2006 Annual Report

Shepley's Hill Landfill
Long Term Monitoring & Maintenance
Devens, Massachusetts

Prepared for:

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2006 ANNUAL REPORT
SHEPLEY'S HILL LANDFILL
LONG TERM MONITORING & MAINTENANCE
DEVENS, MASSACHUSETTS

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EXECUTIVE SUMMARY

The report documents the results of long-term monitoring efforts conducted in 2006. In addition, the document includes groundwater and plant operational data collected during the early operation of the groundwater extraction and treatment Contingency Remedy. Annual reporting of landfill monitoring (groundwater and landfill gas) and inspections has been underway for many years at Shepley's Hill Landfill (SHL) at Former Fort Devens, Massachusetts. The 2005 and 2006 annual reports have expanded reporting of data collected in association with the new groundwater extraction and treatment system. The 2005 Annual Report contains data and assessments conducted during start-up of the system in August/September, 2005 and this report contains data related to regular operation of the system which was initiated in March, 2006 following plant upgrades related to methane monitoring and process venting.

The ROD (ABB-ES, Oct 1995) describes Alternative SHL-2, Limited Action, involving monitoring following landfill closure, and Alternative SHL-9, Groundwater Pump and Discharge to the Ayer Publicly-Owned Treatment Works (POTW). These alternatives became the primary and contingency elements of the selected remedy for the Shepley's Hill Landfill remedial action, respectively. The contingency element of the overall remedy was to be implemented should capping alone not prove to be effective at controlling site risk in accordance with ROD goals. Groundwater data collected over many years indicated that goals were not being met and decisions were made to implement the Contingency Remedy. The design process for the Contingency Remedy was initiated in the Fall of 2003. The remedy was modified by an Explanation of Significant Differences (CH2M HILL, June, 2005) to include treatment and discharge to the Devens POTW and construction of the wellfield and plant were completed in 2005.

CH2M HILL has prepared this report in accordance with the Record of Decision (ROD) for Areas of Contamination 4, 5, and 18 (ABB-ES, Oct 1995), and the approved *Long Term Monitoring and Maintenance Plan* (LTMMP), Stone and Webster Environmental Technology & Services (SWET), May 1996. The LTMMP provides the basis for semi-annual monitoring of groundwater, annual landfill gas sampling, and landfill inspections that have been conducted since the mid 1990's. In addition, to the typical reporting this document summarizes monitoring activities associated with the early operation of the arsenic groundwater extraction, treatment, and POTW discharge system (Contingency Remedy). The monitoring activities associated with start-up and initial operation of the Contingency Remedy are described in the *Contingency Remedy, Performance Monitoring Plan* (PMP), CH2M HILL, 2005 and the industrial discharge permit for the Deven's POTW (Devens/MassDevelopment June, 2006).

The PMP (CH2M HILL, 2005) was developed specifically for the start-up and first year of monitoring associated with the pump, treat, and discharge system. This system performance monitoring has been conducted in concert with the LTMMP (SWET, 1996) over the past year. The 2006 monitoring is considered to be a transition year, both programs were being conducted simultaneously as the early plant and wellfield operations were initiated. The Army prepared a draft Revised Long Term Monitoring and Maintenance Plan (CH2M HILL, 2006), available in December 2006, providing an updated and optimized, comprehensive monitoring strategy for Shepley's Hill Landfill. This plan was issued final in May, 2007 (CH2M HILL, 2007). It is inclusive of the

Contingency Remedy and recommends optimized monitoring based upon review of data collected since closure of the landfill and early operation of the Contingency Remedy. This new document replaces the LTMMP (SWET, 1996) and the PMP (CH2M HILL, 2005) and will be fully implemented in 2007. Adjustments or refinements to the Revised LTMMP in the future are anticipated to be made through recommendations of Annual Reports.

An annual landfill inspection was conducted in the Fall of 2006 and observations made regarding the vegetative cover, vegetation types, erosion, settlement, and general condition of the various features. The inspection checklist is included in Appendix A. Presently, the landfill is in fair condition. The cover surface contains some areas of sparse vegetation, establishment of potentially intrusive vegetation, and settlement. Intermittent standing water, erosion, overgrowth of vegetation, and encroachment of wetland plants within drainage swales were observed. Corrective action recommendations relating to the cap system and associated drainage were made during the 2005 annual reporting cycle and are included in the *Geotechnical Engineering Fall 2005 Annual Inspection Report* (USACE, 2006). Some recommendations from 2005, including repair of fences and gates, have been addressed. Recommendations for 2006 include the following: (1) Secure fence gates with padlocks and chains as required to control access to the site and (2) place topsoil and seed over the sandy area lacking vegetation on the east side along the perimeter of the cap. The landfill is in fair condition and appears to be functioning adequately. Section 3.0 provides further discussion of the inspection.

As part of the annual landfill gas monitoring program, field readings with a photoionization detector (PID), multigas meter, and an infrared spectrophotometer were collected from eighteen (18) gas vents on the landfill and thirteen (13) perimeter gas monitoring wells. Four (4) of the perimeter gas monitoring wells are located just north of the landfill and the other nine (9) are located to the south of the landfill. Those on the south were installed in November, 2005 and were monitored for the first time in February, 2006 and then again as part of the LTMMP in December, 2006.

Readings collected from gas vents in the fall of 2006 indicated that levels of carbon dioxide and hydrogen sulfide were similar to readings collected in the previous monitoring, while oxygen and carbon monoxide levels increased. Trace concentrations of volatile organic compounds (VOCs), less than 0.6 ppm, were detected in five gas vents (GV-5, 12, 13, 14, and 15) while VOCs were not detected in the previous monitoring. LEL and methane concentrations were similar to 2005 concentrations with the following exceptions: GV-1, 7, 11, and 14 showed increased LEL concentrations and GV-5, GV-12, GV-13, GV-16, and GV-17 showed decreased LEL and/or methane concentrations.

Readings collected from all perimeter gas monitoring wells in the December 2006, including those on the north and south, did not indicate the presence of methane. This has been the case in past events, as well. VOCs, oxygen, hydrogen sulfide, carbon dioxide, and LEL readings were similar to past events. These data do not indicate an issue with migrating landfill gas.

As part of October, 2006 gas monitoring, CH2M HILL collected ten (10) soil gas samples from temporary gas probes in the northern perimeter area of the landfill to confirm historical results from the permanent gas monitoring well locations and expand coverage in the area. This was done as part of the methane evaluation conducted with the discovery of dissolved methane detected in deep groundwater being pumped as part of the Contingency Remedy. This groundwater is under strongly

reducing (methanogenesis-dominated) conditions. In addition, in December, 2006, six (6) soil gas samples were collected from temporary soil gas probes located adjacent to off-site, downgradient monitoring wells SHM-99-31, SHM-99-32X, SHM-99-39, SHM-99-40X, SHM-99-41, and SHM-99-42, from which water samples were analyzed for dissolved methane and ethane. Methane was not detected in any of these samples, confirming that dissolved methane in water at depth was not resulting in detectable methane in soil gas.

Groundwater monitoring was performed at the site in April, June, September, and December 2006, as part of LTM and PMP events. Samples were collected in accordance with the EPA's *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells* (EPA, 1996). Groundwater sampling performed as part of the PMP effort was completed in April, June, September, and December 2006. Groundwater sampling performed as part of the LTMMP effort was completed in June and December 2006. A total of 39 monitoring wells were sampled as part of the combined PMP and LTMMP events: nine (9) wells were sampled under the LTMMP alone, 25 wells were sampled under the PMP alone, and five (5) wells (SHL-5B, SHL-5C, SHL-19, SHL-22, and SHL-22C), are included in both the PMP and LTMMMP. PMP samples were analyzed for inorganics and general water quality parameters valuable for assessing inorganics transport and geochemistry. In addition to the established programs, samples were collected from monitoring wells SHM-99-31A, B, and C, SHM-99-32X, SHM-05-39A, SHM-05-40X, SHM-05-41A, B, and C, and SHM-05-42A in December 2006 as part of the evaluation of dissolved methane/ethane in groundwater. LTMMP samples were analyzed for volatile organic compounds (VOCs), inorganics, and general water quality parameters. Laboratory reports were reviewed for adherence to acceptable laboratory practices. Based on the data evaluation elements reviewed, most data were determined to be of acceptable quality for use with few qualifiers. The qualified data are noted in the validation reports and data tables.

LTM wells are monitored to evaluate the effectiveness of the landfill at reducing risk and achieving cleanup levels for contaminants of concern (COCs) in groundwater. The COCs are arsenic, chromium, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethane, lead, manganese, nickel, sodium, aluminum, and iron. According to the LTMMP, only chemicals that present carcinogenic risk are considered trigger chemicals in the monitoring program. The trigger chemicals are arsenic, 1,2 dichlorobenzene, 1,4 dichlorobenzene and 1,2-dichloroethane. The objective of the PMP is to develop data to support evaluation of the long-term protectiveness of the cover system and groundwater extraction system and assess progress toward attainment of groundwater cleanup goals. Changes to the maximum concentration limit (MCL) for arsenic in association with changes of the EPA National Primary Drinking Water Regulations for arsenic and implementation on January 23, 2006, effectively reduce the clean-up level for arsenic from 50 to 10 µg/L.

Arsenic was the only trigger chemical detected above the cleanup level during the 2006 LTM (see Table ES-1). Most results indicated no significant change from previous arsenic levels. However, the highest historical concentration of arsenic detected at SHM-96-22B of 3,690 µg/L was recorded during the April 2006 PMP sampling event. The previous greatest concentration of 3,320 µg/L was detected during the January 2006 sampling. The concentration of arsenic detected at SHM-96-22B in April 2006 was also the highest reported concentration of arsenic detected in any of the wells sampled during 2006. Furthermore, SHM-96-22B was the LTM sample location with the highest recorded concentration of arsenic for each sampling round. The highest concentration observed historically at any compliance well has been 5,110 µg/L at well SHM-96-5B, in May 2000. Wells

SHM-96-5B and SHM-96-22B are located relatively close (less than 100 feet cross gradient) to each other and are screened at similar depths in sand/till deposits. The SHM-95-5B well has typically had higher concentrations than SHM-96-22B, likely due to its shorter screen. Both of these wells have continuously exhibited the highest arsenic levels measured at site compliance wells, one to two orders of magnitude above levels measured at the other compliance wells and are interpreted to be completed in the most reducing (impacted) zone moving north from the landfill. The Contingency Remedy extraction wells are completed in this zone upgradient adjacent to the landfill.

Monitoring well SHM-96-22B shows a trend of generally increasing arsenic concentrations in the past few years. Though arsenic concentrations at SHM-96-5B peaked during the January 2006 monitoring, concentrations detected in June and December 2006 were less than concentrations detected in previous years. These reductions are consistent with the operation of the extraction wells; however, it is too early in the operation of these wells to identify whether the trends are related to operation of the system.

Only four of the fourteen LTMMP monitoring wells sampled in June and December 2006 were below the new arsenic cleanup level of 10 µg/L. The four wells with concentrations of arsenic less than the clean-up level include two Group 1 wells, SHL-3 and SHL-5 and two Group 2 wells SHL-4 and SHL-10.

TABLE ES-1 Compliance Point Wells Exceeding COC Level in 2006 (Arsenic = 10 µg/L)

Well	Orientation to Landfill	Geological Designation	Group #	Concentration (µg/L) June 2006	Concentration (µg/L) December 2006
SHM-96-5B	North	Base of Sand/Till	2	Arsenic = 2,760	Arsenic = 2,980
SHM-96-5C	North	Water Table	2	Arsenic = 51	Arsenic = 24
SHL-9	North	Water Table	1	Arsenic = 21	Arsenic = 51
SHM-93-10C	East	Bedrock	1	Arsenic = 12	Arsenic = 10
SHL-11	East	Water Table	2	Arsenic = 700	Arsenic = 668
SHL-19	East	Water Table	2	Arsenic = 1,790	Arsenic = 142
SHL-20	East	Till	2	Arsenic = 346	Arsenic = 361
SHL-22	North	Base of Till	1	Arsenic = 167	Arsenic = 115
SHM-93-22B	North	Sand/Till Interface	2	Arsenic = 3,440	Arsenic = 3,100
SHM-93-22C	North	Bedrock	1	Arsenic = 17	Arsenic = 73

Cleanup levels for the other three trigger chemicals were not exceeded. However, cleanup levels for the COCs iron, manganese and sodium were exceeded in the 2006 sampling events. In general, concentrations of iron, manganese, and sodium have remained stable or declined since 2002 with the following exceptions: iron concentrations at SHM-93-22C; manganese at SHL-5, SHM-96-5C, SHL-11, SHL-22, and SHM-93-22B; and, sodium at SHM-96-5C, SHL-9, and SHM-96-10C.

Arsenic concentrations greater than the new MCL standard of 10 µg/L were detected in 19 of the 25 monitoring wells sampled under the PMP. A number of monitoring wells down gradient and east of

the landfill have arsenic concentrations below 10 µg/L, including SHP-31A (downgradient-Molumco Road); SHM-42A (downgradient area – woods); SHL-23, SHL-8S, SHL-8D, and SHL-21 (nearfield), and SHL-13 (pond area). In September 2006, an arsenic concentration greater than 10 µg/L was observed in a pond sample collected at PSP-01.

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1.0 INTRODUCTION

This annual report has been prepared to document the monitoring and maintenance procedures conducted in 2006 at the Shepley's Hill Landfill in Devens, Massachusetts. These procedures were conducted in accordance with the *Record of Decision, Shepley's Hill Operable Unit, Areas of Contamination 4, 5, and 18* (ROD) (ABB-ES Oct 1995) for Shepley's Hill Landfill Areas of Contamination 4, 5, and 18, and the *Long Term Monitoring and Maintenance Plan, Shepley's Hill Landfill* (LTMMP) (SWET, May 1996). In addition, this report presents data collected in conjunction with the operation of the groundwater extraction, treatment, and discharge system (Contingency Remedy) during 2006. This work was conducted in accordance with the Contingency Remedy Performance Monitoring Plan (PMP) (CH2M HILL, 2005) and the industrial discharge permit issued by the Deven's POTW (Devens/MassDevelopment June, 2006).

Details of groundwater monitoring, treatment plant operation, landfill gas monitoring, and landfill cap inspection/maintenance are provided such that the long-term effectiveness of the cap (ROD Alternative SHL-2) and the Contingency Remedy (ROD Alternative SHL-9) may be evaluated per the remedial action objectives of the 1995 Record of Decision (ROD). The ROD selected Alternative SHL-2 as a source control action. Alternative SHL-2 consisted of completing closure of Shepley's Hill Landfill in accordance with applicable Massachusetts requirements of 310 CMR 19.000, and monitoring and evaluating the effectiveness of the landfill cover system to control groundwater contamination and site risk. The LTMMP (SWET, 1996) outlines the landfill closure monitoring and maintenance procedures required by the ROD. These procedures include an annual visual inspection and gas emission monitoring of the landfill cap, and a semi-annual groundwater sampling program to monitor contaminants of concern (COCs) and evaluate the effectiveness of the landfill cover system to control groundwater contamination and site risk. The COCs and their cleanup levels for Shepley's Hill Operable Unit are listed in Table 1-1. It should be noted that effective January 23, 2006, the maximum concentration limit MCL for arsenic in drinking water supplies, in accordance with EPA National Primary Drinking Water Regulations, became fully effective, reducing the standard from 50 ppb to 10 ppb.

A groundwater extraction, treatment, and discharge Contingency Remedy (ROD Alternative SHL-9) was selected at the time of the remedial decision for potential future implementation, in the event that in subsequent years the groundwater at compliance wells surrounding the landfill did not meet specified target cleanup goals. Many years of monitoring, two separate five year reviews, and the work of the Army and regulatory agencies established that the Contingency Remedy would need to be implemented. The Army procured resources to complete design and construction of the Contingency Remedy beginning in the Fall of 2003.

The original groundwater pump and discharge Contingency Remedy identified in the ROD was modified to include treatment prior to publicly-owned treatment works (POTW) discharge and the discharge location has changed from the Town of Ayer POTW to the Devens POTW. These changes to the remedy were made through *Explanation of Significant Differences* (CH2M HILL, June, 2005).

The 2006 monitoring year is a transition year involving the early operation of the Contingency Remedy, monitored in accordance with the PMP, along with normal LTMMP monitoring. The Army prepared a draft Revised Long Term Monitoring and Maintenance Plan (CH2M HILL, 2006), available in December 2006, providing an updated and optimized, comprehensive monitoring strategy for Shepley's Hill Landfill. This plan is inclusive of the Contingency Remedy and recommends optimized monitoring based upon review of data collected since closure of the landfill and early operation of the Contingency Remedy. This new document, finalized in May 2007, replaces the LTMMP (SWET, 1996) and the PMP (CH2M HILL, 2005) and will be fully implemented in 2007. Adjustments, refinements or optimization of the Revised LTMMP in the future are anticipated to be made through recommendations of Annual Reports.

1.1 Background

Shepley's Hill Landfill encompasses approximately 84 acres in the northeast corner of the main post of the former Fort Devens, Massachusetts (Figure 1-1). The landfill is bordered to the northeast by Plow Shop Pond, to the north by Nonacoicus Brook (which drains the pond), to the west by Shepley's Hill, to the south by recent commercial development, and to the east by the site of a former railroad roundhouse.

The landfill was reportedly operating by the early 1940s, and evidence from test pits within the landfill suggests earlier usage, possibly as early as the mid-nineteenth century. The landfill contains a variety of waste materials, including incinerator ash, demolition debris, asbestos, sanitary wastes, spent shell casings, glass, and other wastes. The maximum depth of the refuse occurs in the central portion of the landfill and is estimated to be about 40 feet. The volume of the landfill has been estimated at over 1.3×10^6 cubic yards (cy) (ABB-ES, 1995a).

The landfill was closed in five phases between 1987 and 1992-93 in accordance with Massachusetts regulations 310 CMR 19.00 (MADEP, 1985). The Massachusetts Department of Environmental Protection (MADEP) approved the closure plan in 1985. Closure consisted of installing a 30/40-mil polyvinyl chloride (PVC) membrane cap, covered with soil and vegetation and incorporating gas vents. Closure also included installation of wells to monitor groundwater quality around the landfill, and construction of a storm drainage system to control surface water runoff. MADEP issued a Landfill Capping Compliance Letter approving the closure in February 1996.

1.2 Evaluating Effectiveness of Remedial Objectives

In accordance with the LTMMP (SWET, 1996), fourteen compliance point wells are monitored to evaluate the effectiveness of the landfill at reducing risk and achieving cleanup levels. They are designated as Group 1 or Group 2 wells. The ultimate goal of Alternative SHL-2 is to maintain groundwater quality below cleanup levels at Group 1 wells, and to attain cleanup levels at Group 2 wells.

Five-year site reviews evaluate the effectiveness of Alternative SHL-2 at reducing the potential human health risk from exposure to groundwater and at preventing groundwater from contributing to Plow Shop Pond sediment contamination in excess of human health and ecological risk-based values. Evaluating effectiveness at Group 2 wells is based on reduction of risk rather than reduction

of concentration as a measure of progress toward attainment of cleanup levels, because this approach focuses on the cleanup of arsenic, which is the primary contributor to risk in the Group 2 wells.

According to the LTMMP (SWET, 1996), only chemicals that present carcinogenic risk are considered trigger chemicals in the monitoring program. The trigger chemicals are arsenic, 1,2 dichlorobenzene, 1,4 dichlorobenzene and 1,2-dichloroethane. Reduction of carcinogenic risk, rather than simply reduction of contamination, is the measure of progress toward attainment of cleanup. This risk-based approach keeps the focus on mitigation of the most significant contributors to risk.

The LTMMP states that Alternative SHL-2 will be considered effective with regard to Group 2 wells if five-year reviews show an ongoing reduction of potential human health risk (based on trigger chemicals) at Group 2 wells and the ultimate attainment of cleanup levels for all COCs by January 2008. Alternative SHL-2 will be considered effective with regard to Group 1 wells if five-year site reviews show that groundwater quality remains at or below cleanup levels for all COCs.

Chemical concentrations in Group 1 wells have historically attained cleanup goals, while those in Group 2 have not. Originally, all existing wells were designated as Group 2 wells per the LTMMP, including three newer wells installed in 1996 (SHM-96-5B, SHM-96-5C, and SHM-96-22B) based on the first round of sampling. During the first five-year site review (August 1998), six monitoring wells (SHL-3, SHL-5, SHL-9, SHM-93-10C, SHL-22, and SHM-93-22C) achieved cleanup levels for all chemicals of concern and were reclassified as Group 1 wells. The remaining eight wells continue to be classified as Group 2 wells. The second Five Year Review (FYR) conducted in 2000 (HLA, 2000) and the third FYR (HLA 2005), did not reclassify any of the monitoring wells. The second review concluded that based on the data collected to date, the required incremental reduction in risk was not achieved and recommended that the ROD contingency remedy be reevaluated by the Army (HLA, 2000). Subsequent to the second FYR a decision was made to implement the Contingency Remedy (Alternative SHL-9, Groundwater Extraction and Discharge).

In conjunction with design of the Contingency Remedy, on-base and off-base investigation work was conducted and new monitoring locations were incorporated into a Performance Monitoring Plan (PMP) for the Contingency Remedy. Construction of a groundwater extraction and treatment system was completed during 2005. The system is located just north of the landfill cap, near the set of compliance point wells used to monitor groundwater down-gradient of the landfill (SHL-5, SHM-96-5B, SHM-96-5C, SHL-9, SHL-22, SHM-96-22B and SHM-93-22C). The construction work included the wellfield and plant; an access road off of Scully Road, and a utility berm across the landfill cap making connection to the Devens sewer in Cook Street and the power grid. The treatment system was started up and operated for a month in August/September 2005 and became operational in March 2006.

1.3 Five-Year Site Reviews

Stone & Webster Environmental Technology & Services (SWET) conducted the first two years of landfill post-closure monitoring in 1996 and 1997. These first two years of monitoring were included in the first Five Year Review (FYR), Shepley's Hill Landfill, Long Term Monitoring (SWET, August 1998) and marking five years since the final capping of the landfill in 1993. The

USACE, New England District conducted the monitoring between 1998 and 2005. In 2000, a comprehensive review for all Devens sites was performed and included in the *Five Year Review Report for Devens Reserve Forces Training Area, Devens, MA* (HLA, 2000) which included monitoring conducted for Shepley's Hill Landfill Operable Unit in 1996 through 1999. A second comprehensive FYR was completed in 2005 (Nobis, 2005) and included monitoring conducted from 1999 through 2004.

1.4 2006 Annual Report Objectives

Because 2006 was a transition year this annual report covers long-term monitoring and maintenance activities conducted in 2006 in accordance with the LTMMP (SWET, 1996), the PMP (CH2M HILL, 2005), and work the Army conducted to further evaluate dissolved methane/ethane in groundwater. The activities may be summarized as follows:

LTMMP

- Landfill cap inspection to identify areas requiring maintenance.
- Landfill gas measurements at 18 gas vents and 13 permanent landfill perimeter gas monitoring wells to establish long-term trends with regard to gas production and venting.
- Monitoring of fourteen compliance point wells for groundwater elevations and COC concentrations to compare to cleanup levels established in the ROD.

PMP and other

- Groundwater monitoring at 39 wells for As, Fe, Mn, and other cations in accordance with the intervals specified in the PMP (CH2M HILL, 2005). This also included collection of field parameters.
- Monitoring of an expanded hydraulic network in accordance with the intervals specified in the PMP (CH2M HILL, 2005).
- Methane/Ethane monitoring included both groundwater dissolved methane/ethane monitoring at five (5) locations involving eleven (11) wells screens downgradient and plant influent/effluent. Landfill gas measurements at ten (10) temporary soil gas probe locations along the north side of the landfill perimeter and five (5) temporary soil vapor samples adjacent to downgradient monitoring well clusters to monitor for potential gas migration within the vadose zone and from deep groundwater.

The findings documented in this annual report will support a third comprehensive FYR for monitoring conducted between 2005 through 2009.

2.0 LANDFILL CAP SYSTEM INSPECTION AND MAINTENANCE ACTIVITIES

2.1 Summary

The ROD for the Shepley's Hill Landfill requires maintenance of the landfill cap based on observations made during the annual inspections. Normally scheduled maintenance activities performed during 2006 included mowing of the landfill vegetative cover. An upcoming Supplemental Groundwater Investigation and Landfill Cap Assessment (AMEC, in progress) will assess the adequacy of the landfill cap and the overall remedy.

Based on the annual inspection, the following items should be addressed as a priority: (1) secure fence gates with padlocks and chains as required, controlling access to the site; and (2) improve vegetative cover through placement of loam and seed over the sandy area lacking vegetation on the eastern perimeter of the landfill cap. Along with the corrective actions listed above, it is recommended that repair and regrading around the catch basins on the south side of the landfill be conducted.

Other than the issues identified along with recommendations for repair or correction, the landfill cap is in fair condition and appears to be functioning properly. The 2006 landfill cap inspection is discussed further in the next section. In addition, an annotated figure, checklist, and photolog are provided in Appendix A.

2.2 Landfill Inspection

The Shepley's Hill Landfill at Devens, Massachusetts was inspected on October 31, 2006. Features of the landfill that were inspected included the cap, the drainage system, the gas vent system, access roads, and the security fence. Observations were made regarding the vegetative cover, vegetation types, erosion, settlement, and general conditions. A comprehensive evaluation of the landfill cap is currently being conducted to assess the effectiveness of the landfill cap (AMEC, in progress). Table A-1 and Figure A-1 of Appendix A present the Landfill Maintenance Checklist summarizing the findings of this inspection and a map depicting observations. A brief description of the findings and recommendations of the inspection are as follows:

- Catch Basin #3 near the Cook Street entrance to the site is not set at grade. Soil excavation in this area has left the rim of the catch basin six to eight inches higher than the surrounding grade. The rim of this catch basin should either be lowered to the existing grade or regrading of the area near the basin should be completed to facilitate drainage.

- The concrete headwall at the terminus of the catch basin and underground piping system on the south side of the landfill is overgrown with vegetation and is silting in. The grade of the southern swale bottom is uneven and standing water is present. Consideration should be given to clearing the entire southern swale of accumulated sediment and/or regraded, as necessary, to facilitate drainage. Reseeding and/or riprap placement, depending on water velocities, will help stabilize the channel.

- Areas of standing water are present at numerous locations across the landfill surface (refer to Appendix A, Figure A-1) where settlement has occurred. These areas have been recognized in previous inspections.

- In the eastern drainage swale, in the vicinity of GV-13 and continuing downstream to the rip-rapped section, the channel is overgrown with vegetation. It appears to be heavily silted in and has a large area of standing water. There is an earth and vegetation obstruction just upstream of the new rock section detaining and ponding water. The northern reaches of the eastern drainage swale have some minor vegetation growth and sand accumulation. The swale may require regrading and clearing of vegetation to promote drainage.

- The northern reaches of the eastern drainage swale and channel located north of the road connecting the treatment building to Scully Road have some minor vegetation growth and sand accumulation. The swale should be cleared of vegetation (refer to Appendix A, Photo 1).

