spring water range from 47 to 75 µg/L (see Attachment A). Sediment samples from the pond bottom contained arsenic concentrations as high as 44 mg/kg, which is about 100 times higher than the concentrations assumed by the EPA to compute risks posed by arsenic in sediments (see Attachment B).

- The stream that feeds Whispering Pines Pond carries enough water to be potentially valuable as a small hydroelectric resource, if the pond water level could be maintained and regulated at a sufficiently high elevation to provide the needed head drop at the downstream dam. However, a condition of the site remedy requires that the pond level be maintained at a low level to reduce groundwater contact with buried waste on the Site. Therefore, the property owners have lost access to this potentially economically valuable hydroelectric resource on their property, due to the unremediated Superfund site. The requirement to maintain the pond water level at a low position has also further damaged the aesthetic appeal of the pond, and, therefore, further reduced the value of the property.

- The monitoring "remedy" proposed by the EPA will do nothing to restore the quality of Whispering Pines Pond, the once-clean groundwater resource beneath the Whispering Pines property, nor the stigma of an unremediated toxic waste Superfund site next to a residential business property.

- The change in the cleanup plan proposed by the EPA appears to give high priority to reducing cleanup costs for the Responsible Parties but gives no consideration for the costs and adverse impacts to adjacent property owners, especially the Whispering Pines property. This proposed change may be good for the pocketbooks of parties that caused the problem, but it further exacerbates the adverse economic and other impacts on the innocent adjacent property owners. That is a great injustice and clearly unfair.

2.5 THE PROPOSED CHANGE IS BASED ON INSUFFICIENT INFORMATION

- The success of any proposed cleanup action depends on an adequate understanding of the source and causes of the contamination. In the case of the arsenic in groundwater, now the primary contaminant of concern, the EPA has admitted that the source of the arsenic is unknown. Page 3-20 of the August 20, 1993 Supplement II Report, upon which the EPA bases its new recommended remedy, states "The source of arsenic released to the groundwater is not unknown." The EPA and the Site remediation contractors have theorized that the arsenic comes from natural arsenic in the geological materials which becomes mobilized and released by the geochemical conditions of the anaerobic, organic-rich, acidic leachate from the Site landfills. That may or may not be true. The arsenic or some significant portion of it may also be from wastes buried at the Site. Even if the arsenic is from natural materials, the wastes at the Site are causing its release and there is no evidence to indicate that capping the Site will stop the leaching of arsenic; it is simply unproven speculation and theory. Therefore, there is insufficient evidence to conclude that the proposed remedy will work and how long it might take.

- The EPA's information is also lacking an assessment of the ecological and human health risk caused by the high arsenic levels entering Whispering Pines Pond and sediments through springs and seeps. As stated above, visible springs are discharging site-contaminated groundwater along the south-central bank of Whispering Pines Pond and sediments near the springs contain high arsenic levels. The pond water and sediments are inhabited or used by a wide range of biota and are readily accessible to humans for fishing, wading, swimming, drinking, and hunting. Therefore, significant potential exposures and associated ecological and health risks are present. However, these risks have apparently been ignored by the EPA because they are not addressed in the proposed change documents.

2.6 UNJUSTIFIED ASSUMPTIONS USED IN THE PROPOSED CHANGE

The EPA refers to a modeling study by the Responsible Parties' site remediation contractor as a basis to conclude that the do-nothing remedy will achieve remediation goals within five years. I have reviewed the assumptions, approach, and results of the model, and find them insufficient to support the EPA conclusions. The model is based completely on hypothetical assumptions and only addresses dissolved organic carbon concentrations, not arsenic, under the landfills, (not in the downgradient plume). Therefore, these modeling results do not conclude that arsenic levels anywhere in the plume will decline to drinking water levels in five years (or any other time, for that matter). It simply is incredible, based on my extensive experience, to conclude that arsenic levels that are currently in the range of 200 to 500 µg/L in a large portion of the plume will

magically drop below 50 µg/L in five years, simply due to the effects of capping the landfills. Models like this are like spies in the hands of enemy captors—with the right incentives they can be made to say whatever the captors want them to say. The model relied upon in this case is uncalibrated, unverified, unvalidated, and grossly inappropriately applied.