- East of gas vents (GV) 8, 11 and 12, the perimeter of the cap has some areas of erosion and sparse vegetation. The soil in these areas is comprised predominantly of sand. The area should be graded, loam added to a depth of 6 inches, and seeded to promote revegetation. The grass should extend at least twenty feet past the limits of the cap.

- The access roads on the site are in good condition. A new dense-grade road surface was constructed from the Cook Street entrance to the middle of the landfill, in the vicinity of GV-11 (Appendix A, Photo 2). A new access ramp was built over the utility berm in the vicinity of GV-9 (Appendix A, Photos 3 and 4). Some small ruts and standing water were observed along the landfill road from about GV-11 (the terminus of the new dense grade road) to the entrance gate for the treatment plant on the north end of the landfill (Appendix A, Photos 5 and 6).

- Repairs have been made to the perimeter chain-link security fence, an issue identified in 2005. Fence sections and gates have been replaced; however, many of the gates do not have locks and chains, allowing unrestricted access. The gates should be secured with chains and padlocks to ensure unauthorized ATV access is not provided.

- The gas monitoring wells at the northwest edge of the landfill are in excellent condition and have locking protective casings. The gas vents appear to be in good condition. The older gas vents, painted yellow, are showing signs of age, with rusting/corrosion evident (See Appendix A Photo 7). They should be scraped, cleaned, and repainted in the near future.

- Several areas of the landfill have sustained damage by trespassing vehicles, as well as by mowing equipment (Appendix A, Figure A-1 and Photos 8 and 9). These rutted areas should be repaired as part of a project to address other settled areas.

An upcoming Supplemental Groundwater Investigation and Landfill Cap Assessment (AMEC, in progress), expected to be completed by the fall of 2007, will assess the adequacy of the landfill

cap/overall remedy and will comprehensively evaluate and identify any remedial repairs required. Implementation of the recommendations of this effort are expected to address a number of the issues identified in this and previous landfill inspections, improving the drainage and function of the landfill cap system. With the exception of the repairs mentioned above the landfill is in fair condition and appears to be functioning adequately.

3.0 LANDFILL GAS MONITORING RESULTS

3.1 Summary

The purpose of the landfill gas monitoring program is to establish long-term trends with regard to gas production and venting. During closure construction, passive gas vents and associated headers were installed in gas collection layers as an integral component of the landfill cover system. Many of these vents have now been in place for close to twenty years and they appear to be functioning well, continuing to vent landfill gases in areas of the landfill that are still actively producing gas.

In November 2001, four landfill perimeter gas monitoring wells were installed to further evaluate potential landfill gas migration from Shepley's Hill Landfill towards the north, in the direction of Scully Road. Nine (9) additional landfill gas monitoring wells were installed along the commercial property at the south side of the landfill in November 2005. These newly installed gas wells were first sampled in February 2006 as part of a supplemental landfill gas survey and then again in December, 2006 as part of the regular annual monitoring event.

Annual gas monitoring in the early years has involved the vents only. Post 2001, the four (4) permanent gas monitoring wells installed at the north end of the landfill were added and in 2006 the nine (9) newly installed permanent gas monitoring wells on the south were added. In 2006, the Army also conducted monitoring at 15 temporary soil gas probes installed at the north end of the landfill to further evaluate landfill gas migration. This was done as part of a methane evaluation conducted with detection of dissolved methane in deep groundwater being pumped as part of the Contingency Remedy. Data from this effort are provided in Table 3-1 and also in Appendix B in the response to comments associated with the *Technical Memo-Methane Controls* (CH2M HILL, 2006b).

In total, the annual gas survey event was performed on the 18 passive gas vents, 13 perimeter gas monitoring wells and 15 temporary soil gas probes to evaluate methane (percent), hydrogen sulfide (ppm), volatile organic compounds (ppm), oxygen (percent), carbon monoxide (ppm), carbon dioxide (percent), and percent lower explosive limit (LEL) in the subsurface beneath capped and adjacent perimeter areas (refer to Figure 3-1, Figure A-1, Figure 4-3). Key questions that are addressed as part of this type of survey are: 1) Is the methane generation in the landfill trending down as expected by comparison with historic data? and 2) Are there indications that explosive landfill gases are migrating away from the landfill in the subsurface presenting a hazard for surrounding neighbors?

In general, landfill gas production is low, typical of landfills that have been closed for many years. Landfill gas monitoring has been conducted since the 1998 Annual Report (USAEC, 1999). Review of these data and other data collected annually since 1998 indicate variability in production between vents from year to year. This is likely associated with changing soil moisture and atmospheric pressures from monitoring event to event and non-uniform response across the landfill to these changes. However, in a general sense, the data indicate that production is greatest, to the south in the Phase III and IV areas that were the last active areas, being capped and closed between 1989 and 1992. By comparison, many wells to the north have had low methane readings throughout the nine years of monitoring. Gas production for the landfill, as a whole, is low by comparison to active or recently closed municipal landfills. For active or recently closed landfills, high landfill gas flux rates result in measurable high concentrations of landfill gas near vent pipe openings under ambient conditions, prior to capping and purging. This is not the case with Shepleys Hill where ambient readings were non-detect in 2006 following capping and prior to full purging, indicative of generally low flux rates. The historic data from the perimeter gas monitoring wells on the north indicate no history of detectable methane which further suggests gas production is low by comparison with recently closed or active municipal landfills.

During the 2006 sampling event, it was evident that the vents required two or greater well volumes to be purged with the SKC224-PCXRE pump before representative, stabilized readings could be produced. Ambient readings in the vent pipes prior to capping and purging of two vent volumes indicated very little detected landfill gas, indicative of low gas flux rates.

The gas readings are within the parameters of a mature landfill and the vents appear to be functioning properly. If the gas vents are functioning properly and are adequately spaced, off-site migration of landfill gases is controlled. Due to the high LEL readings at some vents and the proximity of residential housing and commercial development, gas monitoring wells have been installed near the landfill property line. Gas monitoring wells installed along the northern end of the landfill near Scully Road, have been monitored since 2001 and no methane (with IR spectrophotometry) or LEL readings have been detected. While gas monitoring conducted in February and December 2006 detected low percent LEL readings at three permanent gas monitoring well locations on the south, no methane or hydrogen sulfide were detected. Neither percent LEL nor methane was detected in the soil gas samples collected next to the downgradient monitoring wells situated between the landfill and Molumco Road in December 2006. Neither methane, hydrogen sulfide, or percent LEL were detected at any of the 15 temporary soil gas probes installed near the north end of the landfill in October 2006. The following sections discuss the monitoring and results in more detail.

3.2 Gas Monitoring Results

Landfill gas sampling was performed in three phases in 2006:

- October 31, 2006 soil gas survey event was conducted adjacent to northern portion of the landfill to supplement routine annual gas monitoring well sampling and confirm that historic conditions in these wells are representative;

- December 11, 2006 – a soil gas survey adjacent to groundwater monitoring wells located downgradient of the landfill that were sampled for dissolved methane/ethane and monitoring of permanent gas monitoring well sampling were conducted; and

- December 14, 2006 – Sampling of gas vents of the landfill was conducted.

Gas samples were field analyzed with a photoionization detector (PID) instrument, a multigas instrument (whetstone bridge sensor), and an infrared spectrophotometer. The instruments included a Thermo Environmental 580B PID, Industrial Scientific TMX 412 multigas meter, and a Landtec Gem 2000 and 500 infrared spectrophotometers. These instruments were calibrated as indicated in Table 3-1.

The weather for the three days of gas sampling was reported as:

- October 31, 2006 – partly cloudy, with temperatures from 40 to 65 degrees Fahrenheit (°F), and an initial barometric pressure of 29.99 inches of mercury and an ending barometric pressure of 29.79 inches of mercury.

- December 11, 2006 – clear, with the temperature in the 30's (°F), and an initial barometric pressure of 30.33 inches of mercury and an ending barometric pressure of 30.37 inches of mercury.

- December 14, 2006 – clear, with the temperature in the 50's (°F), and an initial barometric pressure of 30.01 inches of mercury and an ending barometric pressure of 29.94 inches of mercury.

Figure 3-1 and Figure A-1 depict the location of the vents, permanent soil gas monitoring wells, and temporary soil gas probes that were sampled during these events. Landfill gas vent samples were collected by attaching an end cap, including a barbed fitting/sampling port, to the vent pipe with a pipe joining clamp. Tubing was run from the barbed fitting to a SKC224-PCXRE air pump. The air pump was operated to purge two vent pipe volumes and to ensure that the gases collected were representative of the gas collection layer. A clean tedlar bag was then attached to the pump to collect a sample. The gas monitoring equipment was then attached to the tedlar bag and the readings were recorded after they had stabilized.

The permanent gas monitoring wells were sampled using the same method as the gas vent samples with the following exception: the gas monitoring wells are constructed with an end cap, barbed fitting, and tubing, allowing the sample pump to attach directly to the gas monitoring well.

Samples from the temporary gas probes were collected by attaching tubing to a barbed fitting connected to a slotted shield point. The shield point and tubing were advanced using direct push methods to a depth of three feet below grade. The hollow drive shaft rod was removed and the void space backfilled. A pump was attached to the tubing, the tubing was purged, and a clean tedlar bag was then attached to the pump to collect a sample. The gas monitoring equipment was then attached

to the tedlar bag and readings were recorded after they had stabilized. A soil gas sample was not collected at SHM-99-42 due to standing water in the area.

Details of the landfill gas vents and permanent perimeter gas monitoring wells are provided in Appendix B for reference. The location of the landfill gas vents and the perimeter gas monitoring wells are presented in Figures 3-1 and A-1.

3.2.1 Perimeter Gas Monitoring Wells

The perimeter landfill gas monitoring wells (LGP-01-01X through LGP-05-14X) did not detect hydrogen sulfide or methane. Low levels of VOCs were detected in seven of the gas monitoring wells, ranging from 0.1 ppm to 1.5 ppm. Low percent LEL readings were detected in three of the southern gas monitoring wells, ranging from one to two percent. Eight gas monitoring wells had detectable concentrations of carbon monoxide, ranging from one to four ppm. Carbon dioxide was detected in all but one gas monitoring well, LGP-01-01X, ranging from 0.5 % to 15% (LGP-11). Oxygen levels ranged from 6.9 % at LGP-05-11X to 20.9% at LGP-01-01X. These readings are consistent with previous data and are not indicative of landfill gas migration. The generally high oxygen levels as most locations are consistent with saturation of the vadose zone with ambient air, indicative that the ambient air has not been displaced by migrating gas.

3.2.2 Landfill Gas Vent Results

VOCs were detected in five of the gas vents, GV-5, GV-12, GV-13, GV-14, and GV-15. Of these five vents, all but GV-5 is located in the southeast area of the landfill. The oxygen levels ranged from 1.1% (GV-7) to 21.0% (GV-12, GV-15, and GV-18) using the GEM 500/2000. Percent LEL readings ranged from 0% at GV-12, GV-13, GV-14, and GV-18 to over 100% LEL in eight of the vents. Carbon monoxide was detected in twelve of the gas vents, the greatest concentration was eight ppm. Carbon dioxide was detected in all of the gas vents and ranged from 0.1 % (GV-12) to 23.6 % at GV-9. Methane ranged from 0 % (GV-12, GV-13, GV-14 and GV-18) to 32.0 % at GV-9. No hydrogen sulfide was detected in any of the gas vents.

Readings collected in the fall of 2006 indicated that levels of carbon dioxide and hydrogen sulfide were similar to readings collected in the previous monitoring, while oxygen and carbon monoxide levels increased. VOCs were not detected in the previous monitoring. LEL and methane concentrations were similar to 2005 concentrations for most of the vents with the following exceptions: GV-1, 7, 11, and 14 showed increased percent LEL and GV-5, GV-12, GV-13, GV-16, and GV-17 showed decreased percent LEL.

3.2.3 Soil Gas Survey Results

Hydrogen sulfide, methane, percent LEL were not detected in soil gas samples. VOCs were detected in only three soil vapor samples, GHP-99-32X-GP, SHP-05-40X-GP, and SHP-05-41-GP, at concentrations ranging from 0.1 to 4.6 ppm. Oxygen concentrations ranged from 17.8% at DP-7 to 21.1% at DP-3. These levels are indicative of saturation of soil gas with ambient air and not migration of landfill gas. Carbon monoxide was detected in two samples, SHP-05-39-GP and SHP-

05-41-GP, at concentrations of 3.0 and 2.0 ppm, respectively. Carbon dioxide was detected in all of the samples, ranging from 0.3 % at DP-8 and DP-9 to 2.2 % at DP-7.

4.0 GROUNDWATER AND ARSENIC TREATMENT PLANT MONITORING

4.1 GROUNDWATER ELEVATIONS

Groundwater measurements of Shepley's Hill Landfill wells were collected in conjunction with the LTMMP and PMP monitoring on April 10, June 5, September 18, and December 5, 2006. Table 4-1 and 4-2 provide lists of these wells including key characteristics such as the geological unit(s) screened, screen depths or elevations, and relative locations. Water table elevations for each sampling round are listed in Table 4-3. Groundwater elevations measured in June were the highest of the year followed by December, April, and September. Groundwater contour maps of water levels collected on June 5 and December 5 are provided as Figures 4-1 and 4-2, respectively. The contoured water surface is similar to that observed in previous years and that reported with start-up of the extraction system in 2005 discussed in the Extraction Test *Final Technical Memorandum Start-Up Extraction Test – Shepley's Hill Groundwater Extraction, Treatment, and Discharge System* (CH2M HILL, 2006). Water-level monitoring conducted in accordance with the Revised LTMMP (CH2M HILL, 2007) as the system operational flow rate is increased to 50 gpm will be useful in evaluating system performance at the doubled flow rate and agreement with modeled hydraulic containment at higher flows.

4.2 GROUNDWATER SAMPLING METHODOLOGY

The LTMMP identifies 14 monitoring wells to be sampled. Of these fourteen long-term monitoring wells, the seven at the north end of the landfill (SHL-5, SHM-96-5B, SHM-96-5C, SHL-9, SHL-22, SHM-96-22B and SHM-93-22C) are located in the area predicted to experience the greatest impact from groundwater flowing from beneath the landfill. The remaining seven are located along the eastern edge of the landfill, between the landfill and Plow Shop Pond.

In accordance with the ROD and LTMMP, compliance point wells are designated as Group 1 or Group 2 wells. Chemical concentrations in Group 1 wells have historically attained cleanup goals, while those in Group 2 have not. Originally, all compliance wells were designated as Group 2 wells. During the first five-year site review (August 1998), six monitoring wells (SHL-3, SHL-5, SHL-9, SHM-93-10C, SHL-22, and SHM-93-22C) achieved cleanup levels for all chemicals of concern and were reclassified as Group 1 wells. The remaining eight wells have continued to be classified as Group 2 wells. The second comprehensive FYR (Nobis, 2005) did not recommend changes to the well group designations.

The Contingency Remedy Performance Monitoring Plan (PMP) identified a total of 30 monitoring wells to be sampled, five of which, SHM-96-5B, SHM-965C, SHL-9, SHL-22, and SHM-95-22B, are also identified in the LTMMP. The PMP wells are situated from north to south or generally downgradient to upgradient areas as follows:

Relative Location	Number of Wells	Monitoring Well Identification
Downgradient- Molumco Road	7	SHM-05-40X; SHM-05-39A, 39B; SHP-99-31A, 31B, 31C; and SHP-99-32X
Downgradient-Woods	5	SHM-05-41A, 41B, 41C; and SHM-05-42A, 42B
Nearfield	9	SHL-23; SHL-9; SHL-22, 22B ; SHM-96-5B, 5C; SHL-8S, 8D; SHL-21
Pond Area	5	PSP-01, SHL-13, SHP-36X, SHP-37X, and SHP-01-38A
Upgradient (Landfill and Perimeter)	4	SHL-15; N5-P1, P2; and SHM-93-10D

PMP groundwater samples were collected from the 30 wells in April, June, September, and December 2006. However, SHL-21, a background well was not sampled during the September event. A total of 39 monitoring wells were sampled during the combined PMP and LTMMP monitoring events in June and December since five wells overlap both programs.

4.2.1 Preparation for Sampling

Sampling activities were coordinated with the Devens BRAC Environmental Office and the contract laboratory prior to commencement of sampling. Bottles were checked to insure they met the requirements of the sampling program. Sampling equipment, including water quality meters, portable generators and tubing, was rented or purchased in the case of supplies from local vendors. All equipment was inventoried, tested, and field calibrated to ensure it was operational and functioning properly. Well construction logs and sampling histories for each of the wells to be sampled were reviewed by the field team prior to the scheduled event to determine any well specific sampling requirements. This information is maintained at the treatment plant on site.

4.2.2 Groundwater Sampling and Equipment Decontamination

Monitoring wells were purged and sampled in accordance with EPA's guidance for low stress purging and sampling (U.S. EPA, 1996 & 2002). Monitoring wells SHM-93-10D and SHM-05-39B were sampled after the wells were purged dry and recovered, due to poor recharge. This has been observed in previous sampling rounds for these wells.

Before sampling activities commenced, groundwater elevations were measured at each well location to be sampled. Water quality meters were calibrated at the beginning of each day of use and a calibration check was conducted at the end of each day. During sampling, when a generator needed to power the pumps was used, it was located in a downwind area at least 30 feet away from the well being sampled, to minimize potential contamination from the exhaust.

Upon initial opening of each well, water-level measurements were collected. The pump intake or tubing was lowered to approximately the middle of the screen for each well to be sampled. When the water level was below the top of the screen, the pump or tubing was positioned at a depth approximately midway between the top of the water level and the bottom of the screen. When necessary tubing was weighted to ensure the opening was deployed at the appropriate depth.

Water quality parameters, including temperature, specific conductance, pH, oxidation-reduction potential (ORP), and dissolved oxygen (DO), water-level measurements, and pump flow rates, were collected every 3 to 5 minutes to ensure proper purging before each well was sampled. The results are listed on Groundwater Field Analysis Forms located in Appendix C. Water quality parameters, were monitored using a flow-through cell and a YSI (YSI 600XL) or Hydra Lab (Quanta) quality meter. Sampling was conducted when water quality parameters stabilized for three consecutive readings. The tubing was disconnected from the flow-through cell and samples were collected directly from the discharge tubing. Observations made during sampling activities include:

- To ensure precision of water-level measurements, well casings that had faded marks or no marks were remarked.
- At several wells during each event, the water level was lower than the top of the screen, pumps or tubing were lowered to approximately midway between the water level and the bottom of the screen.
- Monitoring wells SHM-93-10D and SHM-05-39B were sampled after they were purged dry. Poor recharge has been documented in previous sampling rounds for these wells.
- Parameters would not stabilize at SHM-93-22C during the June 2006 sampling. The well was sampled after one hour of purging.

All non-disposable sampling and testing equipment that came in contact with the sampling medium was decontaminated to prevent cross contamination.

For most locations, a peristaltic pump was utilized; however, when the submersible pump was used it was decontaminated using the following procedure:

- Upon removal of the pump from the well following sample collection, the pump was submersed in potable water and detergent (Alconox) solution. At least 1 to 2 gallons of the detergent solution was pumped through (starting the pump at a low flow rate, as in sampling, and increased to a higher speed).
- The pump was removed and sprayed with potable water.
- The pump was then submersed in potable water and at least 1 to 2 gallons were pumped through.
- The pump was then submersed in deionized water and at least 1 to 2 gallons were pumped through.
- The submersible pump was sprayed with isopropyl alcohol (reagent grade) using a hand-held spray bottle, over a tub. The pump was then submersed in a final deionized water rinse and at least 1 to 2 gallons were pumped through.
- The pump was air dried and wrapped in clean aluminum foil.

Samples were collected in containers compatible with the intended analysis and properly preserved prior to shipment to the laboratory. Each sealed container was placed in a leak-proof plastic bag and

placed in a thermal ice chest filled with bubble wrap packing material, or equivalent, to ensure sample integrity during shipment. Ice was added to cool samples to 4 degrees Celsius (°C) or slightly below. Chains of custody were used to identify and track samples from the field through laboratory log-in and analysis. Sample custody was initiated by the sampling team upon collection of samples and chain-of-custody forms were placed in waterproof plastic bags and taped to the inside lid of the sample coolers. Sample coolers were sealed with chain-of-custody seals. Sample coolers were delivered to the analytical laboratory, Alpha Woods Hole Analytical Lab, Westborough, MA, each day by courier or CH2M HILL personnel.

4.2.3 Laboratory Testing

LTMMP and PMP samples were analyzed for volatile organic compounds, inorganics, and general water quality parameters. Select samples in the December 2006 sampling were also analyzed for methane/ethane by UL Laboratories under subcontract to Alpha Woods Hole.

Contaminants of concern (COCs) for compliance point wells include arsenic, chromium, 1,2-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichloroethane, lead, manganese, nickel, sodium, aluminum, and iron. Cleanup levels for these COCs are listed on Table 1-1. Water analyses were conducted according to SW846 Method 8260B for volatile organic compounds (VOCs), and 6010B for target analyte list (TAL) metals (7470A for mercury). The LTMMP and PMP methods for general chemistry are slightly different for some analyses; however, comparable detection limits were generally achieved. The PMP method for sulfate was changed from Standard Method 9038B to EPA Method 300.0 to achieve lower detection limits. The following is a summary of laboratory methods used for general chemistry and exceptions identified in data review:

Parameter	Method
Chemical Oxygen Demand (COD)	EPA Method 410.4 (note: SM5220D was referenced for report # L0607909 – June 2006)
Biochemical Oxygen Demand (BOD)	EPA Method 405.1 (note: SM5210B was referenced for report # L0607909 – June 2006)
Hardness	Standard Method 2340B
Alkalinity	Standard Method 2320B
Cyanide	EPA Method 335.2 (note: SM9017 was referenced for report # L0607909 – June 2006).
Chloride	Standard Method 9251
Nitrate	Standard Method 4500-NO3-F
Sulfate	Standard Method 9038B (April and June 2006) and EPA Method 300.0 (September and December 2006). The PMP method was changed to improve detection limits following the June sampling round.
Total Organic Carbon (TOC)	SW846 Method 9060
Total Dissolved Solids (TDS)	EPA Method 160.1 (note: SM2540C was referenced for report # L0607909 – June 2006)
Total Suspended Solids (TSS)	EPA Method 160.2 (note: SM2540D was referenced for report # L0607909 – June 2006)
Dissolved Gases (Methane & Ethane)	Analysis of Dissolved Methane, Ethane & Ethylene in Groundwater by a Standard Gas Chromatographic Technique, Kampbell & Vandegrift, EPA-OK, Journal of Chrom, Vol 36, May 1998 & Technical Guidance for the Natural Attenuation Indicators, EPA-NE, July 2001.

As reported in previous annual reports, starting with the fall event of 2001, the method used to determine hardness was changed to Standard Method 2340B in order to eliminate the interference to from other heavy metal ions typically present in some of the wells at the site. Table 4-4 summarizes the analysis procedures used in each event.

4.3 SUMMARY OF LABORATORY RESULTS

The primary objective of the annual report is to compare the COC concentrations with ROD cleanup levels (refer to Table 1-1). According to the LTMMP, only chemicals that present carcinogenic risk are considered trigger chemicals in the monitoring program. The trigger chemicals are arsenic, 1,2 dichlorobenzene, 1,4 dichlorobenzene and 1,2-dichloroethane. Reduction of carcinogenic risk, rather than simply reduction of contamination, is the measure of progress toward attainment of cleanup.

When the LTMMP was developed, all of the compliance monitoring wells were considered to be Group 2 wells. However the first FYR, (SWET, 1998) recommended the following reclassification:

- Group 1: SHL-3, SHL-5, SHL-9, SHM-93-10C, SHL-22, and SHM-93-22C;
- Group 2: SHL-4, SHM-96-5B, SHM-96-5C, SHL-10, SHL-11, SHl-19, SHL-20, and SHM-96-22B.

The second FYR (Harding Lawson Associates, 2000) did not reclassify any of the monitoring wells. However, the review concluded that based on the data collected to date, the required incremental reduction in risk was not achieved and the Army and regulatory agencies decided to implement Alternative SHL-9, Groundwater Extraction, Treatment, and Discharge. The treatment system went on-line in March 2006.

Tables 4-1 and 4-2 list the LTMMP and PMP wells, respectively. Figure 4-3 depicts LTMMP wells with arsenic results and shows locations of the PMP wells used to support start-up and early operational monitoring. A draft of the Revised LTMMP (CH2M HILL, 2006) was developed in 2006 integrating and optimizing the two programs for the future. This document has been reviewed by the BCT, was finalized in May, 2007, and will govern sampling to be conducted for the Shepley's Hill Landfill remedy in the future.

Analytical results for groundwater analyses of samples collected at the LTMMP wells in June and December, respectively, are presented in Tables 4-5 and 4-6. Analytical results for groundwater samples collected at the PMP wells are presented in Table 4-7 and in-situ geochemical water quality measurements collected in conjunction with the PMP sampling are presented in Table 4-8. A summary of historical arsenic results at LTM wells are presented as Table 4-9. Historical iron, manganese, and sodium concentrations at LTM wells are presented as Table 4-10. The analytical results for the five monitoring wells, SHM-96-5B, SHM-965C, SHL-9, SHL-22, and SHM-95-22B, which were sampled under both the LTMMP and PMP, are included in both the LTMMP and the PMP summary tables. Table 4-11 provides a listing of the compliance wells that exceeded cleanup levels for trigger chemicals since achieving Group 1 status in 1998.

4.3.1 Arsenic Results - Long Term Monitoring Wells

Arsenic was the only trigger chemical detected above its cleanup level at the site during the 2006 spring and fall sampling events. This has been the case for a number of years. Year 2006 and historic arsenic data for the fourteen (14) compliance point monitoring wells are provided in Table 4-9 and the 2006 data for these wells are also depicted in Figure 4-3. The compliance point monitoring well data are plotted to provide a graphical comparison of historical arsenic concentrations (refer to Appendix D). An anomalously high concentration of arsenic (1,790 µg/L) was reported in the sample collected from SHL-19 in the June 2006. This concentration was an order of magnitude greater than the concentrations reported at SHL-19 since 2002. This is believed be a non-representative result from anomalously high total suspended solids and associated iron in the sample. High TSS and iron results are noted for this sample and the field sample log indicates that iron was observable in groundwater throughout purging. The subsequent December result of 142 µg/L is representative of what has been observed in this well historically.

Of six Group 1 wells sampled in 2006, only the samples collected from SHL-3 and SHL-5 had arsenic concentrations lower than the cleanup level. Of the Group 2 wells, SHL-4 and SHL-10 did not exceed cleanup levels for arsenic during the 2006 sampling. The large number of Group 2 wells exceeding the arsenic standard is a reflection of the reduction of the standard from 50 µg/L to 10 µg/L.

With the exception of arsenic concentrations at SHM-96-22B and SHL-96-5B, arsenic concentrations at the Group 2 wells were similar to or less than concentrations detected in previous sampling events. These two northern wells have continuously exhibited the highest arsenic levels, one to two orders of magnitude above arsenic measured in the other LTM compliance wells.

The arsenic concentration at SHM-96-22B has generally increased in the past year when compared to previous years while SHL-96-5B has generally decreased since having an all-time high result of 5,110 µg/L in May, 2000. However, in January 2006, SHL-96-5B appears to have trended up briefly to 4130 ug/L before returning to lower levels, typical of recent years, later in 2006 (refer to Table 4-9). This general pattern may be associated with early adjustments in the flow field and small-scale changes in redox chemistry related to the operation of the extraction wells nearby; however, observations over a longer period will be necessary to better define trends.

The highest historic level of arsenic at SHM-96-22B, 3,690 µg/L, was recorded during the April, 2006 PMP event. The previous high had been 3,320 µg/L from the January 2006 event (reported in the 2005 Annual Report). Values from years before, back to November 1999, have roughly been 1000 µg/L less on average. SHM-96-22B was the location with the highest recorded concentration of arsenic for all compliance (LTMMP) wells for both the June and December 2006 compliance sampling rounds. SHM-96-22B also had the highest arsenic concentration among compliance wells for an individual LTMMP event in November 2004.

SHM-96-5B has had the highest concentration of arsenic for compliance wells for an individual LTMMP event during most events historically. Wells SHM-96-5B and SHM-96-22B are located relatively close to each other and are screened at similar depths in mostly sand/till; however, SHM-96-5B has a 10 foot screen vs. the 30 foot screen of SHM-96-22B. In addition, SHM-96-5B is

completed partially (a few feet) into bedrock near the eastern edge of an interpreted bedrock valley, expected to be a controlling factor for flow north of the landfill.
Historic concentrations measured in the eastern compliance wells near Plow Shop Pond indicate arsenic concentrations are similar to or decreasing in all wells but SHL-11 and SHL-20. SHL-11 is screened at the water table and SHL-20 is screened at the base of till, while the other eastern wells include four more screened at the water table and one at bedrock.

It is notable that concentrations in the northern wells screened at the water table do not generally change over the years monitored. This includes Group 1 well SHL-5 with arsenic concentrations that usually measure well below the cleanup level.

In general, similar arsenic concentrations were detected in 12 of the 14 wells that were sampled in both the June and December sampling rounds. The only exceptions were observed at SHL-19 and SHM-93-22C. The June 2006 result of 1,790 µg/L at SHL-19 was significantly greater than the December 2006 result of 142 µg/L. The June result is believed to be attributed to anomalous conditions present in the well at the time of sampling, identified above. For SHM-93-22C, the December 2006 result of 73 µg/L was greater than the June 2006 result of 17 µg/L.

Historically, arsenic concentrations are usually higher in the fall than spring in wells SHL-11, SHL-19 and SHM-96-22B, though for the 2006 sampling, arsenic concentrations in samples collected in late spring (June) were greater than the concentrations detected in late fall (December). Monitoring well SHM-96-5B has historically seen higher arsenic concentrations in the spring but this was not observed in the 2006 sampling. The remaining LTM wells don't appear to have a notable seasonal trend for arsenic.

4.3.2 Arsenic Results Performance Monitoring Wells

Arsenic was detected at a concentration greater than 10 µg/L in all samples collected at 23 of the 30 PMP wells. Arsenic was also detected in the pond sample (PSP-01) in the September 2006 sample. In general, arsenic concentrations in the PMP wells have been relative stable since baseline sampling of these locations in August 2005, prior to system start-up testing. A significantly lower arsenic concentration was reported at N5-P1 in the December 2006 sampling.

4.3.3 Other COC Results for LTM Wells

Detectable levels of the VOC trigger chemicals 1,2-dichloroethane, 1,2-dichlorobenzene, and 1,4-dichlorobenzene were not observed in the 14 monitoring well sampled in June 2006. The other COCs not designated as trigger chemicals detected at concentrations above cleanup levels were metals iron, manganese, and sodium.

Other metals identified as chemicals of concern in the ROD, including aluminum, chromium, lead and nickel, were not found to exceed cleanup levels at any of the wells. Iron was detected above its cleanup level of 9,100 µg/L at the Group 2 compliance point wells including SHM-96-5B, SHM-96-5C, SHL-11, SHL-19, and SHM-93-22B only. This is expected due to the close association between dissolved iron (Fe^{2+}) and dissolved arsenic. Iron was not detected above the cleanup level at wells that have achieved Group 1 status.

The Group 1 well SHL-22, and Group 2 wells, including, SHM-96-5B, SHM-96-5C, SHL-11, SHL-19, SHL-20, and SHM-93-22B, had concentrations of manganese above the cleanup level of 1715 µg/L. The maximum value detected for manganese was 9,460 µg/L at SHM-96-5B. Sodium was detected at levels above its cleanup level of 20,000 µg/L at Group 2 wells SHM-96-5B, SHM-96-5C, SHL-11, SHL-20, and SHM-93-22B. Sodium was also detected above the cleanup level at the Group 1 well SHL-22 and SHM-93-22C.

4.3.4 Contingency Remedy and Other Groundwater Data Collected in 2006

Tables 4-7 and 4-8 provide summaries of laboratory analytical and field parameter data collected in 2006 as part of the Performance Monitoring Program. The laboratory analytes include arsenic (summarized above), iron, manganese, and a set of cations including calcium, magnesium, potassium, and sodium. In addition, other general chemistry parameters include turbidity, alkalinity, chloride, nitrogen (as nitrate), and sulfate. In-situ field parameters measurements, include pH, conductivity, dissolved oxygen, temperature, and oxidation reduction potential (ORP).

These data are being used to evaluate geochemical conditions, as they change with operation of the Contingency Remedy, primarily downgradient of the wellfield; however, data were collected in other areas to provide a baseline for conditions upstream. A noteable observation during initial operation of the system is the general stability of the parameters. It is likely still too early to note trends related to changing redox conditions downgradient of the extraction wellfield; however, these will prove to be important parameters for future monitoring of both system performance and arsenic clean-up.

In December 2006, eleven (11) downgradient monitoring well screens and the influent from EW-04 were sampled for dissolved methane and ethane. Methane and ethane in the treatment plant influent from EW-04 was 1660 µg/L and 2.5 µg/L, respectively. Wells downgradient were selected to evaluate dissolved methane/ethane downgradient. These wells included SHP-05-41A, B,C; SHP-05-42A, B; SHP-05-40X; SHP-05-39; SHM-99-31A,B,C; and SHP-99-32X.

Concentrations of methane/ethane in these wells ranged from 0.813 to 7,910 µg/L depending on depth and distance from the landfill. The dissolved methane/ethane is strongly associated with methanogenesis dominated redox conditions, that are also related to iron and manganese dissolution and associated arsenic release and transport. Appendix B provides a response to comments on the *Technical Memo-Methane Controls* (CH2M HILL, 2006) and the data from the associated dissolved methane/ethane sampling that has been conducted. Vadose zone methane gas monitoring data collected at each of these well locations during water sampling, in addition to other landfill gas monitoring data collected historically, discussed in Section 3, do not suggest that dissolved methane/ethane generated and transported at depth under strongly reducing conditions near the landfill results in detectable methane in the vadose zone above.

5.0 WELLFIELD AND ARSENIC TREATMENT PLANT OPERATIONS

The rationale for implementing the Contingency Remedy for Shepley's Hill groundwater along with detailed plans and specifications for the wellfield and treatment plant is provided in the documents entitled, *Remedial Design and Remedial Action Workplan, Final Hundred Percent (100%) Submittal, Groundwater Extraction, Treatment, and Discharge Contingency Remedy for Shepley's Hill Landfill.* (CH2M HILL, May, 2005) and the *Explanation of Significant Differences* (CH2M HILL, 2005).

Groundwater modeling work conducted by the Army over a number of years indicated that a wellfield would effectively provide hydraulic containment of the groundwater moving beneath Shepley's Hill Landfill and to the north if operated at 50 gallons per minute (gpm). Subsequent field investigation and design work conducted in conjunction with the Contingency Remedy design process supported this conclusion. The BRAC Cleanup Team (BCT) decided during the completion of the final design effort to conduct initial operation of the system at 25 gpm and use initial operational data to assess whether or not pumping rates could be increased in the future. Particularly important in the early operation of the system, according to EPA concerns, would be to monitor key geochemical parameters near the landfill, particularly downstream to evaluate if the Contingency Remedy is having adverse geochemical effects resulting in increased arsenic transport. In addition, hydraulic impacts downstream were determined to be important to monitor during start-up and early operation of the system.

5.1 Wellfield

Construction of the wellfield, involving two 6-inch extraction wells, and step-testing was completed in February 2005 and the remainder of system construction and connections with the treatment plant were completed in the Spring and Summer 2005. The wellfield was tested with start-up in August 2005 and well performance was demonstrated to be in agreement with modeled performance at a pumping rate of 25 gpm (CH2M HILL, 2006).

Concurrent with final design and construction work, surface water and groundwater disposal were also evaluated as options for future release of treated water from the Arsenic Treatment Plant (CH2M HILL, 2005). This work involved hydraulic modeling to evaluate the impacts of surface water and groundwater discharge at a number of locations east and southeast of the wellfield. In brief, the evaluation identified locations east of the treatment plant that could be viable for groundwater or surface water discharge.

Wellfield extraction testing, plant process testing, and early system operation were conducted in late August and September 2005. During the start-up period, process testing and adjustments were made over a period of several days to evaluate the appropriate dosage of coagulant needed to achieve treatment to the operational goal of 10 µg/L for arsenic in plant effluent. Influent and effluent sampling was conducted to document arsenic, iron, and manganese concentrations throughout the testing period. This was necessary for evaluation of coagulant dosage, as well as to document influent/effluent characteristic under full operational pumping at 25 gpm. The testing demonstrated

that the treatment process successfully treats a complex matrix (influent groundwater) and meets the goal of 10 µg/L arsenic. These data are presented in the 2005 Annual Report.

In addition, to start-up process testing, geochemical and water-level monitoring were conducted during the start-up period and subsequently during routine operations in accordance with the *Performance Monitoring Plan* (CH2M HILL, 2005c). This data collection confirmed that hydraulic triggers were not exceeded, in addition to demonstrating that groundwater arsenic levels and other geochemical parameters have remained relatively stable in the vicinity of the extraction wellfield and elsewhere during the early operation of the system.

5.2 Arsenic Treatment Plant Operation

Plant process was tested and proved during August/September 2005 during a month of start-up operations. The work conducted during this time is summarized in the *Startup Testing Report Groundwater Treatment System, Shepley's Hill Landfill, Devens, MA* (CH2M HILL, 2005). This report was discussed and provided as an attachment to the 2005 Annual Report. Table 5-1 provides a summary of influent and effluent results for arsenic, iron, and manganese during plant process testing in August, 2005. In addition, it provides arsenic results during the extraction testing conducted in late August, 2005 and through-out operation in September, 2005 and March, 2006 through January, 2007. The table identifies the extraction well, either EW-01 or EW-04 (also referred to as EW-02), that was operating at the time the sample was collected.

During process testing, EW-04 was pumped and average influent concentrations were 5795 µg/L. EW-01 was pumped during the extraction test and average influent concentrations were 3067 µg/L. During initial system testing and during ongoing operations the average flow from the wellfield was 25 gpm, including dead-heading of wells during backwash cycles in the plant. However, in December, 2006, tests were run from the December 5th through 7th with the flow split between both extraction wells at cumulative pumping rates of 50, 40, and 25 gpm. The system was set at 50 gpm (EW-01/04 @ 25 gpm each) on December 5th and operated overnight for approximately 16 hours then sampled the next morning on December 6th; the pumping rate was then changed to 40 gpm and the system operated for approximately 8 hours and sampled later in the afternoon of December 6th; pumping rate was then changed to 25 gpm and the system operated overnight for approximately 16 hours and then sampled the next morning on December 7th. It is notable that the average concentrations during the increased flow rate testing did not differ greatly from operations at lower flow rates. This may be due to the effects of arsenic sorption chemistry in the vicinity of the screened zone on water contributing to flow from the well. It is expected that influent concentrations at changed flow rates may take several days to stabilize. If all available sampling data are utilized, the average influent concentrations from EW-04 and EW-01 throughout start-up and operations are 5504 µg/L and 2873 µg/L, respectively.

Table 5-1 also identifies the POTW permit special condition of 30 µg/L which requires weekly sampling if effluent exceeds this value. With the exception of start-up process testing, when chlorine dioxide dosing was being set, effluent has been well below the POTW special condition and the 10 µg/L Army goal for the design. Weekly sampling was conducted during late December and early January following a result of 34 µg/L on December 26, 2006.

During the first month of start-up operations in 2005, plant monitoring resulted in 35% LEL being detected in the influent tank of the microfilter, 7% LEL in the effluent sump, and 2% LEL in the effluent manhole. Further monitoring indicated that methane/ethane gas was generated from dissolved methane in influent as groundwater it is brought to the surface and equilibrates at atmospheric pressure. The methane/ethane levels in groundwater proved to be fairly typical for groundwater having high TOC levels and that is undergoing active methanogenesis. The plant was shutdown to upgrade systems to ensure that hazardous atmospheres would not develop in headspaces in the plant or process and monitoring/alarms would be in place to shutdown the system during operations, if necessary.

The Army implemented measures to control and monitor methane gas which was detected in the influent in the Fall of 2005. These safety measures focused on protecting personnel at the facility, and included upgrading affected electrical components to explosion-proof, sealing and venting process units, installing methane/O2 detectors at key process units, and re-programming the control system to shut down the system if methane is detected and/or an oxygen-deficient atmosphere exists. Please refer to *Technical Memo-Methane Controls* (CH2M HILL, 2006b) and the associated response to comments provided in Appendix B for more information. Following installation of these safety measures, the system was re-started on Tuesday, March 7, 2006.

5.2.1 Filtered-Bottom Roll Off/Sludge Disposal

Operation of the Arsenic Treatment Plant (ATP) produces process filter sludge that is accumulated in the filtered-bottom roll-off. The plant treats approximately 1.1 millions gallons of groundwater before the roll-off is pumped out by a disposal contractor. The following table provides a brief summary of filter bottom pump-out events in 2006 and groundwater treated:

Number	Date Emptied	Total Volume Treated	Volume Treated per Roll-Off
1	3/29/06	850,000	850,000
2	5/5/06	1,817,000	967,000
3	6/8/06	2,860,400	1,043,400
4	7/21/06	3,987,800	1,127,400
5	10/23/06	5,326,400	1,338,600
6	12/5/06	6,321,500	995,100

The first pump out event was performed on March 29, 2006. Shortly after, on April 5, 2006, the polymer blending system was activated. This system mixes and conditions the sludge with a dilute polymer emulsion solution which enhances the sludge dewatering process. Although using the polymer does not reduce the amount of sludge generated, it significantly enhances the dewatering rate. The enhanced dewatering reduced the pump out frequencies by providing additional capacity for solids in the roll-off box. On April 27, 2006, a motor-operated-valve (MOV) was installed on the sludge line to the roll-off box. The valve automatically alternates flow to each side of the roll-off at programmed intervals and eliminates the need for an operator to manually alternate discharge into the box.

5.2.2 Microfiltration Clean-in-Place Optimization

The microfilter (MF) periodically requires a clean-in-place procedure (CIP) in order to maintain peak performance and low transmembrane pressure (TMP). The CIP is an operator assisted process during which the MF is alternately cleaned with an acid and a caustic/chlorine solution, rinsed, and placed back in service. On April 18 & 19, 2006, the initial (test) Clean-In-Place (CIP) on the microfilter was conducted. The initial CIP was conducted earlier than necessary (before the MF had been fouled to the point of requiring a CIP) in order to understand the process and insure the program worked properly. This initial CIP worked sufficiently and was believed to be the proper CIP process for long-term operations.

On June 21, 2006, the MF required another CIP. This CIP was performed using the same process as the initial CIP, however the recovery after this CIP was considerably less than the initial CIP. Over the next several months, several different CIP methods were utilized to identify the most effective approach. The approaches involved utilizing different acids and caustics, varying temperatures, and extended soak times. These methods produced varying results, but none resulted in acceptable recovery to the initial TMP of the system.

On August 29, 2006, representatives from Pall Corporation were on-site to evaluate and assist with the CIP procedure. The CIP was repeated with a modified concentration of hydrochloric acid and citric acid. In addition, the water used for the CIP solution was heated using a portable propane heater. Initial results of this CIP were promising as the TMP was restored to near original conditions. However, the TMP continued to increase over time at an increased rate than originally experienced, necessitating more frequent CIPs than previously expected. The rapid increase of the TMP indicated that only partial cleaning of the MF modules had been accomplished and was an indication that module/fiber plugging may be occurring.

In January 2007, modifications were made to the MF skid which allowed direct air injection into each module during the CIP process. In addition, a CIP solution consisting of both sulfuric and citric acid was used for the cleaning process. Air injection combined with the sulfuric/citric solution resulted in full recovery of the system TMP. In addition, subsequent operation of the ATP has indicated that the rate of increase in TMPs is similar to that observed when the ATP was initially started.

It is believed that insufficient oxidation of the influent inorganics (iron, arsenic, and manganese) resulted in small concentrations of inorganics remaining in the MF effluent. The MF effluent supplies the backwash water for regular MF backwashes that occur automatically as the plant is operating. Although the concentrations of un-precipitated inorganics were relatively low (below discharge requirements), the backwash solution was being dosed with additional sodium hypochlorite, resulting in the remaining inorganics oxidizing and forming a precipitate while in the backwash holding tank. Repeated backwashes with this "precipitated" solution resulted in the module fibers plugging. This problem has been corrected by maintaining a sufficient chlorine dioxide residual in the MF influent to ensure inorganics are more fully oxidized prior to discharge into the backwash holding tank.

5.2.3 Miscellaneous

On April 18, 2006, piping modifications to Effluent Pump P-1 were completed. Previously, the lift pipe from the sump to the pump was not allowing the pump to prime properly. The piping was replaced and check valve was relocated from the pump discharge pipe to the bottom of the lift pipe. The pump was place back in service and has run without incident.

On May 5, 2006, a Severn Trent NXT3000 vacuum regulator was installed onto the back-up chlorine gas cylinder. Each cylinder is now equipped with a regulator and cascaded into the chlorine dioxide generator. This configuration allows the system to automatically switch to the back-up cylinder when the primary empties. When the back-up becomes the primary, a replacement cylinder can be ordered and placed into service as the back-up with out any system downtime.

6.0 Operating Properly and Successfully - Update

In accordance with CERCLA Section 120(h)(3), federal agencies are required to demonstrate that remedies are "operating properly and successfully" (OPS) prior to deed transfer of federally-owned property (EPA, 1996). CERCLA Section 120(h)(3) provides for transfer of property upon which remedial actions have taken place through the issuance of the CERCLA covenant to the property deed that warrants that *(I) all remedial action necessary to protect human health and the environment with respect to any such substance remaining on the property has been taken before the date of such transfer and (II) any additional remedial action found to be necessary after the date of such transfer shall be conducted by the United States (CERCLA 120(h)(3)(A)(ii)).*

Section 120(h)(3)(B), Covenant Requirements, of CERCLA go on to state:

for the purposes of subparagraph (A)(ii)(I) and (C)(iii), all remedial action described in such subparagraph has been taken if the construction and installation of an approved remedial design has been completed, and the remedy has been demonstrated to the Administrator to be operating properly and successfully. The carrying out of long-term pumping and treating, or operation and maintenance, after the remedy has been demonstrated to the Administrator to be operating properly and successfully does not preclude the transfer of the property.

A remedial action or system is considered to be operating "properly" if it is operating as designed. A remedial system is operating successfully if "its operation will achieve the cleanup levels or performance goals delineated in the decision document (U.S. EPA, 1996)." As described in the Record of Decision for Shepley's Hill landfill (USAEC, 1995), the remedial response objectives are to:

- Protect potential residential receptors from exposure to contaminated groundwater migrating from the landfill having chemicals in excess of MCLs.
- Prevent contaminated groundwater from contributing to the contamination of Plow Shop Pond sediments in excess of human health and ecological risk-based concentrations.

The landfill cap and the groundwater extraction and treatment system at Shepley's Hill have been designed and constructed as approved remedies. The last phase of the landfill cap (ROD alternative SHL-2) was completed in 1993. The cap and drainage system effectively minimize infiltration into the landfill and manage run-off. However, ROD interim goals for clean-up largely relating to incremental risk-reduction for arsenic in groundwater have not been met. Consequently, design for the ROD Contingency Remedy (SHL-9) for groundwater was initiated in September, 2003. In addition, a Supplemental Groundwater Investigation and Landfill Cap Assessment (AMEC, in progress) has been undertaken to assess the adequacy of the landfill cap and the overall remedy.

The groundwater pump with discharge to Ayer POTW remedy envisioned in the ROD was modified by an *Explanation of Significant Differences* (CH2M HILL, 2005) to include treatment

and discharge to the Devens POTW. On-base and off-base investigations were conducted during the design process for the Contingency Remedy and the design was completed, approved, and construction initiated in 2005.

The *Remedial Design and Remedial Action Workplan, Final One Hundred Percent (100%) Submittal, Groundwater Extraction, Treatment, and Discharge Contingency Remedy* (CH2M HILL, May 2005) provides details of the design, initial operational requirements (e.g. pumping rate), and treatment goals. The wellfield design was based on previous pump testing (SWET, 1998) and groundwater modeling (Harding ESE, 2003) indicating that hydraulic containment may be achieved at a pumping rate of 50 gallons per minute.

This pumping rate was used as the basis of design for the wellfield and treatment plant. However, although the system was designed to operate at 50 gpm, it was approved for operation was 25 gpm during initial start-up and the first year of operation. Well step-testing, extraction testing, and subsequent operations at 25 gpm indicate that each of the two extraction wells are operating properly both individually and as a wellfield. Extraction test hydraulic data agree with modeled predictions. In addition, influent data indicate that the wellfield is performing efficiently to hydraulically contain water of the arsenic plume at depth. Average concentrations in the influent for each of these wells are 2873 µg/L (EW-01) and 5504 µg/L (EW-04), which are comparable to the highest concentrations observed during pilot-hole sampling near these two locations conducted prior to extraction well installation (CH2M HILL, 2004). Short-term testing of each extraction well and the plant at 50 gpm in December, 2006 indicate that the remedy operates properly at the design pumping rate. Further evaluation of the wellfield hydraulics may be conducted by the Army during ongoing operations to develop hydraulics data at the doubled pumping rate of 50 gpm to compare with modeled predictions. Assessments of whether the remedy is operating "successfully" in terms of remedial goals may involve evaluation of geochemical data collected downgradient of the system over time and long-term wellfield hydraulics.

The system began operation in August, 2005 and operated for one month. The system was shut down due to concerns that dissolved methane/ethane in groundwater may accumulate as an explosive gas in the building or process equipment. Although monitoring work conducted during the initial operations did not indicate that explosive conditions were developing during operations at 25 gpm, the plant was upgraded to ensure that at higher pumping rates if methane/ethane mass transfer is greater, the plant would have systems in place to monitor and passively vent methane where it might accumulate. Following plant upgrades, long-term operations began in March, 2006.

Appendix B provides a memo summarizing monitoring conducted during start-up to evaluate this issue. In addition, it provides a summary in responses to comments of other activities undertaken by the Army to evaluate both dissolved methane in groundwater and within the plant. The evaluation of the treatment plant and upgrades implemented in the winter of 2005/2006 may be summarized as follows:

> *The release points in the process that were identified during the evaluation (microfilter influent tank, microfilter backwash tank, effluent sump) are sealed and vented to the building exterior. The two other* process *components are the lamella clarifier and the filterbottom roll-off. The lamella clarifier* receives *water/solids generated during the microfilter*

backwash cycle. The compressed air used during the *backwash cycle appears to remove the methane and the backwash tank is vented to the building exterior. The filter-bottom roll-off then receives water/solids from the lamella clarifier. Methane was not initially, nor subsequently, measured in the lamella clarifier and filter-bottom roll-off. In addition, methane* monitors *were installed over the lamella clarifier (approx. 11 feet above the floor) and the filter bottom roll-off (approx. 6 feet above the floor), as well as in the area near the microfilter. The methane monitor over the lamella clarifier provides monitoring close to the ceiling. The methane monitors are connected to the system control logic, which is established to sound an alarm if 10% of the LEL is detected and shut the system down if 20% of the LEL is detected. (Response to Comments, Methane Memo (3/3/2006), EPA General Comment #3 (3/27/2006))*

The treatment system is operating properly and successfully and has achieved the Army treatment process design goal of 10 µg/L for arsenic. This treatment goal has been met throughout operations, to date. The goal is significantly below the established POTW discharge limitation of 150 µg/L and maximum daily loading of .07 pounds/day. The *Start-Up Testing Report* (CH2M HILL, 2005), BCT updates, and operational reports submitted to the POTW summarize operational data. All other discharge limitations provided in the POTW permit have been met, as well.

It is expected that upon completion of the *Supplemental Groundwater Investigation and Landfill Cap Assessment* (AMEC, in progress) and as the Contingency Remedy operates at the design pumping rate of 50 gpm over the next year, that a formal OPS demonstration will be made. The demonstration is expected to show that the system, operating at the design flow rate, is providing hydraulic containment consistent with remedial response objectives.

7.0 QUALITY CONTROL

Quality assurance/quality control (QA/QC) samples were collected to monitor the sample collection, transportation, and analysis procedures. QA/QC samples included field duplicate samples, matrix spike/ matrix spike duplicate samples, and equipment blanks. The results of the QA/QC sampling as well as an assessment of the data quality of analytical results for water samples collected during the 2006 Annual Shepley's Hill sampling events are provided in Appendix E. Based on the data evaluation elements reviewed, most data was determined to be of acceptable quality for use. However, it appears that the total metal sample bottles for SHM-05-42A and SHM-05-42B in the December 2006 sampling were switched. The December 2006 laboratory report for sample SHM-05-42A corresponds to the historical concentrations at SHM-05-42B while the December 2006 laboratory report for SHM-05-42B corresponds to the historical concentrations reported at SHM-05-42A. This report has assumed this labeling mistake occurred and that the laboratory report identifying SHM-05-42A is actually the results for 42B and vice-versa.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

- The Contingency Remedy groundwater extraction and treatment system began long-term operation in March 2006.
- The Group 1 and 2 well designations are no longer relevant for the combined capped landfill and Contingency Remedy. A Revised Long-Term Monitoring and Maintenance Plan (CH2M HILL, 2006) was developed by the Army in 2006 to update and focus the LTMMP while incorporating monitoring to assess performance of the complete remedy for Shepley's Hill, inclusive of the groundwater extraction, treatment, and POTW discharge system. This plan was finalized with BCT input in May, 2007 and will guide monitoring for 2007 and future years.
- Site-wide groundwater measurements were collected in April, June, September, and December 2006 under the LTMMP and PMP. Groundwater elevations measured in June were the highest and September the lowest. Groundwater contour maps developed from water-level data collected in June and December suggest that the operation of the groundwater extraction system is enhancing the northerly flow of water from beneath the capped landfill, similar to observations from the start-up extraction test (CH2M HILL, 2006a) conducted at 25 gpm. This enhanced flow is also suggested by modeling work conducted historically for the Supplemental Groundwater Investigation (Harding ESE, 2003), the wellfield design work (CH2M HILL, 2005a) and subsequent modeling work conducted to evaluate on-site discharge options and locations (CH2M HILL, 2005e).
- Shepley's Hill Landfill Cap appears to be in fair condition.
- Recommendations from the Draft Cap Drainage Report, January 2003 will be further evaluated in the Supplemental Groundwater Investigation and Landfill Cap Assessment (AMEC, in progress), which will assess the adequacy of the landfill cap and overall remedy. Following this work, remedial repairs required will be identified and implemented.
- Implementation of repairs (if required) should improve the drainage and function of the landfill cap. The completion of the Supplemental Groundwater Investigation and Landfill Cap Assessment (AMEC, in progress) is scheduled for Fall 2007.