2.7 ERRONEOUS INTERPRETATIONS AND CONCLUSIONS USED IN THE PROPOSED CHANGE

- The EPA states in its April 11, 1996 news release regarding the proposed change that " . . . the threat of exposure to contamination no longer exists . . .". The EPA also states on page 4 of the April 1996 Proposed Plan that "In 1996, the public's risk of exposure to the site's contaminants no longer exists." Furthermore, the EPA states on page 3 that " . . . two developments have combined to reduce the public risk to zero" (emphasis added). These statements are obviously incorrect because the threat of exposure to elevated arsenic levels in surface water, sediments and groundwater does exist. Arsenic-contaminated groundwater is continuously discharging into Whispering Pines Pond, and Cobas Brook, exposing pond biota to elevated water and sediment arsenic levels, which in turn exposes the ensuing food chain. Potential exposures also exist to children and adults who may swim or wade in the pond, drink its water, or eat fish or water fowl from the pond. A potential exposure also exists for future groundwater users should someone install and drink from a well placed within the off-site contamination plume.

- The EPA states in the April 1996 Proposed Plan (page 3) that " . . . arsenic occurs only in a narrow area and does not appear to discharge to either the streams or the ponds." This is a blatantly false statement. If the EPA had bothered to sample and analyze spring and seep water discharging into Whispering Pines Pond, as we have, they would know that statement is untrue. Site-contaminated groundwater with elevated arsenic concentrations has been detected entering the pond near the south-central shore line. Pond sediments from that area have been found to have arsenic concentrations as high as 44 mg/kg. The EPA has neglected to ensure public health and safety.

2.8 THE EPA APPEARS TO DISREGARD ITS OWN DATA

The EPA implies in its April 1996 Proposed Plan that all contaminant concentrations including arsenic are decreasing at the Site, when, in fact the EPA's own table entitled "Historical Decrease in Significant Contaminants" (emphasis added) shows that maximum arsenic levels have actually increased from 1986 to 1994.

2.9 FAILURE TO CONSIDER ANOTHER POTENTIALLY MORE PROTECTIVE, YET COST-EFFECTIVE ALTERNATIVE

The EPA appears to have arbitrarily limited the remedial alternatives it considered to three, one of which is obviously a cost-prohibitive remedy (encapsulation). They failed to consider another obvious alternative that is potentially suitable and relatively low cost. That alternative is a lower-scale variation of the original pump-and-treat remedy. This alternative would involve placing hydraulic capture wells in the heart of the arsenic plume at the northern boundary of the Site to

capture arsenic-contaminated groundwater before it moves off-site. This is a variation that would not necessarily require pumping and treating the entire plume. This would be much more effective at meeting the nine NCP criteria than the presently proposed do-nothing remedy. This pump-and-treat system would be much lower in cost than the $16 million estimated for the full-scale version in the original ROD. The cost is lower because less water would be pumped and treatment cost are less because only arsenic would be treated (not organics). Why was this alternative not considered?

2.10 VAGUE CRITERIA FOR EVALUATING EFFECTIVENESS OF PROPOSED REMEDY AND ACTIONS TO BE TAKEN WHEN IT FAILS

The new EPA-proposed cleanup plan fails to state the criteria that will be used at the 5-year review to determine whether or not the remedy is working adequately. This is further complicated by the EPA's failure to clearly state what the cleanup goals are. It is implied that the goal is to clean groundwater up to drinking water standards (arsenic below 50 µg/L everywhere, on-site and off-site). Is this true? If so, then if this goal has not been reached in 5 years, what actions will be taken? What about 10 years? 15 years? 25 years? What is a "reasonable time period" for remediation, as stated by the EPA in the Proposed Plan? I am quite confident that arsenic concentrations in the groundwater plume will remain well above 50 µg/L five years from now.