8.2 Recommendations

- In 2006, the Army undertook an effort to review historic monitoring data from the long-term monitoring and maintenance program (LTMMP) along with the Contingency Remedy performance monitoring program (PMP). This work was conducted with the

objective of optimizing the LTMMP and integrating the Contingency Remedy into the program. A draft of the Revised LTMMP was submitted to the regulatory agencies in December, 2006 (CH2M HILL, 2006), BCT comments have been received and addressed, and the document finalized in May, 2007. This new plan provides an optimized approach to monitoring the Shepley's Hill remedy, taking into account recommendations of the 2005 FYR and historic data available through LTMMP and PMP activities. In addition, the plan eliminates the Group 1 and 2 well designation concept from the monitoring plan since the Contingency Remedy has been successfully implemented and the concept is now not applicable. This revised monitoring program should be fully implemented in 2007.

- Data collected during start-up and subsequently indicate that the wellfield is operating properly. Water levels associated with 25 gallon per minute operations indicate that the groundwater pumping system zone of influence is consistent with modeled predictions (CH2M HILL, 2006). The pumping system does not exceed hydraulic triggers identified in the Performance Monitoring Plan (CH2M HILL, 2005). Geochemical data collected during the first year of operation indicate that the geochemistry downgradient is stable and, to date, has not displayed significant changes in chemistry related to the operation of the system.

- Increased pumping conducted in December, 2006 indicates that each of the wells of the two-well system operate properly at 50 gpm or 25 gpm, supporting a cumulative flow from the wellfield of 50 gpm. The wells were designed with variable frequency drives (VFDs) such that these variable flows could be accommodated. This allows one well to pick-up the total wellfield flow of 50 gpm when the other is offline for maintenance. The operational wellfield flow rate should be increased from 25 gpm to 50 gpm to evaluate long-term wellfield and plant operation at the model-predicted hydraulic containment rate. Hydraulic monitoring may be conducted with increased pumping to further confirm that hydraulic triggers established by the PMP are not exceeded and to support further evaluation of containment. Data collected to date and modeled predictions indicate that the wellfield will provide hydraulic containment at 50 gpm, thus operating "properly". Longer-term aquifer geochemical data will be necessary at the higher pumping rate to demonstrate that hydraulic containment provides needed reductions in dissolved arsenic downstream, meeting the remedial response objectives of the ROD. The pumping rate for the wellfield should be increased to 50 gpm.

- Arsenic, Iron, and Manganese concentrations for treatment plant influent when compared with pre-wellfield aquifer data (vertical profiling) indicate that the extraction wells are situated very well within the most reducing water moving north from the landfill. Dissolved methane/ethane data indicate that this water is under dominantly methanogenic redox conditions. Effluent data for the treatment plant indicate that the treatment process is operating properly and successfully reducing all constituents identified in the POTW discharge permit (Devens/MassDevelopment, 2006) to below treatment goals. Notably, the treatment process has been successful treating arsenic below the Army goal of 10 µg/L. Short-term tests conducted in December indicate that the plant operates well at 50 gpm and provides needed treatment.

- The landfill inspection recommends to: (1) Secure fence gates with padlocks and chains as required to control access to the site and (2) place topsoil and seed over the sandy area lacking vegetation on the east side along the perimeter of the cap.
- The Draft Cap Drainage Report, January 2003 resulted in many recommendations to improve the drainage and function of the cap. Recommendations that should be implemented soon or as specified in the Supplemental Groundwater Investigation and Landfill Cap Assessment (AMEC, in progress) are: (1) removal wetland vegetation from drainage swales and (2) clearing of the entire southern swale of accumulated sediment and/or regraded, as necessary, to facilitate drainage. Reseeding and/or riprap placement, depending on water velocities, will help stabilize the channel.
- Other recommendations made in this annual report that are not currently scheduled but should be addressed in the future include, (1) Repair and regrading around the catch basins on the south side of the landfill; and (2) Repair the hasps on the casings of groundwater monitoring wells SHL-4 and SHL-9.

9.0 REFERENCES

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Figures

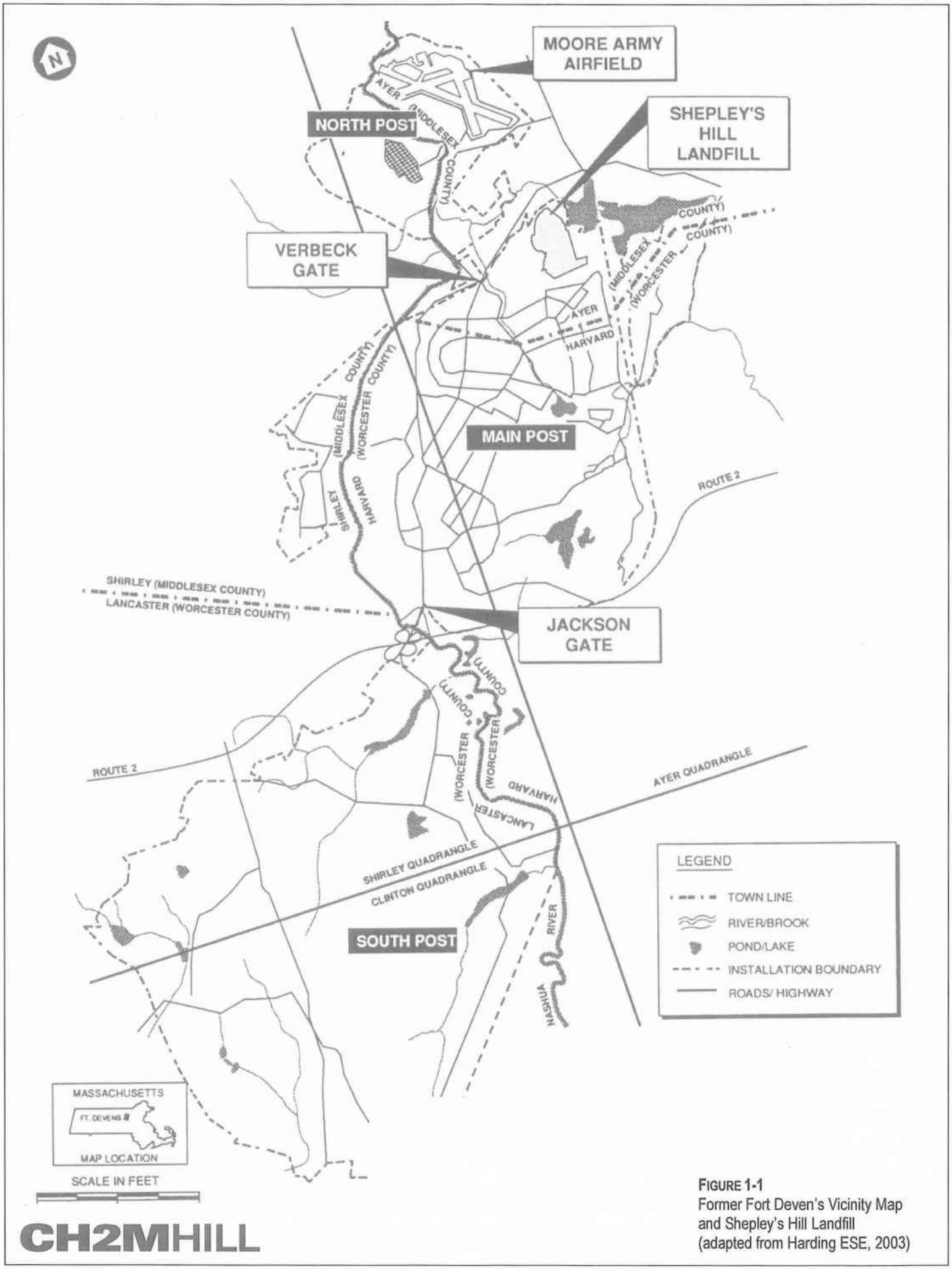
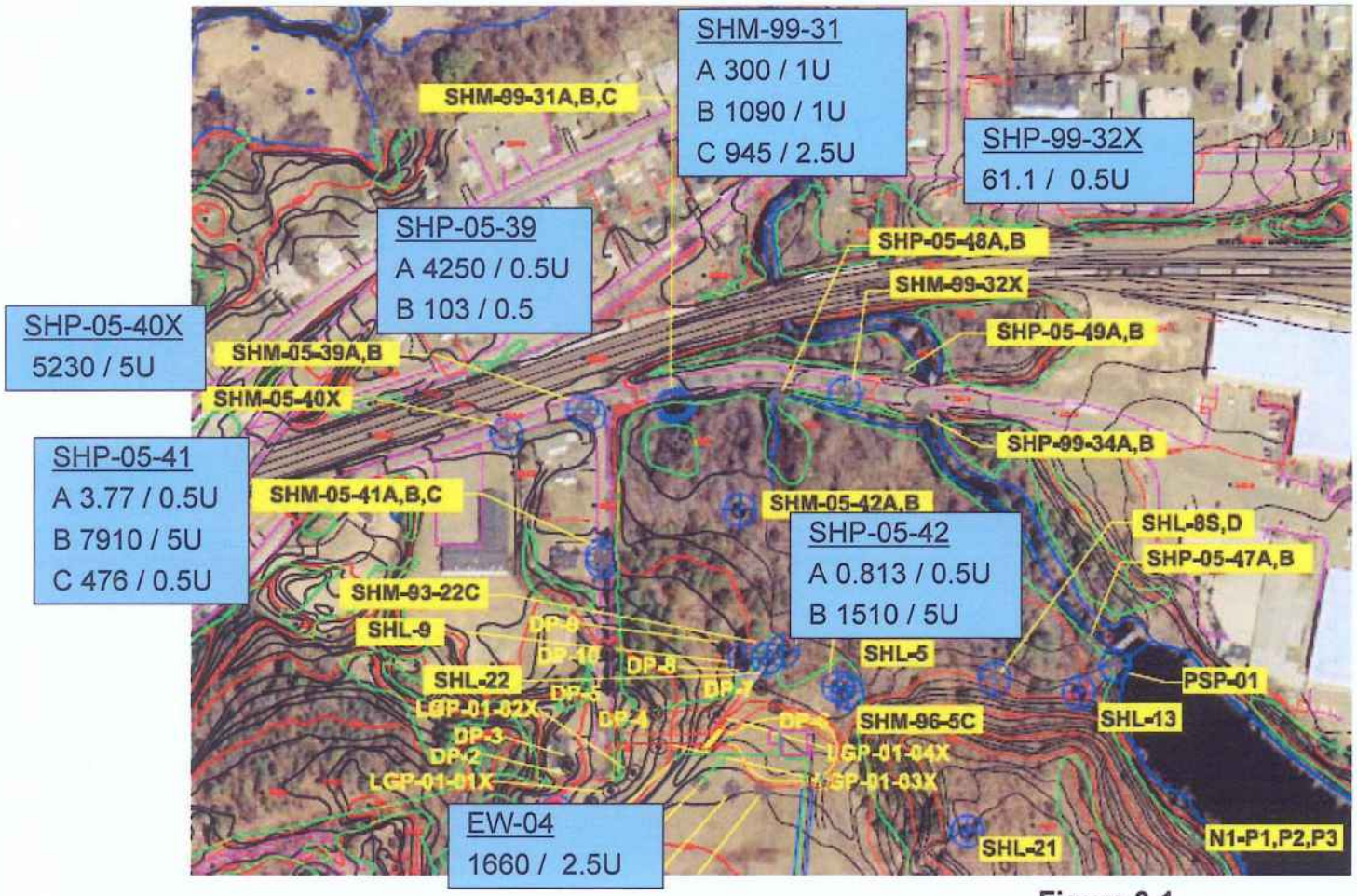


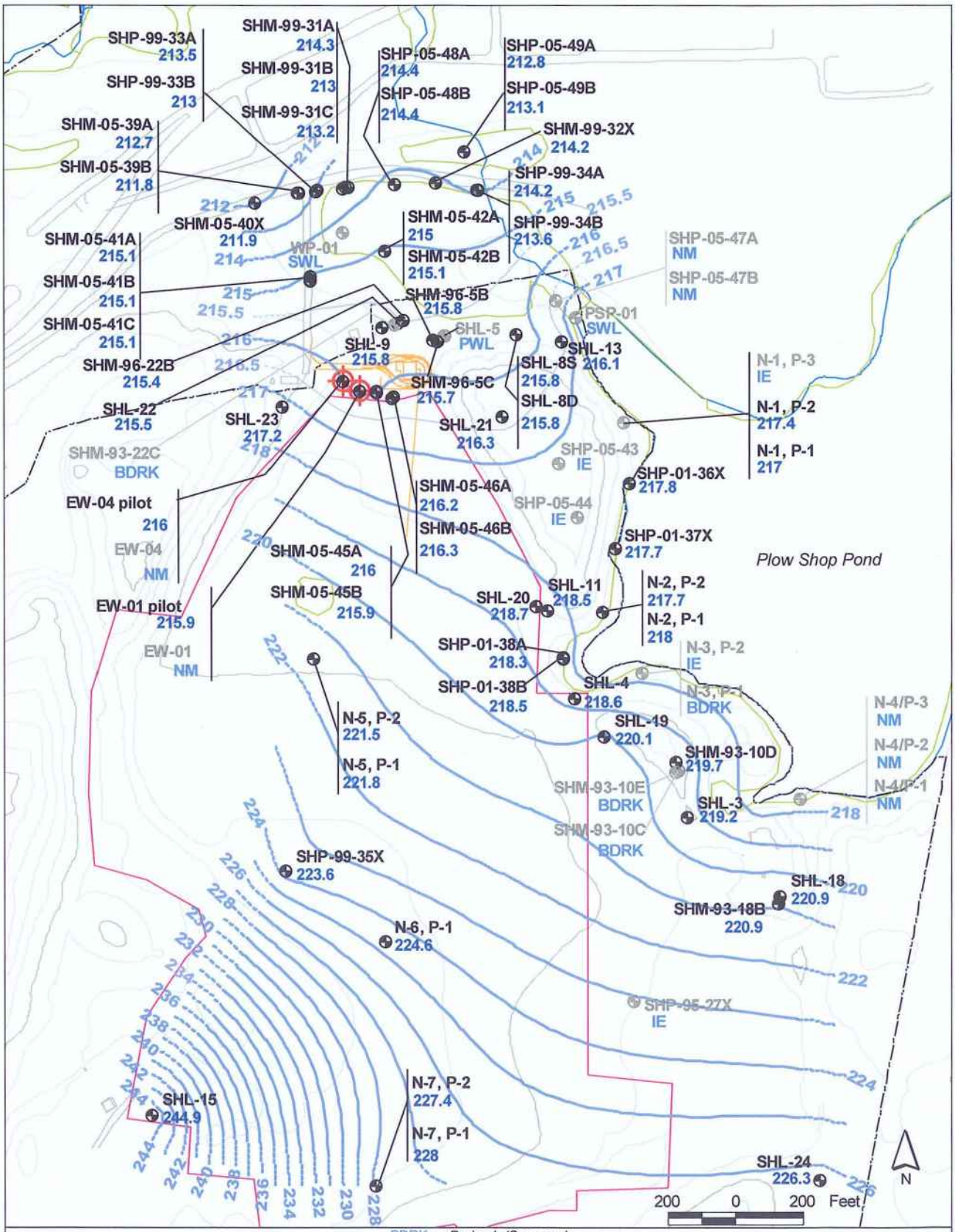
FIGURE 1-1
Former Fort Deven's Vicinity Map
and Shepley's Hill Landfill
(adapted from Harding ESE, 2003)



Note: Dissolved methane / ethane in ug/L. Groundwater monitoring wells, permanent gas probes (LGP-01-01X through LGP-01-04X), and temporary gas probes (DP-1 through DP-10) are identified.

Figure 3-1
12/06 Groundwater Methane/Ethane Data and Temporary Gas Probe Locations
Shepley's Hill Landfill

CH2MHILL



LEGEND

Estimated Groundwater Elevation Contour (dashed where inferred; in feet above mean sea level)

SHL-15 ← Location ID

244.9 ← Groundwater Elevation

Well or Piezometer

Extraction Well

BDRK = Bedrock (Screened Interval)
IE = Instrument Error
NM = No Measurement (Damaged or Under Water)
PWL = Perched Water Level
SWL = Surface Water Level

Contour Interval = 1 foot (except where explicitly labeled)

Figure 4-1
Contour Map of Groundwater Elevations on June 05, 2006

Shepley's Hill Landfill, Fort Devens, MA

CH2MHILL

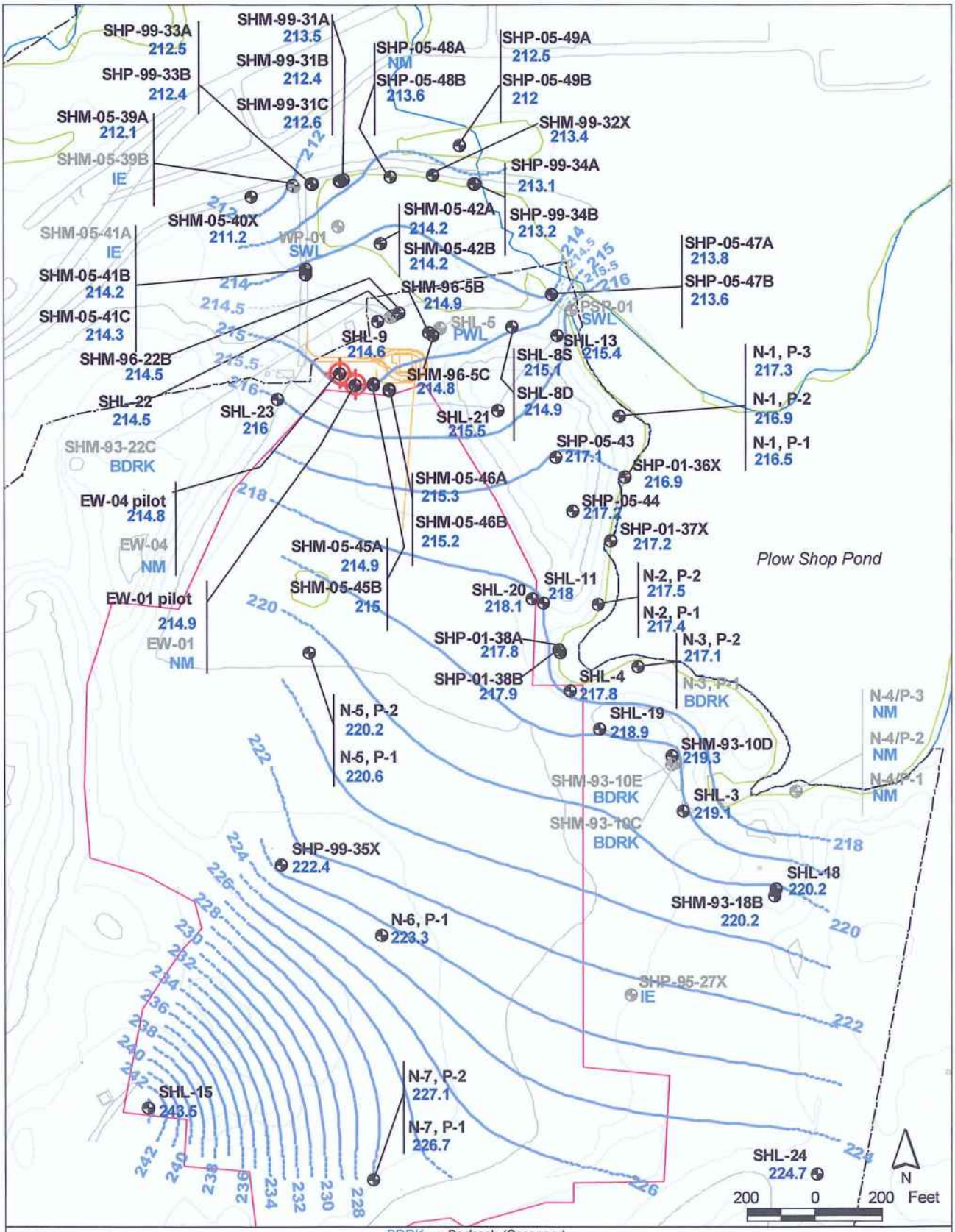
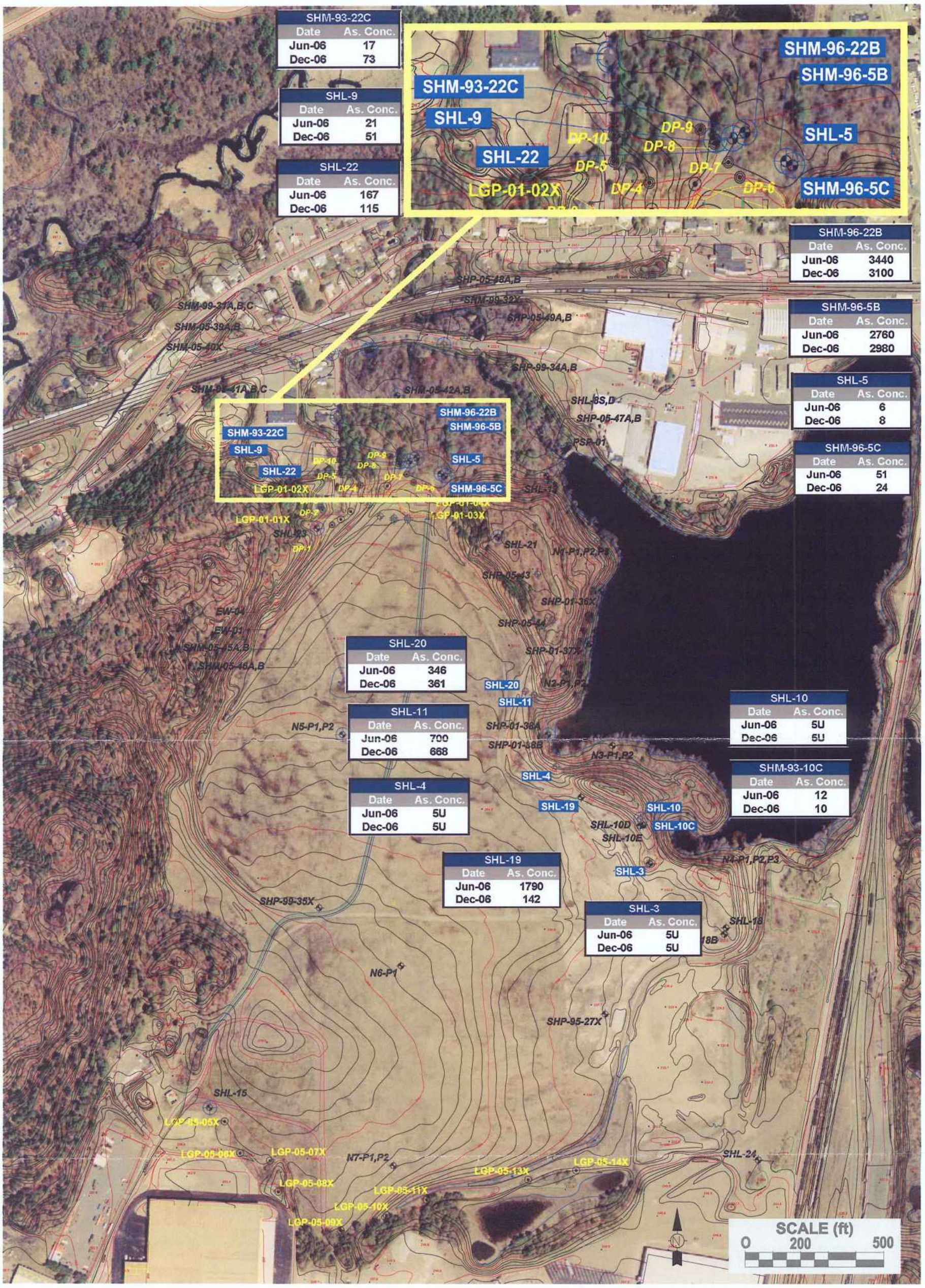


Figure 4-2
Contour Map of Groundwater Elevations on December 15, 2006

Shepley's Hill Landfill, Fort Devens, MA

CH2MHILL



LEGEND

- Long Term Monitoring Network (SHL-9)
- Permanent Gas Monitoring Probe (LGP-05-05X)
- Temporary Gas Probe (10-31-06) (DP-1)

Note: Contingency Remedy performance monitoring network included for reference. Includes Hydraulic ⊕ and Geochemistry monitoring ⊕.

FIGURE 7-1
Long Term Monitoring Network

CH2MHILL

Tables

Table 1-1 Contaminants of Concern (COC) Cleanup Level Shepley's Hill Landfill		
Devens, Massachusetts		
COC	**Cleanup Level ug/L**	**Selection Basis**
Arsenic	10	MCL
Chromium	100	MCL
1,2-Dichlorobenzene	600	MCL
1,4-Dichlorobenzene	5	MCL
1,2-Dichloroethane	5	MCL
Lead	15	Action Level
Manganese	1715	Background [(1)]
Nickel	100	MCL
Sodium	20000	Health Advisory
Aluminum	6870	Background
Iron	9100	Background
(1)Revised ROD clean-up level based on background evaluation.		

Table 3-1
2006 Landfill Gas Monitoring Results
Shepley's Hill Landfill
Devens, Ma

Inspectors:	Bakey/ Reault						
		Barometer at Start:	**End:**	**Time Started:**	**End:**	**Weather**	
Date:	10/31/2006	29.99"	29.79"	0710	1400	Partly Cloudy 40 -65^{O} F	
	12/11/2006	30.33"	30.37"	0830	1430	Clear, 30's	
	12/14/2006	30.01"	29.94"	0730	1400	Clear, 50's	

ID#	VOCs ppm PID	O2 % IR	H2S ppm CGI	% LEL CGI	CO ppm CGI	CO2 % IR	Methane % IR	Remarks
V-1	0.0	6.5	0.0	95.0	4.0	10.9	1.9	12/14/2006 survey
V-2	0.0	5.2	0.0	>100	6.0	15.6	11.5	"
V-3	0.0	6.5	0.0	>100	6.0	18.9	10.9	"
V-4	0.0	10.0	0.0	52.0	2.0	8.8	1.2	"
V-5	0.6	17.9	0.0	2.0	2.0	6.3	2.0	"
V-6	0.0	1.3	0.0	>100	8.0	21.2	14.4	"
V-7	0.0	1.1	0.0	>100	8.0	17.1	6.0	"
V-8	0.0	16.3	0.0	23.0	3.0	11.6	1.2	"
V-9	0.0	6.5	0.0	>100	6.0	23.6	32.0	"
V-10	0.0	8.5	0.0	>100	7.0	17.9	9.6	"
V-11	0.0	10.7	0.0	>100	6.0	7.2	3.3	"
V-12	0.2	21.0	0.0	0.0	0.0	0.1	0.0	"
V-13	0.2	20.1	0.0	0.0	0.0	0.2	0.0	"
V-14	0.1	21.0	0.0	13.0	0.0	0.4	0.1	"
V-15	0.2	21.0	0.0	4.0	0.0	0.4	0.1	"
V-16	0.0	20.1	0.0	1.0	0.0	1.1	0.2	"
V-17	0.0	9.2	0.0	>100	5.0	16.5	17.4	"
V-18	0.0	21.0	0.0	0.0	0.0	0.2	0.0	"
LGP-01-01X	0.0	20.9	0.0	0.0	0.0	0.0	0.0	12/11/2006 survey
LGP-01-02X	0.0	20.4	0.0	0.0	1.0	1.2	0.0	"
LGP-01-03X	0.0	20.6	0.0	0.0	0.0	1.7	0.0	"
LGP-01-04X	1.5	20.6	0.0	0.0	0.0	0.5	0.0	"
LGP-05-05X	0.0	20.3	0.0	0.0	0.0	1.5	0.0	"
LGP-05-06X	0.0	18.2	0.0	0.0	1.0	2.8	0.0	"
LGP-05-07X	0.3	17.3	0.0	0.0	1.0	4.1	0.0	"
LGP-05-08X	0.0	10.4	0.0	0.0	4.0	12.3	0.0	"
LGP-05-09X	0.1	11.0	0.0	1.0	4.0	8.8	0.0	"
LGP-05-10X	0.3	12.6	0.0	2.0	4.0	10.4	0.0	"
LGP-05-11X	2.2	6.9	0.0	2.0	3.0	15.0	0.0	"
LGP-05-12X	--	--	--	--	--	--	--	not installed
LGP-05-13X	0.2	18.5	0.0	0.0	0.0	3.2	0.0	12/11/2006 survey
LGP-05-14X	0.4	8.9	0.0	0.0	3.0	5.1	0.0	"
DP-1	0.0	20.3	0.0	0.0	0.0	0.4	0.0	10/31/2006 temporary soil gas survey
DP-2	0.0	20.7	0.0	0.0	0.0	0.6	0.0	"
DP-3	0.0	21.1	0.0	0.0	0.0	0.6	0.0	"
DP-4	0.0	20.5	0.0	0.0	0.0	0.7	0.0	"
DP-5	0.0	20.9	0.0	0.0	0.0	0.7	0.0	"
DP-6	0.0	19.7	0.0	0.0	0.0	0.5	0.0	"
DP-7	0.0	17.8	0.0	0.0	0.0	2.2	0.0	"
DP-8	0.0	21.1	0.0	0.0	0.0	0.3	0.0	"
DP-9	0.0	21.0	0.0	0.0	0.0	0.3	0.0	"
DP-10	0.0	20.7	0.0	0.0	0.0	0.5	0.0	"
SHM-99-31-GP	0.0	20.6	0.0	0.0	0.0	0.4	0.0	12/11/2006 temporary soil gas survey
SHP-99-32X-GP	0.3	20.6	0.0	0.0	0.0	0.5	0.0	"
SHP-05-39-GP	0.0	20.0	0.0	0.0	3.0	1.2	0.0	"
SHP-05-40X-GP	0.1	20.2	0.0	0.0	0.0	1.2	0.0	"
SHP-05-41GP	4.6	20.6	0.0	0.0	2.0	0.4	0.0	"
SHP-05-42-GP	--	--	--	--	--	--	--	Not sampled due to standing water

Equipment and Calibration Information

Instrument: Thermo Environmental 580B PID 10.6 (Pine ID#6416);Calibrated by Pine Env. 10/31/06 w/ 100 ppm isobutylene (Lot #100 Iso 88410).
Thermo Environmental 580B PID 10.2 (S.N. 242); Calibrated by T. Bakey 12/11/06 and D. Reault 12/14/2006 w/ 100 ppm isobutylene (Lot #90295).

Instrument: Industrial Scientific TMX 412 (Pine ID# 6416); Calib'd by T. Bakey 10/31/06 w/ Cal Gas (Lot# 84993A) 50 ppm CO, 50% LEL, 20.9% O2, 25 ppm H2S.
Industrial Scientific TMX 412 (S.N. 9809009-444); Calib'd by T. Bakey 12/11/06 and D. Reault 12/14/2006 w/ US Env. Cal Gas (Lot# 004266) 50 ppm CO, 50% LEL, 20.9% O2, 25 ppm H2S.

Instrument: GEM 2000 (S.N. GM07991105); Calib'd by Pine Env. on 10/27/06 with 35 ppm CO2, 50ppm CH4, and 20.9 % O2 (Lot #1).
GEM 500 (S.N. E0985); Calibrated by US Env. on 12/11/06 with 35 ppm CO2, 50ppm CH4, and 20.9 % O2; Calibrated by D. Reault on 12/14/06 with 35 ppm CO2, 50ppm CH4, and 20.9 % O2.

NOTES:

V= Landfill gas vent
LGP= Landfill gas well point
DP = Direct push soil gas survey point
GP= Temporary gas point at select downgradient monitoring well locations

Barometric pressures were obtained from http://www.widespread.com for Ayer, MA
Unless otherwise indicated, LEL readings from the GEM 2000 and TMX 412 were the same. If two readings given, the first reading represents the GEM 2000 and the second reading represents the TMX 412 reading.

Revision: 2/12/07

Table 4-1
Long Term Monitoring Well Specifications
Shepley's Hill Landfill
Devens, Massachusetts

Well ID	Description	Orientation to Landfill[1]	Ground Surface Elevation[2] (ft msl)	Reference Elevation[3,4] (ft msl)	Total Depth (feet)	Screen Length (feet)
SHL-3	Water Table	East	247.4	248.6	34.0	10
SHL-4	Water Table	East	226.4	228.1	13.0	10
SHL-5	Water Table	North	216.4	218.6	13.0	10
SHM-96-5B	Base of Sand/Till	North	218.5	220.0	90.0	10
SHM-96-5C	Water Table	North	218.7	219.4	60	10
SHL-9	Water Table	North	222.9	223.0	25.0	10
SHL-10	Water Table	East	249.1	248.8	39.0	15
SHM-93-10C	Bedrock	East	247.1	248.6	54.0	10
SHL-11	Water Table	East	235.0	236.5	27.0	15
SHL-19	Water Table	East	239.5	241.5	30.0	15
SHL-20	Base of Till	East	235.4	237.0	49.0	10
SHL-22	Base of Till	North	219.6	220.6	115.0	10
SHM-96-22B	Sand/Till Interface	North	219.9	220.4	92.3	30
SHM-93-22C	Bedrock	North	217.9	221.7	134.3	10

Notes:

1. North wells are located in the direction of groundwater flow away from the landfill. East wells are located between landfill and Pond.
2. Includes ground surface from published well completion log . If not available, ground surface elevation from Meridian Associates Inc. survey July/Aug 2005 used.
3. All reference elevations based on field survey performed by Meridian Associates, Inc. between July and August 2005 except SHL-10, which is based on groundwater monitoring well completion log by Con-Test Inc.
4. Elevations based upon project system, reported to be National Geodetic Vertical Datum of 1929 (NGVD29).

Table 4-2
Performance Monitoring Well Specifications
Shepley's Hill Landfill
Devens, Massachusetts

Well Location	Ground Surface(1)	Screened Interval(2)	Screened Elevation (feet bgs)	Geologic Designation(3)
DOWNGRADIENT (MOLUMCO ROAD)				
Groundwater Chemistry/Water Levels				
SHM-05-40X	**224.6**	32.0 - 34.0	192.6 - 190.6	Mid-Depth Overburden/Till
SHM-05-39A	**222.9**	37.0 - 39.0	185.9 - 183.9	Mid-Depth Overburden
SHM-05-39B	**222.9**	66.0 - 68.0	156.9 - 154.9	Deep Overburden
SHP-99-31A	**213.8**	4.0 - 14.0	209.8 - 199.8	Shallow Overburden/WT
SHP-99-31B	**213.5**	50.0 - 60.0	163.5 - 153.5	Mid-Depth Overburden
SHP-99-31C	**213.5**	68.0 - 78.0	145.5 - 135.5	Deep Overburden
SHX-99-32X	**220.1**	72.0 - 82.0	148.1 - 138.1	Deep Overburden
Other Water Level Synoptic				
SHP-05-48A,B	**Shallow Piezometer**	- -	- -	Water Table
SHP-05-49A,B	**Shallow Piezometer**	- -	- -	Water Table
SHP-99-34 A	**223.6**	12.5 17.5	211.1 206.1	Shallow Overburden/WT
SHP-99-34 B	**223.6**	74.5 79.5	149.1 144.1	Deep 0verburden
DOWNGRADIENT (WOODS)				
Groundwater Chemistry/Water Levels				
SHM-05-41A	**223.8**	42.0 - 44.0	181.8 - 179.8	Shallow Overburden
SHM-05-41B	**223.6**	62.0 - 64.0	161.6 - 159.6	Mid-Depth Overburden
SHM-05-41C	**224.0**	88.0 - 93.0	136.0 - 131.0	Deep Overburden/Till
SHM-05-42A	**214.5**	40.0 - 42.0	174.5 - 172.5	Shallow Overburden
SHM-05-42B	**214.5**	70.0 - 72.0	144.5 - 142.5	Mid-Depth Overburden
NEARFIELD AREA				
Groundwater Chemistry/Water Levels				
SHL-23	**240.4**	23.0 - 33.0	217.4 - 207.4	Shallow Overburden/WT
SHL-9	**222.9**	15.0 - 25.0	207.9 - 197.9	Shallow Overburden/WT
SHL-22	**219.6**	105.0 - 115.0	114.6 - 104.6	Deep Overburden
SHM-96-22B	**219.9**	82.0 - 92.0	137.9 - 127.9	Mid-Depth Overburden
SHM-93-22C	**217.9**	124.3 - 134.3	93.6 - 83.6	Bedrock
SHL-5	**216.4**	3.0 - 13.0	213.4 - 203.4	Shallow Overburden/WT
SHM-96-5B	**218.5**	80.0 - 90.0	138.5 - 128.5	Base of Sand/Till
SHM-96-5C	**218.7**	50.0 - 60.0	168.7 - 158.7	Mid-Depth Overburden
SHL-8S	**220.1**	52.0 - 54.0	168.1 - 166.1	Mid-Depth Overburden
SHL-8D*	**220.1**	68.0 - 70.0	152.1 - 150.1	Deep Overburden
SHL-21	**257.9**	42.0 - 52.0	215.9 - 205.9	Shallow Overburden/WT
Other Water Level Synoptic				
SHP-05-45A	**227.3**	20.0 - 25.0	207.3 - 202.3	Shallow Overburden
SHP-05-45B	**227.7**	65.0 - 75.0	162.7 152.7	Mid-Depth Overburden
SHP-05-46A	**227.3**	20.0 - 25.0	207.3 - 202.3	Shallow Overburden
SHP-05-46B	**227.1**	65.0 - 75.0	162.1 152.1	Mid-Depth Overburden
SHP-05-43	**259.4**	50.5 - 60.5	208.9 - 198.9	Shallow Overburden
SHP-05-44	**256.4**	51.0 - 61.0	205.4 - 195.4	Mid-Depth Overburden
POND AREA				
Groundwater Chemistry/Water Levels				
SHL-13	**220.1**	5.0 - 20.0	215.1 - 200.1	Shallow Overburden/WT
SHP-36X	**221.1**	3.0 8.0	218.1 213.1	Shallow Overburden/WT
SHP-37X	**219.5**	1.0 6.0	218.5 213.5	Shallow Overburden/WT
SHP-01-38A	**219.8**	1.5 6.5	218.3 213.3	Shallow Overburden/WT
Other Water Level Synoptic				
PSP-01 (pond sample)	**Pond Stage**	- -	- -	N/A
SHP-05-47A,B	**Shallow Piezometer**	- -	- -	Water Table
N1-P1	**228.8**			Deep Overburden
N1-P2	**228.8**			Mid-Depth Overburden
N1-P3	**228.8**			Shallow Overburden/WT
N2-P1	**221.6**			Deep Overburden
N2-P2	**221.6**			Shallow Overburden/WT
SHP-01-38B	**219.9**	18.0 23.0	201.9 - 196.9	Deep Overburden
N3-P1*	**219.8**	33.0 - 35.0	186.8 - 184.8	Bedrock
N3-P2*	**219.8**	4.0 - 9.0	215.8 - 210.8	Water Table
UPGRADIENT AREA				
Groundwater Chemistry/Water Levels				
SHL-15	**260.1**			Shallow Overburden/WT
N5-P1*	**241.7**	144.0 - 149.0	97.7 - 92.7	Bedrock
N5-P2*	**241.7**	20.0 - 25.0	221.7 - 216.7	Shallow Overburden/WT
SHL-20	**235.6**	39.0 - 49.0	196.6 - 186.6	Deep Overburden/Till
SHL-11	**235.0**	12.0 - 27.0	223.0 - 208.0	Shallow Overburden/WT
SHL-4	**226.0**	3.0 - 13.0	223.0 - 213.0	Shallow Overburden/WT
SHL-19	**239.5**	20.0 - 30.0	219.5 - 209.5	Shallow Overburden/WT
SHL-10	**249.1**	24.0 - 39.0	225.1 - 210.1	Shallow Overburden/WT
SHL-10C	**247.1**	44.0 - 54.0	203.1 - 193.1	Bedrock
SHL-10D	**246.5**			Bedrock
SHL-3	**247.4**	24.0 - 34.0	223.4 - 213.4	Shallow Overburden/WT
Other Water Level Synoptic				
SHP-99-35X	**257.8**	30.2 - 40.2	227.6 - 217.6	Shallow Overburden/WT
SHL-18	**236.8**			Shallow Overburden/WT
SHM-93-18B	**236.2**	78.5 - 88.5	157.7 - 147.7	Deep Overburden/Till
SHP-95-27X	**236.3**			Shallow Overburden/WT
N6-P1*	**257.1**	84.0 - 88.0	173.1 - 169.1	Bedrock
N7-P1*	**254.4**	65.0 - 69.0	189.4 - 185.4	Bedrock
N7-P2*	**254.4**	29.0 - 35.0	225.4 - 219.4	Shallow Overburden/WT
SHL-24*	**237.8**	110.0 - 120.0	127.8 - 117.8	Deep Overburden

* Includes estimated figures derived from Supplemental Groundwater Investigation (Harding ESE, 2003).

(1) Includes ground surface from published well completion log. If not available, ground surface elevation from Meridian Associates Inc. survey July/Aug 2005 used.

(2) Well completion depths derived from original logs to the extent available. SGI (Harding ESE, 2003) Section 2.6 table and x-section depictions used to derive screen depths if original logs not available.

(3) Information consistent with Table 2-5 designations in Supplemental Groundwater Investigation (Harding ESE, 2003)

Table 4-3
Site-Wide Groundwater Elevations
Shepley's Hill Landfill

		4/10/2006		6/5/2006		9/18/2006		12/15/2006	
Well ID	Reference Elevation[1,2] (ft msl)	DTW (TOC) (ft)	Elevation (ft msl)	DTW (TOC) (ft)	Elevation (ft msl)	DTW (TOC) (ft)	Elevation (ft msl)	DTW (TOC) (ft)	Elevation (ft msl)
SHM-05-39A	222.6	11.23	211.4	9.88	212.7	11.47	211.1	10.52	212.1
SHM-05-39B	222.6	12.05	210.6	10.76	211.8	12.24	210.4	15.61	207.0
SHM-05-40X	224.4	13.99	210.4	12.52	211.9	14.14	210.3	13.16	211.2
SHM-05-41A	223.5	10.08	213.4	8.44	215.1	10.49	213.0	2.30	221.2
SHM-05-41B	223.3	9.91	213.4	8.23	215.1	10.32	213.0	9.15	214.2
SHM-05-41C	223.6	10.15	213.5	8.46	215.1	10.54	213.1	9.35	214.3
SHM-05-42A	217.8	4.29	213.5	2.80	215.0	4.79	213.0	3.65	214.2
SHM-05-42B	217.8	4.28	213.5	2.70	215.1	4.75	213.1	3.63	214.2
SHM-99-31A	215.4	2.51	212.9	1.07	214.3	3.72	211.7	1.91	213.5
SHM-99-31B	215.4	3.60	211.8	2.41	213.0	3.91	211.5	3.00	212.4
SHM-99-31C	215.8	3.87	211.9	2.61	213.2	4.22	211.6	3.25	212.6
SHM-99-32X	222.3	9.56	212.7	8.14	214.2	9.81	212.5	8.89	213.4
SHP-05-47A	218.5	5.36	213.1	--		5.68	212.8	4.68	213.8
SHP-05-47B	216.3	3.21	213.1	--		3.63	212.7	2.74	213.6
SHP-05-48A	217.0	3.54	213.5	2.61	214.4	4.21	212.8	Couldn't Access	
SHP-05-48B	218.4	5.01	213.4	4.02	214.4	5.55	212.9	4.83	213.6
SHP-05-49A	217.8	4.42	213.4	5.00	212.8	5.81	212.0	5.27	212.5
SHP-05-49B	216.2	Dry	Dry	3.13	213.1	4.69	211.5	4.22	212.0
SHP-99-33A	224.1	12.12	212.0	10.64	213.5	12.66	211.4	11.56	212.5
SHP-99-33B	223.7	11.92	211.8	10.69	213.0	12.16	211.5	11.32	212.4
SHP-99-34A	225.7	Dry	Dry	11.54	214.2	Dry	Dry	12.60	213.1
SHP-99-34B	225.6	13.26	212.3	12.02	213.6	12.92	212.7	12.38	213.2
WP-01	213.4	Dry	Dry	1.25	214.7	Dry	Dry	1.28	214.7
EW-01 pilot	228.0	13.82	214.2	12.11	215.9	14.04	214.0	13.10	214.9
EW-04 pilot	228.1	14.10	214.0	12.14	216.0	14.43	213.7	13.28	214.8
SHL-13	221.8	6.90	214.9	5.68	216.1	7.29	214.5	6.39	215.4
SHL-21	260.0	45.04	215.0	43.69	216.3	45.71	214.3	44.55	215.5
SHL-22	220.6	6.82	213.8	5.13	215.5	7.14	213.5	6.08	214.5
SHL-23	242.3	27.29	215.0	25.15	217.2	28.18	214.1	26.26	216.0
SHL-5	218.6	3.12	215.5	1.91	216.7	4.93	213.7	2.81	215.8
SHL-8D	221.8	7.36	214.4	5.97	215.8	7.93	213.9	6.89	214.9
SHL-8S	222.0	7.52	214.5	6.22	215.8	7.73	214.3	6.95	215.1
SHL-9	223.0	9.06	213.9	7.18	215.8	9.57	213.4	8.38	214.6
SHM-05-45A	229.5	15.20	214.3	13.55	216.0	15.51	214.0	14.56	214.9
SHM-05-45B	230.1	15.81	214.3	14.19	215.9	16.12	214.0	15.12	215.0
SHM-05-46A	229.3	14.75	214.6	13.08	216.2	15.12	214.2	13.97	215.3
SHM-05-46B	228.7	14.06	214.6	12.39	216.3	14.41	214.3	13.48	215.2
SHM-93-22C	221.7	7.86	213.8	6.21	215.5	8.26	213.4	7.15	214.6

		4/10/2006		6/5/2006		9/18/2006		12/15/2006	
Well ID	Reference Elevation[1,2] (ft msl)	DTW (TOC) (ft)	Elevation (ft msl)	DTW (TOC) (ft)	Elevation (ft msl)	DTW (TOC) (ft)	Elevation (ft msl)	DTW (TOC) (ft)	Elevation (ft msl)
SHM-96-22B	220.4	6.68	213.7	4.98	215.4	6.98	213.4	5.93	214.5
SHM-96-5B	220.0	5.80	214.2	4.25	215.8	6.26	213.7	5.12	214.9
SHM-96-5C	219.4	5.25	214.2	3.70	215.7	5.71	213.7	4.62	214.8
SHP-05-43	261.7	44.86	216.8	41.24	220.5	45.31	216.4	44.61	217.1
SHP-05-44	259.1	42.07	217.0	51.82	207.3	42.27	216.8	41.87	217.2
N-1, P-1	231.0	14.72	216.3	14.02	217.0	14.74	216.3	14.52	216.5
N-1, P-2	231.0	14.51	216.5	13.60	217.4	14.62	216.4	14.13	216.9
N-1, P-3	231.2	14.28	216.9	15.24	216.0	14.34	216.9	13.94	217.3
N-2, P-1	223.1	5.68	217.4	5.11	218.0	5.98	217.1	5.75	217.4
N-2, P-2	223.0	5.91	217.1	5.35	217.7	5.76	217.2	5.51	217.5
PSP-01	216.1	1.05	217.2	1.53	217.6	0.90	217.0	0.48	216.6
SHL-11	236.5	18.57	217.9	17.98	218.5	18.81	217.7	18.54	218.0
SHL-20	237.0	18.93	218.1	18.31	218.7	19.21	217.8	18.90	218.1
SHL-4	228.1	10.45	217.7	9.49	218.6	10.66	217.4	10.29	217.8
SHP-01-36X	225.1	obstruction @ 6.8'		7.29	217.8	obstruction @ 6.8'		8.23	216.9
SHP-01-37X	223.7	6.72	217.0	6.05	217.7	6.74	217.0	6.49	217.2
SHP-01-38A	221.8	4.07	217.7	3.50	218.3	4.21	217.6	4.00	217.8
SHP-01-38B	222.0	4.11	217.9	3.49	218.5	4.28	217.7	4.06	217.9
N-3, P-1	221.8	5.05	216.8	4.80	217.0	4.74	217.1	4.95	216.9
N-3, P-2	221.5	4.56	216.9	7.86	213.6	4.69	216.8	4.43	217.1
N-4, P-1[3]	219.2	--	--	--	--	--	--	--	--
N-4, P-2[3]	219.2	--	--	--	--	--	--	--	--
N-4, P-3[3]	219.2	--	--	--	--	--	--	--	--
N-5, P-1	243.7	22.52	221.2	22.21	221.5	23.31	220.4	23.54	220.2
N-6, P-1	259.9	29.39	227.2	28.60	228.0	30.24	229.7	29.93	226.7
N-7, P-1	256.6	29.44	227.7	29.70	227.4	29.91	226.7	30	227.1
N-7, P-2	257.1	18.14	242.8	16.03	244.9	29.95	227.2	17.42	243.5
SHL-15	260.9	19.41	219.2	17.75	220.9	19.36	241.5	18.41	220.2
SHL-18	238.6	22.91	218.6	21.42	220.1	19.51	219.1	22.59	218.9
SHL-19	241.5	29.80	218.8	29.45	219.2	23.32	218.2	29.53	219.1
SHL-3	248.6	29.70	218.9	28.40	220.2	30.67	217.9	28.87	219.7
SHM-93-10C	248.6	30.32	218.6	29.22	219.7	29.80	218.8	29.65	219.3
SHM-93-10D	248.9	29.55	219.0	28.15	220.4	30.54	218.4	28.68	219.8
SHM-93-10E	248.5	19.07	219.2	17.41	220.9	29.61	218.9	18.06	220.2
SHM-93-18B	238.3	--	--	13.50	226.3	19.20	219.1	15.15	224.7
SHL-24	239.8	15.15	223.4	33.05	205.5	15.29	224.5	13.60	224.9
SHP-95-27X	238.5	35.78	223.4	35.59	223.6	15.96	222.5	36.77	222.4
SHP-99-35X	259.2	35.78	177.6	35.59	223.6	36.29	222.9	36.77	222.4

NA=Not Available (survey data not available)

Notes:

1. All ground surface and reference elevations based on field survey performed by Meridian Associates, Inc. between July and August 2005 except SHL-10, which is based on groundwater monitoring well completion log by Con-Test Inc.
2. Elevations based upon project system, reported to be National Geodetic Vertical Datum of 1929 (NGVD29).
3. N-4 ice damaged.

= Suspect measurement.