3.0 CONCLUSION

The proposed change in the cleanup plan is clearly positioned to benefit the Responsible Parties who caused the environmental harm, while ignoring the significant adverse impacts on innocent property owners to the north and downgradient of the Site. Furthermore, the proposed remedy fails to meet the basic requirements of the NCP's nine criteria and fails to meet the most fundamental intentions of Superfund—to reduce risk to the environment and human health and adverse impacts on innocent private citizens and to make responsible parties pay to restore the damage they have caused. I implore the EPA to reconsider this clearly unjustified, unprotective, and unfair remedy and ask, instead, that it implement prompt remedial actions that will eliminate the continuing discharge of contaminated groundwater laden with arsenic and other site contaminants onto and beneath private residential property to the north. The EPA proposal only goes further to erode the credibility of the Agency as protector of the environment and human health as well as the credibility of the Superfund Program. The only beneficiaries from implementation of this plan are the responsible polluters.

It appears the EPA has been in the battle trenches too long in the Auburn Road campaign. It looks like the EPA is now making a strategic withdrawal and declaring victory. The only problem with this, however, is that the winners are the responsible parties who are supposed to be cleaning up the groundwater and paying the bill. The losers in this decision are the innocent landowner citizens and adjacent residents who must bear the continuing adverse environmental impacts on their property, associated health risks, economic impacts, and increased stress, resulting from the EPA's inexcusable delay and refusal to do the right thing. By the way, another apparent loser is

Sent By: HP LaserJet 3100; 434 1149; Dec-15-06 2:10PM; Page 1
10/15/96 TUE 13:58 FAX 703 471 4180 HYDRO GEOLOGIC

Post-it® Fax Note 7671	Date 10/15/96 # of pages ▸ 4
To Alan Simard	From Jack Roberts
Co./Dept. Whispering Pines	Co. HydroGeologic Inc.
Phone #	Phone # 703 478 5186
Fax # 603 434 7155	Fax #

HYDRO Geologic Inc.

October 15, 1996

Mr. Derrell Luce
Remedial Project Manager
U.S. Environmental Protection Agency
Region 1 HBO
JFK Federal Building
Boston, MA 02203

Dear Mr. Luce:

On May 22 of this year I wrote you a letter expressing my concerns regarding the EPA's proposed changes to the Record of Decision (ROD) for the Auburn Road Superfund site, Londonderry, New Hampshire, in which the Agency proposes to abandon any direct efforts to contain or remediate contaminated groundwater at the site. In that letter, I pointed out our most serious concern which is the continuing and increasing discharge of arsenic-laden groundwater into the water and sediments of Whispering Pines Pond on Mr. Alan Simard's abutting property north of the site. I provided you with our analytical results that confirmed high arsenic levels in the contaminated springflow entering the pond and in the sediments associated with the springflow area.

We recently resampled the spring discharge in the pond and associated sediments and find that arsenic concentrations are much higher than previously observed, confirming my conclusion that the source control remedial measures are not causing a reduction of arsenic in groundwater or in the concentrations entering the surface and subsurface of Mr. Simard's property, despite EPA's statements to the contrary and the conclusions of the PRP's contractor.

A summary of our sampling data for the spring discharge area of Whispering Pines Pond is provided below. The approximate sample locations can be seen on the attached map.