Table 4-4
Groundwater Sample Analysis and Procedures
Shepley's Hill Landfill
Devens, Massachusetts

Parameters	April 2006 Method	June 2006 Method	September 2006 Method	December 2006 Method	Sample Container	Minimum Volume	Preservative	Holding Time
Volatile Organic Compounds	NS	SW846 8260B	NS	SW846 8260B	2 x 40 mL Vials with Teflon septa screw caps	40 mL	HCl to pH <2 No Headspace 4o +/- 2o C	14 Days
Arsenic	SW846 6010B	SW846 6010B	SW846 6010B	SW846 6010B	1 Liter HDPE	300 mL	HNO3 to pH <2	180 Days
Calcium	SW846 6010B	SW846 6010B	SW846 6010B	SW846 6010B				except
Iron	SW846 6010B	SW846 6010B	SW846 6010B	SW846 6010B				28 Days Hg
Manganese	SW846 6010B	SW846 6010B	SW846 6010B	SW846 6010B				
Magnesium	SW846 6010B	SW846 6010B	SW846 6010B	SW846 6010B				
Potasium	SW846 6010B	SW846 6010B	SW846 6010B	SW846 6010B				
Sodium	SW846 6010B	SW846 6010B	SW846 6010B	SW846 6010B				
Aluminum, Barium, Cadmium	NS	SW846 6010B	NS	SW846 6010B				
Chromium, Copper, Lead	NS	SW846 6010B	NS	SW846 6010B				
Nickel, Selenium, Silver, Zinc	NS	SW846 6010B	NS	SW846 6010B				
Mercury	NS	SW846 7470A	NS	SW846 7470A				
Hardness	NS	SM 2340B	NS	SM 2340B				
Cyanide	NS	SM 9014 / EPA Method 335.2	NS	EPA Method 335.2	500 ml HDPE	500 mL	NaOH to pH >12 4o +/- 2o C	14 Days
Total Dissolved Solids	NS	SM 2540C / EPA 160.1	NS	EPA 160.1	500 mL HDPE	100 mL	4° +/- 2° C	48 Hours
Chloride	SM 9251	SM 9251	SM 9251	SM 9251				28 Days
Nitrate as N	SM 4500NO3-F	SM 4500NO3-F	SM 4500NO3-F	SM 4500NO3-F				48 Hours
Sulfate	SM 9038B	SM 9038B	EPA 300.0	EPA 300.0				28 Days
Alkalinity	SM 2320B	SM 2320B	SM 2320B	SM 2320B				14 Days
Turbidity	SM 2130B	SM 2130B	SM 2130B	SM 2130B				None
Biochemical Oxidation Demand - 5 Day	NS	SM 5210B / EPA 405.1	NS	EPA 405.1	1 Liter HDPE	1 Liter	4° +/- 2° C	48 Hours
Total Suspended Solids	NS	SM 2540D / EPA 160.2	NS	EPA 160.2	1 Liter HDPE	1 Liter	4° +/- 2° C	7 Days
Chemical Oxidation Demand	NS	SM 5220D / EPA 410.4	NS	EPA 410.4	250 mL HDPE	250 mL	H2SO4 to pH <2	28 Days
Total Organic Carbon	NS	SW 9060	NS	SW 9060	2 x 40 mL Vials with Teflon septa screw caps	40 mL	H2SO4 to pH <2 4o +/- 2o C	28 Days
Methane/ Ethane	NS	NS	NS		2 x 40 mL Vials with Teflon septa screw caps	40 mL	HCl to pH <2 No Headspace 4o +/- 2o C	
General Field Parameters								
pH	YSI 600 XL	YSI 600 XL	YSI 600 XL	YSI 600 XL \ Hydra Lab Quanta	N/A	N/A	N/A	N/A
Temperature	YSI 600 XL	YSI 600 XL	YSI 600 XL	YSI 600 XL \ Hydra Lab Quanta	N/A	N/A	N/A	N/A
Specific Conductivity	YSI 600 XL	YSI 600 XL	YSI 600 XL	YSI 600 XL \ Hydra Lab Quanta	N/A	N/A	N/A	N/A
Dissolved Oxygen	YSI 600 XL	YSI 600 XL	YSI 600 XL	YSI 600 XL \ Hydra Lab Quanta	N/A	N/A	N/A	N/A
Oxygen Reduction Potential	YSI 600 XL	YSI 600 XL	YSI 600 XL	YSI 600 XL \ Hydra Lab Quanta	N/A	N/A	N/A	N/A

Notes: NS = Not Sampled
NA=Not Applicable

Notes: For the June 2006 sampling two methods were used

Table 4-5
Groundwater Analytical Results
LTMMP - June, 2006 Sampling Event
Shepley's Hill Landfill
Devens, Massachusetts

Analaytical Parameter	Units	MCL or ROD Standard	Sample ID													
			SHL-03	SHL-4	SHL-5	SHM96-5B	SHM96-5C	SHL-9	SHL-10	SHM96-10C	SHL-11	SHL-19	SHL-20	SHL-22	SHM96-22B	SHM93-22C[1]
Alkalinity, Total	mg CaCO3/L		7	43	35	310	370	62	10	180	190	68	250	380	290	72
Solids, Total Dissolved	ug/L		35,000	63,000	28,000	370,000	440,000	89,000	36,000	280,000	270,000	120,000	310,000	450,000	300,000	140,000
Solids, Total Suspended	ug/L		37,000	5,000 U	5,000 U	35,000	120,000	5,000 U	25,000	6,900	59,000	160,000	5,800	5,000 U	94,000	28,000
Cyanide, Total	ug/L	30	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	10	5 U	5 U	5 U
Chloride	ug/L		1,000 U	1,400	1,600	21,000	43,000	5,000	1,000 U	20,000	22,000	1,200	23,000	29,000	22,000	13,000
Nitrogen, Nitrate	ug/L		110	100 U	100 U	100 U	110	100 U	180	100 U	180	140	100 U	100 U	100 U	180
Sulfate	ug/L		10,000 U	10,000 U	20,000	10,000 U	10,000 U	10,000 U	10,000 U	22,000	10,000 U	14,000	10,000 U	10,000 U	10,000 U	10,000 U
Chemical Oxygen Demand	ug/L		20,000 U	20,000 U	20,000 U	31,000	95,000	22,000	20,000 U	20,000 U	36,000	20,000 U	20,000 U	20,000 U	31,000	20,000 U
BOD, 5 day	ug/L		2,000 U	2,000 U	2,000 U	2,000 U	5,000	2,000 U	2,000 U	2,000 U	3,500	2,000 U	2,000 U	2,000 U	4,100	2,000 U
Total Organic Carbon	ug/L		500 U	1,300	6,600	4,000	8,600	7,200	500 U	740	3,800	1,400	3,000	3,700	4,900	4,400
Hardness	ug/L		9,700	34,000	40,000	240,000	260,000	66,000	12,000	200,000	130,000	66,000	190,000	32,000	200,000	120,000
			Total Metals by MCP 6000/7000 series													
Aluminum, Total	ug/L	6,870	490	100 U	190	100 U	100 U	100	100 U	100 U	100 U	100 U	100 U	100 U	100 U	120
Arsenic, Total	ug/L	10	5 U	5 U	6	2,760	51	21	5 U	12	700	1,790	346	167	3,440	17
Barium, Total	ug/L	200	10 U	20	10 U	40	60	10	10 U	10 U	70	30	100	10	70	120
Cadmium, Total	ug/L	5	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Chromium, Total	ug/L	100	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Copper, Total	ug/L	10,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Iron, Total	ug/L	9,100	640	210	2,900	27,000	89,000	7,500	50 U	50 U	61,000	100,000	6,900	670	67,000	650
Lead, Total	ug/L	15	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Manganese, Total	ug/L	1715	20	400	490	8,500	4,900	380	10 U	40	2,200	2,400	6,700	2,900	2,100	110
Mercury, Total	ug/L	2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel, Total	ug/L	100	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Selenium, Total	ug/L	50	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Silver, Total	ug/L	7	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U
Sodium, Total	ug/L	20,000	2,000 U	4,600	2,900	28,000	38,000	2,900	2,000 U	9,000	24,000	2,800	30,000	39,000	29,000	10,000
Zinc, Total	ug/L	900	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	100	50 U	50 U	50 U	50 U
			Volatile Organics by MCP 8260B													
1,1-Dichloroethane	ug/L	70	0.75 U	0.75 U	0.75 U	1	0.92	0.0005 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	1.2	1.2	0.75 U
Benzene	ug/L	5	0.5 U	0.5 U	0.5 U	0.78	1.4	0.5 U	0.5 U	0.5 U	1.5	0.5 U	0.74	0.5 U	1.2	1.5
Chlorobenzene	ug/L	100	0.5 U	0.5 U	0.5 U	0.98	2	0.5 U	0.5 U	0.5 U	0.57	0.5 U	0.5 U	0.56	0.98	0.5 U
Chloroethane	ug/L	1	1 U	1 U	1 U	1.9	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.8	1.8	1 U
cis-1,2-Dichloroethene	ug/L	70	0.5 U	0.5 U	0.5 U	2.4	2.5	0.5 U	0.5 U	0.5 U	1.7	0.5 U	0.81	2	2.5	0.5 U
Ethyl ether	ug/L	1000	2.5 U	2.5 U	2.5 U	16	17	2.5 U	2.5 U	3.8	16	2.5 U	0.011	18	16	2.5 U
Tetrahydrofuran	ug/L	5000	10 U	10 U	10 U	10 U	150	10 U	10 U	10 U	10 U	10 U	10 U	11	10 U	190
Toluene	ug/L	1000	10 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	10 U	10 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	>100
Field Readings			SHL-03	SHL-4	SHL-5	SHM96-5B	SHM96-5C	SHL-9	SHL-10	SHM96-10C	SHL-11	SHL-19	SHL-20	SHL-22	SHM96-22B	SHM93-22C[1]
pH		n/a	6.6	6.4	5.8	6.57	6.55	6.46	6.8	7.0	6.4	6.2	6.5	6.5	6.53	7.5
Specific Conductivity	(uS/cm)	n/a	0.02	0.07	0.09	0.52	0.77	0.12	0.03	0.36	0.39	0.14	0.39	0.57	0.56	0.51
Dissolved Oxygen	(mg/L)	n/a	11.01	0.14	0.19	0.17	0.15	0.23	10.95	0.63	0.48	0.97	0.25	0.13	0.12	0.13
Oxidation Reduction Potentia	(mV)	n/a	133.1	61.0	36.0	-75.7	-104.8	-37.6	156.9	155.7	-51.7	23.4	-30.2	-52.9	-111.7	-138.4

NOTES: 1. Water table did not stabilize

Table 4-6
Groundwater Analytical Results
LTMMP - December, 2006 Sampling Event
Shepley's Hill Landfill
Devens, Massachusetts

Analytical Parameter	Units	MCL or ROD Standard	Sample ID													
			SHL-3	SHL-4	SHL-5	SHM96S-B	SHM96-5C	SHL-9	SHL-10	SHM93-10C	SHL-11	SHL-19	SHL-20	SHL-22	SHM96-22B	SHM93-22C
Alkalinity, Total	mg CaCO3/l		11	62	29	330	370	84	16	190	240	89	250	390	310	330
Solids, Total Dissolved	ug/l		25,000	85,000	81,000	380,000	410,000	160,000	20,000	280,000	290,000	130,000	320,000	470,000	350,000	450,000
Solids, Total Suspended	ug/l		5,900	5,000 U	5,000 U	19,000	19,000	5,000 U	5,000 U	9,300	32,000	22,000	8,700	5,000 U	63,000	20,000
			Anions by Ion Chromatography													
Chloride	ug/l		500 U	5,400	1,000	19,000	39,000	6,000	500 U	22,000	24,000	1,300	25,000	26,000	22,000	42,000
Nitrogen, Nitrate	ug/l		210	410	50 U	230	200	100 U	760	100 U	120	110	100 U	100 U	250	50 U
Sulfate	ug/l		2,600	4,000	5,000	4,700	2,700	8,600	2,400	21,000	1,500	15,000	15,000	5,600	3,500	20,000
Cyanide, Total	ug/l	200	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	120	5 U	9	5 U	5 U	5 U
Chemical Oxygen Demand	ug/l		20,000 U	20,000 U	20,000 U	29,000	31,000	24,000	20,000 U	20,000 U	24,000	20,000 U	20,000	22,000	31,000	20,000 U
BOD, 5 day	ug/l		2,000 U	2,000 U	2,000 R	2,000 R	3,200 J	2,000 R	2,000 R	2,000 U	6,900	2,000 U	2,000 U	2,000 R	4,200 R	2,000 U
Total Organic Carbon	ug/l		500 U	1,400	6,300	3,700	6,300	7,700	500 U	690	3,800	980	2,400	3,400	4,700	2,300
Hardness	ug/l		12,000	55,000	31,000	240,000	260,000	79,000	18,000	190,000	130,000	74,000	190,000	320,000	200,000	330,000
			Total Metals by MCP 6000/7000 series													
Aluminum, Total	ug/l	6,870	100 U	100 U	190	100 U	100 U	100 U	100 U	160	100 U	100 U	100 U	100 U	100 U	100 U
Arsenic, Total	ug/l	10	5 U	5 U	8	2,980	24	51	5 U	10	668	142	361	115	3,100	73
Barium, Total	ug/l	200	10 U	30	10 U	50	64	16	10 U	10 U	79	21	109	12	76	93
Cadmium, Total	ug/l	5	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Chromium, Total	ug/l	100	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Copper, Total	ug/l	10,000	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Iron, Total	ug/l	9,100	50 U	160	2,200	31,000	28,000	11,000	50 U	210	58,000	13,000	7,200	540	74,000	2,700
Lead, Total	ug/l	15	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Manganese	ug/l	1715	10 U	198	372	9,460	5,420	580	10 U	70	2,620	1,320	6,370	3,520	2,070	702
Mercury, Total	ug/l	2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel, Total	ug/l	100	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U	25 U
Selenium, Total	ug/l	50	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Silver, Total	ug/l	7	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U	7 U
Sodium, Total	ug/l	20,000	2,000 U	4,300	2,000 U	28,000	36,000	3,700	2,000 U	8,900	25,000	2,000 U	29,000	39,000	30,000	24,000
Zinc, Total	ug/l	900	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U
			Volatile Organics by MCP 8260B													
1,1-Dichloroethane	ug/l	70	0.75 U	0.75 U	0.75 U	0.88	0.92	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	1.1	1.2	1.5
Benzene	ug/l	5	0.5 U	0.5 U	0.5 U	0.63	0.5 U	0.5 U	0.5 U	0.5 U	1.5	0.5 U	0.5 U	0.5 U	1.1	0.5 U
Chlorobenzene	ug/l	100	0.5 U	0.5 U	0.5 U	0.8	1.7	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.9	0.5 U
cis-1,2-Dichloroethene	ug/l	70	0.5 U	0.5 U	0.5 U	2.1	2.2	0.5 U	0.5 U	0.5 U	1.4	0.5 U	0.68	2	2.3	1.5
Ethyl ether	ug/l		2.5 U	2.7	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	6.1	14	2.5 U	9.7	18	17	20
Methyl tert butyl ether	ug/l	70	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1.1
Tetrahydrofuran	ug/l		10 U	10 U	10 U	10 U	20	10 U	10 U	10 U	10 U	10 U	10 U	37	10 U	10 U
Field Readings			SHL-03	SHL-4	SHL-5	SHM96-5B	SHM96-5C	SHL-9	SHL-10	SHM96-10C	SHL-11	SHL-19	SHL-20	SHL-22	SHM96-22B	SHM93-22C[1]
pH			6.8	5.6	6.3	7.0	6.9	6.8	6.5	7.5	6.4	6.3	6.5	6.9	6.9	7.5
Specific Conductivity	(uS/cm)		0.02	0.20	0.11	0.75	0.96	0.23	0.04	0.43	0.59	0.25	0.53	0.76	0.76	0.75
Dissolved Oxygen	(mg/L)		9.53	--	1.83	1.56	1.74	0.68	9.93	0.43	3.30	0.29	0.28	0.70	0.10	2.50
Oxidation Reduction Potential	(mV)		121.0	74.0	-136.8	-77.4	-81.6	-18.2	175.0	28.0	-74.0	2.0	-38.0	-47.6	-22.6	-162.0

NOTES:

1. Water table did not stabilize

Table 4-7
Groundwater (Laboratory) Analytical Results
PMP - April, June, September, and December Sampling Events
Shepley's Hill Landfill
Devens, Massachusetts

DOWNGRADIENT - MOLUMCO ROAD

SHM-05-40X

	MCL or ROD Std.	Units	B33HM0540XW 11-APR-06 L0605067-15	Qual	B43HM0540XW 08-JUN-06 L0608066-06	Qual	B53HM0540XW 20-SEP-06 L0613556-05	Qual	B63HM05-40XW 06-DEC-06 L0617627-08	Qual
Turbidity		NTU	160		240		250		170	
Alkalinity, Total		mg CaCO3/L	170		140		140		250	
Chloride		ug/l	6,300		9,300		7,500		12,000	
Nitrogen, Nitrate		ug/l	150		100	U	140		250	
Sulfate		ug/l	10,000	U	10,000	U	3,000		3,200	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	3,610		3,420		3,510		4,070	
Calcium, Total		ug/l	30,000		26,000		28,000		53,000	
Iron, Total	9,100	ug/l	48,000		42,000		44,000		66,000	
Magnesium, Total		ug/l	4,400		3,900		4,200		8,600	
Manganese, Total	1715	ug/l	1,100		940		1,000		1,430	
Potassium, Total		ug/l	6,400		5,500		5,500		7,300	
Sodium, Total	20,000	ug/l	11,000		12,000		11,000		19,000	
Dissolved Gases by GC										
Ethane		ug/l							5	U
Methane		ug/l							5,230	

SHM-05-39A

	MCL or ROD Std.	Units	B33HM0539AW 11-APR-06 L0605067-14	Qual	B43HM0539AW 12-JUN-06 L0608215-01	Qual	B53HM0539AW 20-SEP-06 L0613556-06	Qual	B63HM0539AW 06-DEC-06 L0617627-07	Qual
Turbidity		NTU	120		350		270		120	
Alkalinity, Total		mg CaCO3/L	300		320		260		250	
Chloride		ug/l	15,000		10,000		8,800		13,000	U
Nitrogen, Nitrate		ug/l	320		100		190		260	
Sulfate		ug/l	10,000	U	10,000	U	1,000	U	1,000	U
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	289		288		270		248	
Calcium, Total		ug/l	48,000		55,000		45,000		48,000	
Iron, Total	9,100	ug/l	86,000		90,000		71,000		77,000	
Magnesium, Total		ug/l	6,200		7,000		6,000		6,700	
Manganese, Total	1715	ug/l	2,000		2,300		2,000		2,170	
Potassium, Total		ug/l	14,000		14,000		11,000		12,000	
Sodium, Total	20,000	ug/l	20,000		18,000		12,000		15,000	
Dissolved Gases by GC										
Ethane		ug/l							0.5	U
Methane		ug/l							4,250	

SHM-05-39B[1]

	MCL or ROD Std.	Units	B33HM0539BW 11-APR-06 L0605298-08	Qual	B43HM0539BW 13-JUN-06 L0608216-07	Qual	B53HM0539BW 25-SEP-06 L0613730-02	Qual	B63HM0539BW 12-DEC-06 L0617995-03	Qual
Turbidity		NTU	880	J	1,200		530	J	140	
Alkalinity, Total		mg CaCO3/L	460		450		450		400	
Chloride		ug/l	56,000		51,000		46,000	J	45,000	
Nitrogen, Nitrate		ug/l	100	U	100	U	100	U	100	U
Sulfate		ug/l	10,000	U	10,000	U	1,100		1,700	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	590		634		415		412	
Calcium, Total		ug/l	120,000		120,000		120,000		100,000	
Iron, Total	9,100	ug/l	76,000		100,000		36,000		26,000	
Magnesium, Total		ug/l	32,000		38,000		26,000		18,000	
Manganese, Total	1715	ug/l	8,200		8,800		7,600		6,420	
Potassium, Total		ug/l	20,000		25,000		15,000		10,000	
Sodium, Total	20,000	ug/l	48,000		48,000		43,000		40,000	
Dissolved Gases by GC										
Ethane		ug/l								
Methane		ug/l								

SHP-99-31A

	MCL or ROD Std.	Units	B33HM9931AW 11-APR-06 L0605067-18	Qual	B43HM9931AW 12-JUN-06 L0608216-04	Qual	B53HM9931AW 20-SEP-06 L0613556-02	Qual	B63HM9931AW 07-DEC-06 L0617726-08	Qual
Turbidity		NTU	0.63		0.60		0.69		6.50	
Alkalinity, Total		mg CaCO3/L	57		54		53		53	
Chloride		ug/l	10,000		7,600		14,000		7,700	
Nitrogen, Nitrate		ug/l	100	U	100	U	100		100	U
Sulfate		ug/l	10,000	U	10,000	U	6,700		4,800	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	9		12		23		16	
Calcium, Total		ug/l	14,000		15,000		15,000		16,000	
Iron, Total	9,100	ug/l	8,800		6,900		9,600		7,500	
Magnesium, Total		ug/l	1,000		1,000		960		840	
Manganese, Total	1715	ug/l	540		440		940		543	
Potassium, Total		ug/l	2,500	U	2,500	U	2,500	U	2,500	U
Sodium, Total	20,000	ug/l	8,400		8,200		11,000		9,400	
Dissolved Gases by GC										
Ethane		ug/l							1.00	U
Methane		ug/l							300	

SHP-99-31B

	MCL or ROD Std.	Units	B33HM9931BW 11-APR-06 L0605067-19	Qual	B43HM9931BW 12-JUN-06 L0608216-03	Qual	B53HM9931BW 20-SEP-06 L0613556-04	Qual	B63HM99-31BW 07-DEC-06 L0617726-07	Qual
Turbidity		NTU	1.10		1.70		3.50		0.56	
Alkalinity, Total		mg CaCO3/L	100		120		150		130	
Chloride		ug/l	6,600		8,900		10,000		8,200	
Nitrogen, Nitrate		ug/l	110		100	U	120		100	U
Sulfate		ug/l	10,000	U	10,000	U	5,800		6,100	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	56		53		74		72	
Calcium, Total		ug/l	22,000		27,000		34,000		29,000	
Iron, Total	9,100	ug/l	12,000		17,000		20,000		16,000	
Magnesium, Total		ug/l	2,700		3,400		4,000		3,200	
Manganese, Total	1715	ug/l	800		900		1,400		1,210	
Potassium, Total		ug/l	5,100		6,000		6,500		5,100	
Sodium, Total	20,000	ug/l	8,500		11,000		11,000		8,700	
Dissolved Gases by GC										
Ethane		ug/l							1.00	U
Methane		ug/l							1,090	

SHP-99-31C

	MCL or ROD Std.	Units	B33HM9931CW 11-APR-06 L0605067-17	Qual	B43HM9931CW 12-JUN-06 L0608216-02	Qual	B53HM9931CW 20-SEP-06 L0613556-03	Qual	B63HM9931CW 07-DEC-06 L0617726-06	Qual
Turbidity		NTU	130		220		320		90	
Alkalinity, Total		mg CaCO3/L	370		360		420		470	
Chloride		ug/l	45,000		43,000		40,000		39,000	
Nitrogen, Nitrate		ug/l	210		100	U	140		100	U
Sulfate		ug/l	10,000	U	10,000	U	2,400		1,600	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	270		273		305		301	
Calcium, Total		ug/l	82,000		81,000		95,000		100,000	
Iron, Total	9,100	ug/l	45,000		46,000		54,000		57,000	
Magnesium, Total		ug/l	13,000		13,000		16,000		17,000	
Manganese, Total	1715	ug/l	3,700		3,700		4,000		4,680	
Potassium, Total		ug/l	18,000		17,000		17,000		17,000	
Sodium, Total	20,000	ug/l	42,000		40,000		41,000		41,000	
Dissolved Gases by GC										
Ethane									2.5	U
Methane									945	

SHX-99-32X

	MCL or ROD Std.	Units	B33HM9932XW 11-APR-06 L0605067-16	Qual	B43HM9932XW 08-JUN-06 L0608066-07	Qual	B53HM9932XW 20-SEP-06 L0613556-01	Qual	B63HM99-32XW 07-DEC-06 L0617726-09	Qual
Turbidity		NTU	170		320		350		80	
Alkalinity, Total		mg CaCO3/L	400		410		410		370	
Chloride		ug/l	44,000		49,000		44,000		38,000	
Nitrogen, Nitrate		ug/l	330		100	U	200		180	
Sulfate		ug/l	10,000	U	10,000	U	3,500		3,100	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	168		186		202		176	
Calcium, Total		ug/l	90,000		90,000		88,000		82,000	
Iron, Total	9,100	ug/l	56,000		67,000		74,000		59,000	
Magnesium, Total		ug/l	14,000		14,000		14,000		12,000	
Manganese, Total	1715	ug/l	4,700		4,100		4,000		3,150	
Potassium, Total		ug/l	14,000		14,000		14,000		13,000	
Sodium, Total	20,000	ug/l	42,000		42,000		37,000		35,000	
Dissolved Gases by GC										
Ethane									0.5	U
Methane									61.1	

Notes: 1. Water table did not stabilize

DOWNGRADIENT - WOODS

SHM-05-41A

	MCL or ROD Std.	Units	B33HM0541AW 11-APR-06 L0605067-13	Qual	B43HM0541AW 08-JUN-06 L0608066-03	Qual	B53HM0541AW 20-SEP-06 L0613556-07	Qual	SHM05-41A 06-DEC-06 L0617627-04	Qual
Turbidity		NTU	7.6		2.8		1.3		0.52	
Alkalinity, Total		mg CaCO3/L	42		48		38		39	
Chloride		ug/l	4,100		9,600		6,000		4,500	
Nitrogen, Nitrate		ug/l	100	U	100	U	100	U	100	U
Sulfate		ug/l	10,000	U	10,000	U	14,000		17,000	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	54		52		41		36	
Calcium, Total		ug/l	10,000		12,000		11,000		11,000	
Iron, Total	9,100	ug/l	8,600		10,000		7,800		5,600	
Magnesium, Total		ug/l	1,800		2,300		2,100		2,200	
Manganese, Total	1715	ug/l	970		1,200		940		663	
Potassium, Total		ug/l	2,500	U	2,500	U	2,500	U	2,500	U
Sodium, Total	20,000	ug/l	2,000	U	2,000	U	2,000	U	3,700	
Dissolved Gases by GC										
Ethane									0.5	U
Methane									3.77	

SHM-05-41B

	MCL or ROD Std.	Units	B33HM0541BW 11-APR-06 L0605067-12	Qual	B43HM0541BW 08-JUN-06 L0608066-05	Qual	B53HM0541BW 20-SEP-06 L0613556-08	Qual	B63HM0541BW 06-DEC-06 L0617627-05	Qual
Turbidity		NTU	150		330		270		100	
Alkalinity, Total		mg CaCO3/L	350		310		340		330	
Chloride		ug/l	13,000		12,000		11,000		11,000	U
Nitrogen, Nitrate		ug/l	160		100	U	100	U	160	
Sulfate		ug/l	10,000	U	10,000	U	1,000	U	1,000	U
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	2,420		2,720		2,730		2,280	
Calcium, Total		ug/l	49,000		47,000		56,000		54,000	
Iron, Total	9,100	ug/l	100,000		100,000		100,000		94,000	
Magnesium, Total		ug/l	7,100		6,800		7,300		6,600	
Manganese, Total	1715	ug/l	1,600		1,600		1,900		1,880	
Potassium, Total		ug/l	14,000		14,000		14,000		14,000	
Sodium, Total	20,000	ug/l	16,000		16,000		16,000		16,000	
Dissolved Gases by GC										
Ethane									5	U
Methane									7,910	

SHM-05-41C

	MCL or ROD Std.	Units	B33HM0541CW 11-APR-06 L0605298-07	Qual	B43HM0541CW 08-JUN-06 L0608066-04	Qual	B53HM0541CW 20-SEP-06 L0613556-09	Qual	B63HM0541CW 06-DEC-06 L0617627-06	Qual
Turbidity		NTU	270		220		190		170	
Alkalinity, Total		mg CaCO3/L	350		340		340		350	
Chloride		ug/l	42,000		40,000		35,000		36,000	
Nitrogen, Nitrate		ug/l	100	U	100	U	140		120	
Sulfate		ug/l	10,000	U	10,000	U	1,000	U	1,000	U
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	626		614		640		666	
Calcium, Total		ug/l	93,000		88,000		95,000		97,000	
Iron, Total	9,100	ug/l	18,000		18,000		18,000		19,000	
Magnesium, Total		ug/l	13,000		12,000		13,000		13,000	
Manganese, Total	1715	ug/l	3,000		2,900		3,200		3,080	
Potassium, Total		ug/l	4,400		4,200		4,300		4,300	
Sodium, Total	20,000	ug/l	37,000		38,000		35,000		38,000	
Dissolved Gases by GC										
Ethane									0.5	U
Methane									476	

SHM-05-42A

	MCL or ROD Std.	Units	B33HM0542AW 14-APR-06 L0605298-11	Qual	B43HM0542AW 09-JUN-06 L0608076-06	Qual	B53HM0542AW 21-SEP-06 L0613556-21	Qual	B63HM0542AW 07-DEC-06 L0617726-05	Qual
Turbidity		NTU	2.1		0.63		1.4		2.5	
Alkalinity, Total		mg CaCO3/L	18		16		15		16	
Chloride		ug/l	1,000	U	1,300		1,800		2,100	U
Nitrogen, Nitrate		ug/l	100	U	100	U	100	U	100	U
Sulfate		ug/l	10,000	U	10,000	U	7,400		8,700	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	5	U	5	U	5	U	5	U
Calcium, Total		ug/l	6,100		5,400		5,400		5,900	
Iron, Total	9,100	ug/l	320		170		220		310	
Magnesium, Total		ug/l	1,200		1,100		1,200		1,200	
Manganese, Total	1715	ug/l	50		30		20		40	
Potassium, Total		ug/l	2,500	U	2,500	U	2,500	U	2,500	U
Sodium, Total	20,000	ug/l	2,000	U	2,000	U	2,000	U	2,000	U
Dissolved Gases by GC										
Ethane									5	U
Methane									1,510	