HydroGeologic, Inc.
1155 Herndon Parkway • Suite 900 • Herndon, Virginia 20170 • USA
(703) 478-5186 • Fax (703) 471-4180 • http://www.access.digex.net/~hgi

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10/15/96 TUE 14:00 FAX 783 471 4180

D. Lucy
Page 2
10/15/96

Sample Type	Location Number	Description	Date of Sample and Arsenic Concentration mg/kg (sediment) or µg/L (water)				
			9/11/91	12/20/91	12/19/94	7/19/95	8/06/96
Sediment	2	Background (Cobas Brook)	NA	NA	1.47	1.04	<0.6
	3	East end of pond		NA	3.66	1.70	4.43
	5	Near spring discharge	NA	NA	NA	14.5	13.4
	6	At spring discharge	NA	NA	37.1	44.3	168-866[1]
	8		NA	NA	NA	8.14	7.02
	11	Southwest arm of pond	NA	NA	NA	6.07	6.44
	12	North-central side of pond	NA	NA	NA	5.24	8.16
Springwater (submerged)	5	Southwest part of pond	75	47	NA	NA	881

NA: Not Analyzed

[1] Results from two samples collected at same location

As can be seen from this table, arsenic levels in sediments at the submerged springflow location (location no. 6) have always been unnaturally high but, more importantly, have increased from 37.1 mg/kg in 1994 to between 168 and 866 mg/kg in August 1996. Similarly, arsenic concentrations in contaminated groundwater discharging into the pond through the spring have increased alarmingly from 75 µg/L in 1991 to 881 µg/L in August of 1996.

These results are just the opposite of those predicted in your agency's documents issued to support the proposed change in the ROD.

Ms. Simard's property is continuing to receive an ever-increasing assault of toxic arsenic originating at the Auburn Road Superfund site. This arsenic is increasing risks to human health and the environment and is decreasing the value of his property. The EPA's continuing efforts to avoid reducing or stopping this off-site migration is contrary to the requirements of the National Contingency Plan, EPA's own guidance documents, and EPA's responsibilities to the innocent abutting landowners. I urge you again to do the right thing, withdraw your proposed abandonment of groundwater remediation and containment, and implement a protective containment/cleanup remedy that will eliminate off-site migration of arsenic and other contaminants.

I am requesting an official reply to this letter in writing from Region I. I will look forward to hearing from you. I also asked for a written response to my May 22 letter and have received none. Is this the way Region I listens and responds to community concerns?

Sincerely,

John B. Robertson

Attachment

cc: Alan Simard
EPA Region I Office of Counsel

HYDRO Geologic inc.

November 27, 1996

Mr. Darrell Luce
U.S. Environmental Protection Agency
Region I
John F. Kennedy Building
Boston, MA 02203-0001

Dear Mr. Luce:

Thank you for your letter of November 6, 1996, regarding my concerns about the proposed amendment to the Record of Decision on the Auburn Road Superfund site, Londonderry, New Hampshire. I was very interested to learn that EPA had developed recent new concerns regarding increasing arsenic levels in Cohas Brook sediments. Those increases are no surprise to me and are consistent with our data showing increases in arsenic levels in sediment and spring water of Whispering Pines Pond on Mr. Alan Simard's property.

I are aware that arsenic can have different degrees of toxicity depending on its chemical state. It also displays different degrees of toxicity to different types of organisms. The fact that your biotoxicity tests showed relatively low toxicity to the amphipod *Hyalella azteca* does little to assuage my concern for arsenic toxicity to other higher organisms such as fish, waterfowl, and humans. Is *Hyalella azteca* a native and prominent benthic organism in Cohas Brook and Whispering Pines Pond? Are there not some bioconcentration factors to be concerned with, such as the arsenic moving up the food chain? Have you done any biotoxicity testing with the most contaminated sediments of Whispering Pines Pond? Why not, as that is where Mr. Simard's and my concerns are greatest?

You indicated some skepticism with the analytical data I sent you. Enclosed are our complete laboratory sheets with chain of custody for all arsenic samples referred to in the attached table. Please note that the table I sent with my October 15, 1996, letter had some errors that I have corrected in the attached table.