SHM-05-42B

	MCL or ROD Std.	Units	B33HM0542BW 14-APR-06 L0605298-12	Qual	B43HM0542BW 09-JUN-06 L0608076-07	Qual	B53HM0542BW 21-SEP-06 L0613556-22	Qual	B63HM0542BW 07-DEC-06 L0617726-03	Qual
Turbidity		NTU	180		180		230		180	
Alkalinity, Total		mg CaCO3/L	370		280		320		360	
Chloride		ug/l	28,000		22,000		21,000		30,000	
Nitrogen, Nitrate		ug/l	290		100	U	100	U	100	U
Sulfate		ug/l	10,000	U	10,000	U	10,000	U	1,000	U
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	266		241		276		296	
Calcium, Total		ug/l	58,000		50,000		57,000		67,000	
Iron, Total	9,100	ug/l	73,000		63,000		71,000		82,000	
Magnesium, Total		ug/l	9,700		8,400		9,600		11,000	
Manganese, Total	1715	ug/l	1,600		1,400		1,500		1,560	
Potassium, Total		ug/l	20,000		18,000		18,000		20,000	
Sodium, Total	20,000	ug/l	35,000		31,000		28,000		33,000	
Dissolved Gases by GC										
Ethane									0.5	U
Methane									0.813	

NEARFIELD AREA

SHL-23

	MCL or ROD Std.	Units	B300SHL23W 14-APR-06 L0605298-13	Qual	B400SHL23W 12-JUN-06 L0608216-06	Qual	B500SHL23W 25-SEP-06 L0613730-03	Qual	B600SHL23W 12-DEC-06 L0617995-01	Qual
Turbidity		NTU	2.5		0.43		5.3	J	0.42	
Alkalinity, Total		CaCO3/L	4.3		3		3.3		3.6	
Chloride		ug/l	1,200		1,100		2,000	J	2,800	
Nitrogen, Nitrate		ug/l	240		130		290		210	
Sulfate		ug/l	10,000	U	10,000	U	6,300		5,000	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	5	U	5	U	5	U	5	U
Calcium, Total		ug/l	2,700		1,800		2,800		2,500	
Iron, Total	9,100	ug/l	120		70		340		50	U
Magnesium, Total		ug/l	220		180		280		200	
Manganese, Total	1715	ug/l	20		20		30		15	
Potassium, Total		ug/l	2,500	U	2,500	U	2,500	U	2,500	U
Sodium, Total	20,000	ug/l	2,000	U	2,000	U	2,000	U	2,000	U

SHL-9

	MCL or ROD Std.	Units	B300SHL9W 10-APR-06 L0605067-02	Qual	B400SHL9W 09-JUN-06 L0608076-04	Qual	B500SHL09W 21-SEP-06 L0613556-20	Qual	B600SHL09W 06-DEC-06 L0617628-04	Qual
Turbidity		NTU	2.6		6.1		1.2		1.1	
Alkalinity, Total		CaCO3/L	75		62		82		84	
Chloride		ug/l	10,000		5,000		6,500		6,000	
Nitrogen, Nitrate		ug/l	100	U	100	U	100	U	100	U
Sulfate		ug/l	10,000	U	10,000	U	5,000		8,600	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	21		21		46		51	
Calcium, Total		ug/l	25,000		22,000		28,000		29,000	
Iron, Total	9,100	ug/l	8,000		7,500		11,000		11,000	
Magnesium, Total		ug/l	1,700		1,500		1,800		1,900	
Manganese, Total	1715	ug/l	410		380		520		580	
Potassium, Total		ug/l	2,500	U	2,500	U	2,600		2,500	U
Sodium, Total	20,000	ug/l	3,800		2,900		3,300		3,700	

SHL-22

	MCL or ROD Std.	Units	B300SHL22W 10-APR-06 L0605067-03	Qual	B400SHL22W 09-JUN-06 L0608076-02	Qual	B500SHL22W 21-SEP-06 L0613556-17	Qual	B600SHL22W 06-DEC-06 L0617628-06	Qual
Turbidity		NTU	3.1		1.2		1.4	J	1.6	
Alkalinity, Total		CaCO3/L	400		380		390		390	
Chloride		ug/l	30,000		29,000		25,000		26,000	
Nitrogen, Nitrate		ug/l	100	U	100	U	100	U	100	U
Sulfate		ug/l	10,000	U	10,000	U	5,700		5,600	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	171		167		109		115	
Calcium, Total		ug/l	110,000		100,000		100,000		110,000	
Iron, Total	9,100	ug/l	710		670		680		540	
Magnesium, Total		ug/l	14,000		14,000		14,000		15,000	
Manganese, Total	1715	ug/l	2,800		2,900		3,100		3,520	
Potassium, Total		ug/l	6,400		5,800		5,700		5,800	
Sodium, Total	20,000	ug/l	39,000		39,000		34,000		39,000	

SHL-22B

	MCL or ROD Std.	Units	B33HM9622BW 10-APR-06 L0605067-01	Qual	B43HM9622BW 09-JUN-06 L0608076-03	Qual	B53HM9622BW 21-SEP-06 L0613556-18	Qual	B63HM9622BW 06-DEC-06 L0617628-05	Qual
Turbidity		NTU	430		150		190		200	
Alkalinity, Total		CaCO3/L	310		290		310		310	
Chloride		ug/l	21,000		22,000		19,000		22,000	
Nitrogen, Nitrate		ug/l	160		100	U	170		250	
Sulfate		ug/l	10,000	U	10,000	U	3,600		3,500	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	3,690		3,440		3,110		3,100	
Calcium, Total		ug/l	61,000		58,000		64,000		67,000	
Iron, Total	9,100	ug/l	66,000		67,000		64,000		74,000	
Magnesium, Total		ug/l	11,000		10,000		11,000		12,000	
Manganese, Total	1715	ug/l	2,200		2,100		2,600		2,070	
Potassium, Total		ug/l	15,000		16,000		14,000		16,000	
Sodium, Total	20,000	ug/l	30,000		29,000		26,000		30,000	

SHM-96-5B

	MCL or ROD Std.	Units	B33HM965BW 10-APR-06 L0605067-05	Qual	B43HM965BW 08-JUN-06 L0608066-12	Qual	B53HM965BW 20-SEP-06 L0613556-10	Qual	B63HM965BW 05-DEC-06 L0617628-02	Qual
Turbidity		NTU	79		84		56		63	
Alkalinity, Total		CaCO3/L	330		310		330		330	
Chloride		ug/l	22,000		21,000		19,000		19,000	
Nitrogen, Nitrate		ug/l	120		100	U	100		230	
Sulfate		ug/l	10,000	U	10,000	U	4,800		4,700	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	2,110		2,760		1,570		2,980	
Calcium, Total		ug/l	76,000		68,000		79,000		78,000	
Iron, Total	9,100	ug/l	20,000		27,000		15,000		31,000	
Magnesium, Total		ug/l	12,000		11,000		13,000		13,000	
Manganese, Total	1715	ug/l	9,700		8,500		10,000		9,460	
Potassium, Total		ug/l	11,000		11,000		9,800		10,000	
Sodium, Total	20,000	ug/l	31,000		28,000		27,000		29,000	

SHM-96-5C

	MCL or ROD Std.	Units	B33HM965CW 10-APR-06 L0605067-04	Qual	B43HM965CW 08-JUN-06 L0608066-11	Qual	B53HM965CW 20-SEP-06 L0613556-11	Qual	B63HM965CW 05-DEC-06 L0617628-01	Qual
Turbidity		NTU	550		450		250		67	
Alkalinity, Total		CaCO3/	410		370		370		370	
Chloride		ug/l	46,000		43,000		37,000		39,000	
Nitrogen, Nitrate		ug/l	210		110		270		200	
Sulfate		ug/l	10,000	U	10,000	U	2,300		2,700	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	47		51		37		24	
Calcium, Total		ug/l	79,000		77,000		80,000		88,000	
Iron, Total	9,100	ug/l	94,000		89,000		62,000		28,000	
Magnesium, Total		ug/l	11,000		11,000		11,000		12,000	
Manganese, Total	1715	ug/l	4,600		4,900		4,900		5,420	
Potassium, Total		ug/l	18,000		16,000		16,000		17,000	
Sodium, Total	20,000	ug/l	38,000		38,000		32,000		36,000	

SHL-8S

	MCL or ROD Std.	Units	B300SHL8SW 10-APR-06 L0605067-06	Qual	B400SHL8SW 08-JUN-06 L0608066-01	Qual	B500SHL8SW 21-SEP-06 L0613556-15	Qual	B600SHL8SW 05-DEC-06 L0617627-01	Qual
Turbidity		NTU	1.20	J	0.75		0.65		0.31	
Alkalinity, Total		CaCO3/	21		19		21		21	
Chloride		ug/l	5,300		5,300		4,700		5,800	
Nitrogen, Nitrate		ug/l	170		160		240		140	
Sulfate		ug/l	10,000	U	10,000	U	1,000	U	1,000	U
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	5	U	5	U	5	U	5	U
Calcium, Total		ug/l	3,800		3,800		4,000		3,900	
Iron, Total	9,100	ug/l	60		70		50	U	50	U
Magnesium, Total		ug/l	660		680		690		670	
Manganese, Total	1715	ug/l	380		150		110		61	
Potassium, Total		ug/l	2,500	U	2,500	U	2,500	U	2,500	U
Sodium, Total	20,000	ug/l	5,600		5,700		6,100		5,900	

SHL-8D

	MCL or ROD Std.	Units	B300SHL8DW 11-APR-06 L0605067-11	Qual	B400SHL8DW 08-JUN-06 L0608066-02	Qual	B500SHL8DW 21-SEP-06 L0613556-16	Qual	B600SHL8DW 05-DEC-06 L0617627-02	Qual
Turbidity		NTU	0.31		0.2	U	0.23		0.2	U
Alkalinity, Total		CaCO3/	58		60		62		55	
Chloride		ug/l	5800		6,200		8,200		6,400	
Nitrogen, Nitrate		ug/l	720		680		420		510	
Sulfate		ug/l	10000	U	10,000	U	5,600		6,400	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	5	U	5	U	5	U	5	U
Calcium, Total		ug/l	19,000		18,000		20,000		17,000	
Iron, Total	9,100	ug/l	50	U	50		80		50	U
Magnesium, Total		ug/l	2,300		2,500		2,500		2,500	
Manganese, Total	1715	ug/l	30		20		880		207	
Potassium, Total		ug/l	2,500	U	2,500	U	2,500	U	2,500	U
Sodium, Total	20,000	ug/l	4,900		6,100		7,600		8,000	

SHL-21

	MCL or ROD Std.	Units	B300SHL21W 14-APR-06 L0605298-14	Qual	09-JUN-06 Not Sampled	Qual	B500SHL21W 25-SEP-06 L0613730-04	Qual	B600SHL21W 12-DEC-06 L0617995-02	Qual
Turbidity		NTU	1.8				0.85	J	0.63	
Alkalinity, Total		CaCO3/	20				23		24	
Chloride		ug/l	1,000	U			2,000	J	2,500	
Nitrogen, Nitrate		ug/l	100	U			100	U	100	
Sulfate		ug/l	10,000	U			9,500		9,400	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	5	U			5	U	5	U
Calcium, Total		ug/l	7,700				8,800		9,400	
Iron, Total	9,100	ug/l	80				240		60	
Magnesium, Total		ug/l	740				990		820	U
Manganese, Total	1715	ug/l	10	U			10	U	10	
Potassium, Total		ug/l	2,500	U			2,500	U	2,500	U
Sodium, Total	20,000	ug/l	2,400				2,500		3,200	

POND AREA

PSP-01

	MCL or ROD Std.	Units	B300PSP01W 10-APR-06 L0605067-07	Qual	B400PSP1W 06-JUN-06 L0607908-03	Qual	B500PSP1W 21-SEP-06 L0613556-13	Qual	B600PSP1W 07-DEC-06 L0617726-01	Qual
Turbidity		NTU	1.5		1.2		7.2		1.3	
Alkalinity, Total		mg CaCO3/L	25		18		34		18	
Chloride		ug/l	65,000		38,000		43,000		34,000	
Nitrogen, Nitrate		ug/l	110		100	U	100	U	120	
Sulfate		ug/l	10,000	U	10,000	U	7,200		8,700	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	5	U	6		10		5	U
Calcium, Total		ug/l	12,000		7,600		13,000		8,500	
Iron, Total	9,100	ug/l	360		630		1,600		390	
Magnesium, Total		ug/l	2,300		1,600		2,300		1,700	
Manganese, Total	1715	ug/l	130		30		570		30	
Potassium, Total		ug/l	2,500		2,500	U	2,500	U	2,500	U
Sodium, Total	20,000	ug/l	35,000		24,000		25,000		20,000	

SHL-13

	MCL or ROD Std.	Units	B300SHL13W 10-APR-06 L0605067-08	Qual	B400SHL13W 06-JUN-06 L0607908-04	Qual	B500SHL13W 21-SEP-06 L0613556-14	Qual	B600SHL13W 05-DEC-06 L0617627-03	Qual
Turbidity		NTU	0.2	U	0.56		0.2		0.65	
Alkalinity, Total		mg CaCO3/L	31		25		26		24	
Chloride		ug/l	56,000		56,000		40,000		53,000	
Nitrogen, Nitrate		ug/l	150		100	U	100	U	100	U
Sulfate		ug/l	10,000	U	10,000	U	6,500		8,300	U
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	5	U	5	U	5	U	5	U
Calcium, Total		ug/l	9,800		10,000		8,200		10,000	
Iron, Total	9,100	ug/l	50	U	50	U	50	U	70	
Magnesium, Total		ug/l	1,800		2,000		1,500		1,900	
Manganese, Total	1715	ug/l	700		50		650		378	
Potassium, Total		ug/l	2,500	U	2,500	U	2,500	U	2,500	U
Sodium, Total	20,000	ug/l	33,000		36,000		26,000		32,000	

SHP-36X

	MCL or ROD Std.	Units	B33HP0136XW 13-APR-06 L0605298-06	Qual	B43HP0136XW 09-JUN-06 L0608076-01	Qual	B53HP0136XW 21-SEP-06 L0613556-23	Qual	B63HP0136XW 13-DEC-06 L0618106-03	Qual
Turbidity		NTU	0.96		0.58		2.4		1.2	
Alkalinity, Total		mg CaCO3/L	25		21		34		26	
Chloride		ug/l	45,000		15,000		42,000		35,000	
Nitrogen, Nitrate		ug/l	100	U	100	U	100	U	100	U
Sulfate		ug/l	10,000	U	10,000	U	1,100		5,500	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	24		22		30		19	
Calcium, Total		ug/l	12,000		4,400		9,900		9,700	
Iron, Total	9,100	ug/l	6,900		2,700		9,400		5,300	
Magnesium, Total		ug/l	2,400		840		1,800		1,900	
Manganese, Total	1715	ug/l	240		120		210		155	
Potassium, Total		ug/l	2,500	U	2,500	U	2,500	U	2,500	U
Sodium, Total	20,000	ug/l	16,000		15,000		25,000		21,000	

SHP-37X

	MCL or ROD Std.	Units	B33HP0137XW 13-APR-06 L0605298-05	Qual	B43HP0137XW 09-JUN-06 L0608066-10	Qual	B53HP0137XW 21-SEP-06 L0613556-24	Qual	B63HP0137XW 13-DEC-06 L0618106-02	Qual
Turbidity		NTU	0.83		3.1		1.3		2.1	
Alkalinity, Total		mg CaCO3/L	18		14		15		20	
Chloride		ug/l	1,900		1,000	U	2,700		36,000	
Nitrogen, Nitrate		ug/l	100	U	100	U	100	U	100	U
Sulfate		ug/l	10,000	U	10,000	U	9,600		8,000	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	41		49		46		46	
Calcium, Total		ug/l	3,800		4,100		4,300		8,100	
Iron, Total	9,100	ug/l	5,200		8,900		6,100		12,000	
Magnesium, Total		ug/l	700		680		680		1,400	
Manganese, Total	1715	ug/l	310		380		340		638	
Potassium, Total		ug/l	2,500	U	2,500	U	2,500	U	2,500	
Sodium, Total	20,000	ug/l	2,200		2,400		3,200		18,000	

SHP-01-38A

	MCL or ROD Std.	Units	B33HP0138AW 13-APR-06 L0605298-04	Qual	B43HP0138AW 09-JUN-06 L0608066-09	Qual	B53HP0138AW 21-SEP-06 L0613556-25	Qual	B63HP0138AW 13-DEC-06 L0618106-01	Qual
Turbidity		NTU	19		31		14		22	
Alkalinity, Total		mg CaCO3/L	160		96		140		98	
Chloride		ug/l	22,000		15,000		22,000		18,000	
Nitrogen, Nitrate		ug/l	120		110		130		100	U
Sulfate		ug/l	10,000	U	10,000	U	12,000		12,000	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	550		496		681		623	
Calcium, Total		ug/l	22,000		16,000		24,000		18,000	
Iron, Total	9,100	ug/l	26,000		24,000		27,000		24,000	
Magnesium, Total		ug/l	4,300		2,600		4,500		3,200	
Manganese, Total	1715	ug/l	830		650		720		616	
Potassium, Total		ug/l	9,100		8,600		10,000		8,000	
Sodium, Total	20,000	ug/l	16,000		12,000		18,000		13,000	

UPGRADIENT AREA (Landfill and Perimeter)

SHL-15

	MCL or ROD Std.	Units	B300SHL15W 13-APR-06 L0605298-01	Qual	B400SHL15W 06-JUN-06 L0607887-01	Qual	B500SHL15W 25-SEP-06 L0613730-06	Qual	B600SHL15 07-DEC-06 L0617726-02	Qual
Turbidity		NTU	0.54		0.67		0.78	J	7.9	
Alkalinity, Total		mg CaCO3/L	54		43		60		120	
Chloride		ug/l	7,600		6,700		7,100	J	2,400	
Nitrogen, Nitrate		ug/l	190		430		440		100	U
Sulfate		ug/l	18,000		12,000		17,000		1,300	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	18		16		44		93	
Calcium, Total		ug/l	20,000		18,000		20,000		31,000	
Iron, Total	9,100	ug/l	280		890		1,300		18,000	
Magnesium, Total		ug/l	2,800		2,200		2,800		2,800	
Manganese, Total	1715	ug/l	60		130		140		1,880	
Potassium, Total		ug/l	4,700		3,800		4,900		3,800	
Sodium, Total	20,000	ug/l	5,000		4,400		5,900		2,000	U

N5-P1

	MCL or ROD Std.	Units	B300N5P1W 13-APR-06 L0605298-03	Qual	B400N5P1W 06-JUN-06 L0607908-02	Qual	B500N5P1W 25-SEP-06 L0613730-08	Qual	B600N5P1W 12-DEC-06 L0617995-04	Qual
Turbidity		NTU	150		270		37	J	6.6	
Alkalinity, Total		mg CaCO3/L	320		260		300		350	
Chloride		ug/l	20,000		16,000		17,000	J	22,000	
Nitrogen, Nitrate		ug/l	160		100	U	100	U	100	U
Sulfate		ug/l	10,000	U	10,000	U	8,400		8,600	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	4,940		5,970		4,560		1,930	
Calcium, Total		ug/l	72,000		70,000		73,000		96,000	
Iron, Total	9,100	ug/l	30,000		41,000		30,000		9,100	
Magnesium, Total		ug/l	10,000		10,000		10,000		13,000	
Manganese, Total	1715	ug/l	6,100		7,000		6,100		6,690	
Potassium, Total		ug/l	5,900		6,600		6,000		4,900	
Sodium, Total	20,000	ug/l	20,000		21,000		20,000		26,000	

N5-P2

	MCL or ROD Std.	Units	B300N5P2W 13-APR-06 L0605298-02	Qual	B400N5P2W 06-JUN-06 L0607908-01	Qual	B500N5P2W 25-SEP-06 L0613730-07	Qual	B600N5P2W 12-DEC-06 L0617995-05	Qual
Turbidity		NTU	210		290		94	J	69	
Alkalinity, Total		mg CaCO3/L	670		600		640		670	
Chloride		ug/l	19,000		20,000		18,000	J	18,000	
Nitrogen, Nitrate		ug/l	190		140		100	U	100	U
Sulfate		ug/l	10,000	U	10,000	U	1,000	U	1,000	U
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	22		46		22		30	
Calcium, Total		ug/l	130,000		140,000		130,000		140,000	
Iron, Total	9,100	ug/l	65,000		77,000		63,000		67,000	
Magnesium, Total		ug/l	14,000		16,000		15,000		16,000	
Manganese, Total	1715	ug/l	370		470		380		363	
Potassium, Total		ug/l	20,000		23,000		21,000		21,000	
Sodium, Total	20,000	ug/l	22,000		26,000		23,000		24,000	

SHL-10D[1]

	MCL or ROD Std.	Units	B300SHL10DW 14-APR-06 L0605298-15	Qual	B43HM9310DW 13-JUN-06 L0608216-08	Qual	B500SHL10DW 25-SEP-06 L0613730-05	Qual	B600SHL10DW 13-DEC-06 L0618106-04	Qual
Turbidity		NTU	120		61		60	J	32	
Alkalinity, Total		mg CaCO3/L	160		69		51		85	
Chloride		ug/l	25,000		23,000		21,000	J	24,000	
Nitrogen, Nitrate		ug/l	100	U	100	U	2,700		350	
Sulfate		ug/l	28,000		30,000		26,000		23,000	
Total Metals by MCP 6000/7000 series										
Arsenic, Total	10	ug/l	14		22		14		12	
Calcium, Total		ug/l	48,000		43,000		38,000		42,000	
Iron, Total	9,100	ug/l	5,800		3,900		5,100		3,800	
Magnesium, Total		ug/l	1,400		1,300		560		400	
Manganese, Total	1715	ug/l	70		50		60		31	
Potassium, Total		ug/l	6,300		6,200		5,700		6,000	
Sodium, Total	20,000	ug/l	8,900		8,900		7,600		8,700	

Notes: 1. Water table did not stabilize

Table 4-8
In-Situ Water Quality Results
PMP - April, June, September, and December Sampling Events
Shepley's Hill Landfill Performance Monitoring Plan Wells
Devens, Massachusetts

DOWNGRADIENT (MOLUMCO ROAD)

SHM-05-40X

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/4/2005	1318	6.14	0.506	0.64	9.64	-22.9	Profile
8/4/2005	1403	5.57	0.589	0.46	12.2	-65.9	Purge
9/6/2005	1020	6.63	0.672	0.15	9.68	-92.0	Profile
9/21/2005	1502	6.52	0.604	0.27	9.63	-91.7	Profile
3/17/2006	1534	6.64	0.483	0.00	10.65	91.0	Profile
3/24/2006	1454	6.27	0.563	0.78	10.56	-71.8	Profile
4/11/2006	1157	6.65	0.337	0.52	12.70	-130.0	Purge
6/8/2006	1306	6.76	0.306	0.13	11.27	-113.3	Purge
9/20/2006	1215	6.79	0.398	NR	13.04	-164.6	Purge
12/6/2006	1434	6.93	0.625	0.68	9.38	-7.7	Purge

SHM-05-39A

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/4/2005	1203	6.66	0.765	0.39	9.92	-42.5	Profile
8/4/2005	1229	5.39	0.850	0.56	11.87	-37.1	Purge
9/6/2005	1004	6.44	0.922	0.11	9.84	-84.8	Profile
9/21/2005	1435	6.34	0.895	0.26	9.82	-89.8	Profile
3/17/2006	1549	7.04	0.955	0.04	10.59	38.0	Profile
3/24/2006	1628	6.69	1.011	0.20	10.50	8.0	Profile
4/11/2006	1130	6.45	0.589	0.64	11.59	-110.0	Purge
5/16/2006	1306	6.59	0.499	0.10	10.05	-99.1	Profile
6/12/2006	1012	6.35	0.599	0.20	11.48	-81.8	Purge
9/20/2006	1227	6.48	0.638	NR	12.30	-132.2	Purge
12/6/2006	1410	6.68	0.637	0.35	9.99	-26.4	Purge

SHM-05-39B

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/4/2005	1151	6.54	0.886	0.73	10.18	-54.6	Profile
8/4/2005	1235	6.69	0.847	1.34	15.63	-57.8	Purge
9/6/2005	951	6.92	1.009	0.09	10.10	-91.3	Profile
9/21/2005	1452	6.73	0.992	0.18	10.05	-72.9	Profile
3/17/2006	1610	6.90	1.046	0.00	10.17	-110.0	Profile
3/24/2006	1619	6.85	0.894	0.25	10.17	-130.0	Profile
4/11/2006	1330	6.81	0.773	0.57	13.88	-103.0	Purge
5/16/2006	1337	7.01	0.589	0.07	10.16	-98.7	Profile
6/13/2006	843	6.62	0.772	0.93	13.80	-92.9	Purge
9/25/2006	853	7.00	0.935	0.14	13.99	-123.3	Purge
12/12/2006	1353	6.89	0.812	2.2%	13.47	-105.0	Purge

SHP-99-31A

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/3/2005	1251	5.58	0.231	0.44	13.94	122.9	Purge(1)
9/6/2005							Purge(2)
9/21/2005							Purge(2)
3/17/2006	1517	6.26	0.240	0.09	3.49	-38.0	Purge
3/24/2006	1520	6.10	0.384	0.58	4.11	-1.8	Purge
4/11/2006	1341	5.97	0.107	0.39	6.31	14.3	Purge
5/16/2006							Purge(3)
6/12/2006	1208	6.01	0.118	0.16	12.00	-40.5	Purge
9/20/2006	1146	6.06	0.175	NR	14.46	-72.9	Purge
12/7/2006	1455	5.79	0.161	0.17	9.09	50	Purge

(1) Sticking at approximately 4 ft below top of casing.
(2) Unable to profile, probe does not fit down well; NS
(3) Could not sample - approx 10 in. of rain; well under about three feet of water

SHP-99-31B

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/3/2005	1126	6.22	0.298	0.45	9.69	100.9	Profile
8/3/2005	1157	6.19	0.410	0.59	10.86	4.5	Purge
9/6/2005	910	6.32	0.430	0.05	9.62	-140.6	Profile
9/21/2005	1419	6.24	0.380	0.10	9.50	-81.3	Profile
3/17/2006	1459	6.82	0.227	0.00	9.77	-101.0	Profile
3/24/2006	1517	6.08	0.377	0.08	9.81	-33.0	Profile
4/11/2006	1412	6.35	0.173	0.40	9.98	-52.0	Purge
5/16/2006							Profile(1)
6/12/2006	1130	6.35	0.224	0.12	11.40	-85.2	Purge
9/20/2006	1135	6.36	0.363	NR	11.22	-80.5	Purge
12/7/2006	1424	5.92	0.362	0.19	9.79	-18.0	Purge

(1) Could not sample - approx 10 in of rain; well under about three feet of water