You stated that "...many of the high concentrations were for data that should have been rejected...because the solids content was too low--less then 30%." Only two of the samples in the attached table had solids content lower than 30%; one was only slightly below 30% (27.6%) and the other was 18.8%. I agree that those two samples cannot be considered as accurate as samples with high sediment content, but they surely should not be totally disregarded. Do you think the result would have changed significantly if the solids content had been 31% instead of 27.6%? Of course not. Two things are important regarding the solids content: (1) there needs

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to be sufficient mass of solids present to meet the minimum weight requirements of the analytical method employed and (2) an excess of water in the sample most likely will remove some of the solid phase contaminant in accordance with the applicable aqueous/solid distribution coefficient. Thus, excess water tends to lower the detected concentration in the solid phase. Therefore, results reported for low-solids-content samples can be considered as least approximate minimum values.

Regarding your concern about the high arsenic content of the spring water sample (881µg/L), the sample was unfiltered because previous samples were unfiltered and we are most interested in total arsenic concentrations of water entering the pond, that is the water to which biota are exposed (no one filters the water for them). The sample collected had no visible solid-phase sediment in it. We intend to resample in December and at that time will collect both filtered and unfiltered splits. We would welcome you or another EPA representative to accompany us for the next sampling.

Finally, I again urge you to reconsider the proposed amendments to the ROD. Your own data on Cobas Brook sediments confirms our data and the clear conclusion that arsenic levels are increasing, not decreasing. Speculated decreases in arsenic was the cornerstone upon which your ROD amendment was based. It simply is not happening and there is no indication that it will happen in the future.

If the amended ROD is implemented, Mr. Sinard has only two things to look forward to: (1) increasing arsenic levels discharging into his pond and accumulating in the pond sediments (and the associated ecological and human health risks) and (2) decreasing value of his business property because of accumulating arsenic levels, damaged natural resources, the stigma of an adjacent unremediated Superfund site, and lack of freedom to develop his property and resources to their fullest potential. Your attention and appropriate consideration of these legitimate concerns will be greatly appreciated.

Sincerely,

John B. Robertson, P.G.
Executive Vice President

JBR:cf

Attachment

Sample Type	Location Number	Description	Date of Sample and Arsenic Concentration mg/kg (sediment) or µg/L (water)				
			9/11/91	12/30/91	12/19/94	7/19/95	8/06/96
Sediment	2	Background (Cohas Brook)	NA	NA	NA	1.04	<0.6
	3	East end of pond		NA	NA	1.70	4.43
	5	Near spring discharge	NA	NA	NA	14.5	13.4
	6	At spring discharge	NA	NA	37.1	44.3[2]	168-866[1,3]
	8	Northwest of spring	NA	NA	NA	8.14	7.02
	11	area	NA	NA	3.58	6.07	6.46
	12	Southwest end of pond North-central side of pond	NA	NA	1.47-2.34[1]	5.24	8.46
Springwater (submerged)	9	Southwest part of pond	75	47	NA	NA	881

NA: Not Analyzed

[1] Results from two samples collected at same location

[2] Percent solids for this sample was 27.6 which is slightly below the recommended minimum of 30 percent; however, a low percent solids content does not mean the result is meaningless; it means the result may be lower than would be obtained for a high-solids content sample. Therefore, 44.3 mg/kg for this sample should be considered a minimum.

[3] The 866 mg/kg result was for a sample that was 18.8 percent solids, significantly below the recommended minimum of 30 percent. However, that does not mean the result is meaningless; it means the true value for a high-percent solids samples can be expected to be that great or greater. The second samples collected from the same location had an arsenic concentration of 168 mg/kg and an acceptable percent solids content of 34.5 percent.

As can be seen from this table, arsenic levels in sediments at the submerged springflow location (location no. 6) have always been unnaturally high but, more importantly, have increased from 37.1 mg/kg in 1994 to between 168 and 866 mg/kg in August 1996. Similarly, arsenic concentrations in contaminated groundwater discharging into the pond through the spring have increased alarmingly from 75 µg/L in 1991 to 881 µg/L in August of 1996.