SHP-99-31C

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/3/2005	1142	6.55	1.036	0.43	9.82	47.8	Profile
8/3/2005	1240	6.53	1.031	1.03	11.85	-60.6	Purge
9/6/2005	850	6.57	1.050	0.10	9.75	-89.2	Profile
9/21/2005	1359	6.55	1.025	0.13	9.7	-106.6	Profile
3/17/2006	1442	6.63	1.100	0.00	9.88	-97.0	Profile
3/24/2006	1545	6.29	1.092	0.30	9.92	-85.0	Profile
4/11/2006	1318	6.56	0.671	0.57	10.58	-107.0	Purge
5/16/2006							Profile(1)
6/12/2006	1058	6.54	0.661	0.17	10.68	-98.0	Purge
9/20/2006	950	6.68	0.731	NR	11.11	-123.4	Purge
12/7/2006	1415	6.59	1.932	0.41	9.46	-65.2	Purge

(1) Could not sample - approx 10 in of rain; well under about three feet of water

SHX-99-32X

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/5/2005	1305	6.51	0.959	0.85	9.82	-64.9	Profile
8/5/2005	1344	5.58	0.942	0.71	12.06	-69.9	Purge
9/6/2005	759	6.65	1.026	0.21	9.76	-113.0	Profile
9/21/2005	1329	6.61	0.979	0.19	9.72	-129.4	Profile
3/17/2006	1414	6.75	1.006	0.00	9.80	-115.0	Profile
3/24/2006	1457	6.48	1.074	0.30	9.90	-99.0	Profile
4/11/2006	1225	6.55	0.718	0.65	10.74	-104.0	Purge
5/16/2006	1246	6.66	0.677	0.09	9.85	-110.00	Profile
6/8/2006	1334	6.45	0.757	0.16	10.05	-77.70	Purge
9/20/2006	925	6.59	0.749	NR	10.90	-131.50	Purge
12/7/2006	1256	6.31	1.006	0.24	10.02	-74	Purge

DOWNGRADIENT (WOODS)

SHM-05-41A

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/4/2005	911	6.43	0.126	2.26	9.86	-24.6	Profile
8/4/2005	955	6.06	0.125	0.56	12.21	14.0	Purge
9/6/2005	1122	6.46	0.271	0.32	9.73	38.7	Profile
9/21/2005	1239	6.52	0.230	0.21	9.72	-8.1	Profile
3/15/2006	1439	6.20	0.181	2.78	10.03	28.0	Profile
3/24/2006	1141	5.73	0.261	2.71	10.06	72.0	Profile
4/11/2006	1032	6.32	0.090	0.40	9.73	-13.6	Purge
5/17/2006	1422	6.30	0.081	4.48	9.87	75.5	Profile
6/8/2006	1140	6.30	0.116	0.13	10.39	-8.0	Purge
9/20/2006	1343	6.37	0.129	NR	11.91	-67.8	Purge
12/6/2006	1510	6.58	0.146	0.21	9.76	91.3	Purge

SHM-05-41B

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/4/2005	954	6.36	0.704	0.47	10.15	-27.5	Profile
8/4/2005	1105	6.28	0.788	0.86	12.00	-58.2	Purge
9/6/2005	1109	6.37	0.870	0.10	10.08	-86.6	Profile
9/21/2005	1227	6.30	0.870	0.30	10.06	-83.9	Profile
3/15/2006	1407	6.48	0.858	0.42	10.28	-97.0	Profile
3/24/2006	1327	6.22	0.938	0.36	10.32	-91.0	Profile
4/11/2006	953	6.32	0.584	0.66	9.61	-89.4	Purge
5/16/2006	1403	6.49	0.525	0.07	10.19	-88.7	Profile
6/8/2006	1155	6.27	0.589	0.20	10.58	-78.8	Purge
9/20/2006	1319	6.40	0.790	NR	12.66	-127.6	Purge
12/6/2006	1456	6.61	0.751	1.09	9.61	19.9	Purge

SHM-05-41C

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/4/2005	853	6.92	0.786	0.42	10.3	-84.3	Profile
8/4/2005	1039	6.70	0.791	0.53	11.84	-62.0	Purge
9/6/2005	1159	7.16	0.861	0.05	10.22	-156.1	Profile
9/21/2005	1306	7.10	0.822	0.10	10.19	-169.7	Profile
3/15/2006	1518	7.20	0.848	0.02	10.35	-178.0	Profile
3/24/2006	1409	6.93	0.916	0.20	10.40	-143.0	Profile
4/13/2006	1402	6.99	0.595	0.57	11.49	-147.0	Purge
5/16/2006	1437	7.21	0.508	0.06	10.35	-148.6	Profile
6/8/2006	1114	7.01	0.572	0.15	10.65	-141.6	Purge
9/20/2006	1401	7.11	0.764	NR	11.73	-173.6	Purge
12/6/2006	1540	7.20	0.773	0.06	9.75	-44.5	Purge

SHM-05-42A

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/4/2005	1443	5.82	0.067	6.11	11.18	164.0	Purge
9/6/2005							Purge(1)
9/22/2005	1412	5.84	0.160	5.39	10.90	209.5	Purge
3/17/2006	1329	6.35	0.115	0.05	7.96	136.0	Purge
3/24/2006	1409	6.31	0.232	3.81	8.56	78.3	Purge
4/14/2006	919	6.02	0.047	5.26	9.46	120.0	Purge
5/16/2006							(2)
6/9/2006	1230	5.86	0.042	5.07	10.41	142.9	Purge
9/21/2006	1245	6.09	0.050	4.90	10.35	180.3	Purge
12/7/2006	1230	6.38	0.134	4.62	9.10	217.1	Purge

(1) Not sampled
(2) Wetland area flooded

SHM-05-42B

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/4/2005	1450	5.84	1.026	0.48	11.58*	70.1	Purge
9/6/2005							Purge
9/22/2005	1425	6.29	0.575	0.22	10.86	-90.2	Purge
3/17/2006	1345	6.66	0.984	0.00	7.91	-92.0	Purge
3/24/2006	1420	6.45	1.022	0.51	8.70	-90.8	Purge
4/14/2006	946	6.56	0.620	0.59	10.27	-95.0	Purge
5/16/2006							(2)
6/9/2006	1349	6.43	0.557	0.12	10.47	-96.3	Purge
9/21/2006	1305	6.74	0.778	0.16	11.03	-110.2	Purge
12/7/2006	1221	6.28	1.021	0.43	9.59	-77	Purge

(1) Not sampled
(2) Wetland area flooded

NEARFIELD AREA

SHL-23

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/5/2005	1115	4.92	0.032	14.80	8.51	67.6	Profile
8/5/2005	1159	3.91	0.033	12.01	10.49	-18.0	Purge
8/30/2005	1012	5.38	0.175	8.09	8.47	217.1	Profile
9/21/2005	1523	5.85	0.129	10.88	8.63	197.7	Profile
3/15/2006	1325	5.61	0.042	11.05	9.65	167.0	Profile
3/24/2006	1022	5.39	0.245	9.63	9.03	137.2	Profile
4/14/2006	1037	5.40	0.026	11.02	13.22	199.4	Purge
5/17/2006	1400	5.76	0.025	9.20	9.23	193.0	Profile
6/12/2006	1539	5.74	0.021	11.40	11.51	231.4	Purge
9/25/2006	1035	5.56	0.033	11.54	12.70	238.3	Purge
12/12/2006	935	6.63	0.027	97.5%	13.37	209.0	Purge

SHL-9

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/2/2005	855	6.46	0.159	1.91	8.42	-297.5	Profile
8/2/2005	935	6.16	0.155	0.49	9.69	-232.5	Purge
9/7/2005	1026	6.34	0.322	0.14	9.14	-40.5	Profile
9/21/2005	1539	6.40	0.300	0.22	9.50	-36.6	Profile
3/15/2006	1312	6.68	0.170	0.52	8.29	30.0	Profile
3/23/2006	1015	6.32	0.350	0.14	7.33	-38.0	Profile
4/10/2006	947	6.59	0.135	0.49	7.37	-45.0	Purge
5/17/2006	1245	6.62	0.102	2.20	6.92	-30.9	Profile
6/9/2006	1120	6.46	0.122	0.23	9.16	-37.6	Purge
9/21/2006	1107	6.72	0.208	0.15	10.69	-73.3	Purge
12/6/2006	1010	6.76	0.231	0.68	9.68	-18.2	Purge

SHL-22

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/2/2005	836	6.66	0.826	0.47	10.35	-187.8	Profile
8/2/2005	927	6.55	0.786	6.05	11.2	24.8	Purge
9/7/2005	1100	6.69	0.836	0.10	10.23	-11.1	Profile
9/21/2005	1605	6.65	0.858	0.14	10.23	-94.6	Profile
3/15/2006	1123	6.93	0.878	0.89	10.38	-160.0	Profile
3/24/2006	1005	6.61	0.924	0.42	10.45	-73.0	Profile
4/10/2006	1014	6.74	0.553	0.65	9.36	-61.0	Purge
5/17/2006	1246	6.83	0.592	0.06	10.39	-73.9	Profile
6/9/2006	1030	6.50	0.571	0.13	10.71	-52.9	Purge
9/21/2006	1031	6.78	0.738	0.22	10.97	-22.0	Purge
12/6/2006	958	6.92	0.756	0.70	9.29	-47.6	Purge

SHM-96-22B

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/2/2005	1452	6.64	0.816	0.38	10.15	-89.7	Profile
8/2/2005	1529	6.24	0.812	0.36	11.3	-84.3	Purge
9/7/2005	1129	6.75	0.855	0.07	10.08	-137.6	Profile
9/21/2005	1630	6.67	0.852	0.09	10.07	-129.6	Profile
3/15/2006	1217	6.69	0.861	0.84	10.25	-117.0	Profile
3/24/2006	931	6.56	0.906	0.45	10.30	-118.0	Profile
4/10/2006	812	6.79	0.511	0.66	8.58	-107.0	Purge
5/17/2006	1322	6.79	0.590	0.05	10.23	-129.8	Profile
6/9/2006	1057	6.53	0.561	0.12	10.08	-111.7	Purge
9/21/2006	1048	6.77	0.724	0.20	10.63	-129.3	Purge
12/6/2006	1050	6.91	0.761	0.10	9.46	-22.6	Purge

SHM-96-5B

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/2/2005	1321	6.41	0.723	0.44	9.95	-104.8	Profile
8/2/2005	1411	5.31	0.726	0.41	12.58	-78.9	Purge
9/7/2005	1153	6.55	0.758	0.15	9.89	-57.2	Profile
9/22/2005	1253	6.51	0.793	0.11	9.88	-61.9	Profile
3/14/2006	1602	6.60	0.641	0.11	10.03	-62.0	Profile
3/24/2006	829	6.40	0.851	0.45	10.16	-58.0	Profile
4/10/2006	1159	6.57	0.495	0.70	10.58	-54.0	Purge
5/17/2006	1115	6.63	0.522	0.09	10.12	-93.5	Profile
6/8/2006	1445	6.57	0.522	0.17	10.49	-75.7	Purge
9/20/2006	1502	6.53	0.680	NR	12.09	-160.5	Purge
12/5/2006	1540	6.97	0.749	1.56%	8.28	-77.4	Purge

SHM-96-5C

	Time	pH	Cond	DO	Temp	Eh/ORP	
4/10/2006	1121	6.60	0.734	0.88	9.6	-86.0	Purge
5/17/2006	1146	6.77	0.844	0.06	9.98	-197.5	Profile
6/8/2006	1417	6.55	0.769	0.15	10.2	-104.8	Purge
9/20/2006	1524	6.49	0.910	NR	11.42	-186.9	Purge
12/5/2006	1515	6.89	0.963	1.74%	9.20	-81.5	Purge

SHL-8S

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/2/2005	1157	6.14	0.057	0.56	9.58	-9.0	Profile
8/2/2005	1225	6.03	0.056	0.71	10.64	141.2	Purge
9/7/2005	749	6.17	0.199	0.07	9.46	153.5	Profile
9/22/2005	1148	6.20	0.153	0.11	9.48	174.2	Profile
3/17/2006	1240	7.83	0.118	0.000	9.43	83.0	Profile
3/23/2006	1522	6.75	0.071	0.60	9.61	108.4	Profile
4/10/2006	1328	6.25	0.059	2.29	10.13	152.0	Purge
5/16/2006	1533	6.47	0.038	2.40	9.57	142.0	Profile
6/8/2006	951	6.24	0.047	1.26	9.82	206.2	Purge
9/21/2006	848	6.21	0.062	NR	9.95	-182.9(1)	Purge
12/12/2006	1045	6.58	0.089	1.5	9.42	140	Purge

(1) ORP probe problem.

SHL-8D

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/2/2005	1148	6.06	0.183	2.05	9.84	-62.7	Profile
8/2/2005	1230	5.67	0.188	1.90	10.93	-55.4	Purge
9/7/2005	808	6.26	0.278	1.44	9.72	107.4	Profile
9/22/2005	1208	6.12	0.295	1.15	9.73	108.0	Profile
3/17/2006	1229	7.34	0.175	0.00	9.84	106.0	Profile
3/23/2006	1509	6.53	0.113	1.89	9.85	123.7	Profile
4/11/2006	901	6.07	0.103	1.39	9.04	189.0	Purge
5/16/2006		6.32	0.096	0.69	9.82	100.3	Profile
6/8/2006	1015	6.07	0.116	0.82	10.09	145.2	Purge
9/21/2006	914	6.05	0.160	NR	10.14	-266.8(1)	Purge
12/12/2006	1015	6.46	0.189	90.%	8.65	139.9	Purge

(1) ORP probe problem.

SHL-21

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/3/2005	1011	5.40	0.081	4.09	9.64	153.5	Profile
8/3/2005	842	5.54	0.077	8.70	10.85	217.0	Purge
9/7/2005	834	5.78	0.238	1.29	9.4	160.2	Profile
9/22/2005	1133	5.68	0.191	3.17	9.41	168.0	Profile
3/17/2006	1210	6.85	0.088	0.00	9.41	90.0	Profile
3/24/2006	1234	5.42	0.253	3.88	9.42	139.5	Profile
4/14/2006	1145	5.89	0.054	8.61	14.87	153.8	Purge
5/17/2006	1036	5.86	0.065	0.28	9.45	148.0	Profile
9/25/2006	1137	5.97	0.077	7.19	13.67	207.6	Purge
12/12/2006	1110	5.73	0.075	74%	13.31	201	Purge

POND AREA

PSP-01 (pond sample)

	Time	pH	Cond	DO	Temp	Eh/ORP	
9/7/2005	36	6.45	0.404	1.15	20.01	77.9	Grab
9/21/2005	1225	6.49	0.349	1.73	19.4	112.7	Grab
3/23/2006	1210	7.63	0.197	4.88	5.61	163.9	Grab
4/10/2006	1400	7.03	0.204	10.84	12.64	100.5	Grab
5/16/2006	1324	7.19	0.097	9.19	10.36	59.3	Grab
6/6/2006	1520	6.91	0.147	6.52	18.79	84.3	Grab
9/21/2006	751	7.08	0.230	NR	18.63	-184.6(1)	Grab
12/7/2006	1041	6.95	0.375	1.53	4.65	82.8	Grab

(1) ORP probe problem.

SHL-13

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/2/2005	1037	6.18	0.245	0.69	11.3	-153.4	Profile
8/2/2005	1110	5.81	0.244	0.42	13.02	-167.8	Purge
9/7/2005	710	6.33	0.370	0.13	11.10	22.8	Profile
9/22/2005	1222	6.37	0.335	0.17	11.09	59.0	Profile
3/14/2006	1250	7.07	0.317	0.05	11.15	110.0	Profile
3/23/2006	1219	6.67	0.223	0.16	10.73	144.6	Profile
4/10/2006	1300	6.31	0.180	0.40	11.73	103.1	Purge
5/16/2006	1646	6.18	0.090	4.95	9.56	142.0	Profile
6/6/2006	1531	6.35	0.172	0.14	11.84	130.8	Purge
9/21/2006	821	6.49	0.211	NR	11.63	-326.1(1)	Purge
12/5/2006	1145	6.66	0.271	2.62%	10.20	121.1	Purge

(1) ORP probe problem.

SHP-36X

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/3/2005	858	6.32	0.245	0.32	16.02	12.2	Purge
9/22/2005	1119	6.23	0.381	0.77	19.02	-13.7	Purge
3/17/2006	1027	6.83	0.168	0.01	7.90	-61.0	Purge
3/24/2006	1220	6.59	0.303	0.84	7.68	-41.3	Purge
4/13/2006	1209	6.51	0.156	1.58	9.65	-48.0	Purge
5/17/2006	1022	6.74	0.162	1.02	11.25	-38.0	Purge
6/9/2006	921	6.55	0.092	0.81	11.90	-64.1	Purge
9/21/2006	1351	6.61	0.224	0.20	17.28	-41.7	Purge
12/13/2006	1120	6.64	0.194	2.3%	10.82	-47.0	Purge

SHP-37X

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/3/2005	922	6.31	0.077	0.43	14.57	114.8	Purge
9/21/2005	1057	6.17	0.344	0.18	17.41	-28.4	Purge
3/17/2006	1003	7.08	0.085	0.000	7.10	-101.0	Purge
3/24/2006	1206	6.67	0.265	0.18	7.68	-56.6	Purge
4/13/2006	1148	6.83	0.047	0.29	9.53	-93.0	Purge
5/17/2006	1006	7.18	0.044	0.16	10.67	-75.2	Purge
6/9/2006	903	6.68	0.053	0.09	11.11	-106.8	Purge
9/21/2006	1408	6.82	0.069	0.13	15.29	-84.0	Purge
12/13/2006	1100	6.75	0.202	2.3%	10.18	-61.0	Purge

SHP-01-38A

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/1/2005	950	6.21	0.366	0.47	12.84	238.4	Purge
9/21/2005	1039	6.12	0.486	0.26	13.29	-47.7	Purge
3/17/2006	941	6.26	0.409	0.00	8.42	-53.0	Purge (1)
3/24/2006	1150	6.04	0.564	0.38	8.87	-27.6	Purge
4/13/2006	1116	6.22	0.290	0.56	10.16	-53.0	Purge
5/17/2006	948	6.88	0.325	0.24	10.59	-90.6	Purge
6/9/2006	840	6.20	0.225	0.14	11.36	-76.8	Purge
9/21/2006	1426	6.51	0.381	0.17	12.90	-66.0	Purge
12/13/2006	1040	6.81	0.309	2.9%	9.99	-72.0	Purge

(1) DO results questionable

UPGRADIENT AREA

SHL-15

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/1/2005	1322	5.43	0.176	1.28	10.04	-523.8	Profile
8/1/2005	1357	4.89	0.171	0.62	11.86	-473.9	Purge
8/30/2005	1521	5.98	0.308	0.40	10.88	14.6	Profile
9/22/2005	1342	6.06	0.297	0.17	10.76	39.1	Profile
3/17/2006	747	6.34	0.178	0.00	10.77	99.0	Profile
3/24/2006	1050	5.62	0.330	0.76	10.67	112.0	Profile
4/13/2006	916	5.74	0.128	0.58	10.56	40.0	Purge
5/17/2006	858	5.94	0.118	0.28	10.14	-11.5	Profile
6/6/2006	1013	6.00	0.099	0.67	10.63	-30.9	Purge
9/25/2006	1319	6.00	0.187	0.40	13.00	30.1	Purge
12/12/2006	1035	6.24	0.482	0.99	13.14	91.8	

N5-P1

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/5/2005	1017	6.41	0.741	0.78	17.65	-45.4	Purge
9/22/2005	953	5.99	1.404	0.30	12.32	-48.3	Purge
3/17/2006	905	6.89	0.780	0.00	9.20	-86.0	Purge
3/24/2006	1128	6.56	0.877	0.54	10.69	-70.4	Purge
4/13/2006	1022	6.53	0.539	0.72	11.33	-107.8	Purge
5/17/2006	837	6.65	0.504	0.25	11.38	-97.2	Purge
6/6/2006	1327	6.62	0.454	0.19	12.53	-95.2	Purge
9/25/2006	1440	6.61	0.68	0.23	12.63	-121.6	Purge
12/12/2006	1455	6.7	0.72	4.7%	9.9	-71.0	Purge

N5-P2

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/5/2005	1017	3.82	1.348	0.89	13.78	75.8	Purge
9/22/2005	1009	6.30	0.801	0.37	12.86	-30.0	Purge
3/17/2006	846	6.38	1.355	0.00	9.83	-94.0	Purge
3/24/2006	1104	6.11	1.483	1.09	11.26	-81.6	Purge
4/13/2006	1000	6.16	1.009	1.06	11.31	-96.0	Purge
5/17/2006	818	6.31	1.006	0.71	11.59	-101.2	Purge
6/6/2006	1306	6.33	0.936	0.23	13.12	-78.2	Purge
9/25/2006	1420	6.28	1.359	0.33	13.41	-103.5	Purge
12/12/2006	1510	6.2	1.33	2.6%	11.2	-66.0	Purge

SHM-93-10D

	Time	pH	Cond	DO	Temp	Eh/ORP	
8/1/2005	1029	11.02	0.429	1.96	9.14	-312.9	Profile
8/1/2005	1100	9.79	0.422	1.61	14.88	-289.2	Purge
9/6/2005	1321	10.92	0.47	0.67	9.15	-63.1	Profile
9/22/2005	1327	10.43	0.418	0.62	9.44	2.4	Profile
3/17/2006	805	7.98	0.482	0.00	10.59	-152.0	Profile
3/24/2006	1653	7.33	0.675	0.08	10.24	-193.0	Profile
4/14/2006	1308	10.80	0.272	0.76	12.20	-6.0	Purge
5/17/2006	923	9.22	0.189	0.42	10.34	-40.0	Profile
6/13/2006	1105	8.51	0.093	7.24	13.83	60.5	Purge
9/25/2006	1219	10.98	0.337	0.36	12.83	-38.1	Purge
12/13/2006	955	11.44	0.464	1	13.7	-33	Purge

Note
NR – DO probe malfunction, no reading.

Table 4-9
Comparison of Historic Arsenic Concentrations (ug/L)
Shepley's Hill Landfill Compliance Point Wells
Devens, Massachusetts

Sample Date	Monitoring Well ID (group designation)						
	SHL-3 (1)	SHL-4 (2)	SHL-5 (1)	SHM-96-5B (2)	SHM-96-5C (2)	SHL-9 (1)	SHL-10 (2)
Aug-91	**35.0**	**260**	**23.0**	NS	NS	**37.0**	**67.0**
Dec-91	**120**	**140**	**38.0**	NS	NS	**67.0**	**120**
Mar-93	6.5	2.54	**11.4**	NS	NS	**42.4**	**280**
Jun-93	NS	NS	NS	NS	NS	NS	NS
Nov-96	NS	48.8	**12.0**	**1,440**	**71**	**46.9**	3.4 B
May-97	<10	**73.6** J	<10	**3,300** J	**43.2**	**16.1** J	<10
Oct-97	<10	**180**	<10	**2,040**	**43.1**	**25.2**	**209**
May-98	<5	**37.4**	<5	**4,300**	**49.5**	**15.0**	<5
Nov-98	<5.4	**89.1**	**11.5**	**3,080**	**46.8**	**27.2**	<5.4
May-99	2.7 B	**78.2**	5.0 B	**3,490**	**57**	**71.3**	2.7 B
Nov-99	<1.9	**61.3**	6.5	**2,700**	**44.8**	**28.5**	<1.9
May-00	<2.5	**116**	<2.5	**5,110**	**52.2**	**15.0**	<2.5
Nov-00	**17.4**	**91.5**	**13.8**	**2,500**	**40.3**	**31.4**	<4.2
May-01	<4.1	**50.8**	**13.8**	**3,800**	**80.5**	**15.1**	<4.1
Oct-01	<1.5	**66.0**	**14.8**	**1,850**	**41.1**	**28.1**	<1.5
May-02	2.8 B	**47.8** B	**11.9** B	**3,800**	**50.4** B	**144**	4.0 B
Oct-02	<3.2	**66.1**	<3.2	**1,970**	**41.3**	**29**	<3.2
May-03	<4.7	**26.6**	7.3	**3,920**	**55.1**	**13.4**	<4.7
Nov-03	<4.1	**13.4**	4.7 B	**3,380**	**48.3**	**30.6**	<4.1
May-04	<2.6	**27.2**	7.4 B	**3,950**	**47.1**	**19.8**	<2.6
Nov-04	<5.8	**19.5**	6.8 B	**2,110**	**49.5**	**32.2**	<5.8
Jun-05	<4.5	**10.1**	7.0 B	NS	NS	NS	<4.5
Jan-06	NS	<5	<5	**4,130**	**43**	**18.0**	<5
Jun-06	<5	<5	6	**2,760**	**51**	**21**	<5
Dec-06	<5	<5	8	**2,980**	**24**	**51**	<5

Sample Date	Monitoring Well ID (group designation)						
	SHM-93-10C (1)	SHL-11 (2)	SHL-19 (2)	SHL-20 (2)	SHL-22 (1)	SHM-93-22B (2)	SHM-93-22C (1)
Aug-91	NS	**320**	**340**	**98**	**27**	NS	NS
Dec-91	NS	**320**	**710**	**89**	**25**	NS	NS
Mar-93	**21.3**	**340**	**390**	**330**	**32.9**	NS	**68.9**
Jun-93	**18.1**	NS	NS	NS	NS	NS	**49.8**
Nov-96	**12.4**	**332**	**138**	**244**	**24.8**	**324**	**44.6**
May-97	<10	**252** J	<10	<10	<10	**318** J	**40.4**
Oct-97	**10.5**	**366**	**298**	**227**	**34.8**	**352**	<10
May-98	7.5	**346**	**77.5**	**238**	**10.6**	**365**	**31.6**
Nov-98	**10.2**	**376**	**145**	**218**	<5.4	**406**	**51.1**
May-99	**10.8** B	**431**	**156**	**216**	**12.2** B	**707**	**42.8**
Nov-99	8.7	**492**	**176**	**215**	7.3	**1,440**	**33.2**
May-00	5.9 J	**404**	**41.4**	**216**	**14.6**	**1,360**	**34.4**
Nov-00	8.8	**523**	**154**	**172**	**45**	**1,180**	**47.8**
May-01	6.9	**487**	**129**	**186**	**47.6**	**1,540**	**19.7**
Oct-01	10.1	**573**	**183**	**165**	**44.2**	**1,670**	**31.6**
May-02	**11.0** B	**469**	**66.9**	**154**	**55.9** B	**2,040**	**30.5** B
Oct-02	7.1	**648**	**164**	**175**	**77.1**	**159**	**30.1**
May-03	9.8	**498**	**36.1**	**197**	**101**	**2,070**	**21.0**
Nov-03	<5.2	**639**	**83.6**	**194**	**76.4**	**2,500**	**29.8**
May-04	7.2 B	**502**	**75**	**136**	**88.1**	**1,690**	**27.8**
Nov-04	**10.6** B	**617**	**121**	**156**	**65.4**	**2,360**	**34.9**
Jun-05	8.1 B	**524**	**26.3**	**159**	NS	NS	**15.8**
Jan-06	**11.0**	**567**	**156**	**189**	**154**	**3,320**	**23.0**
Jun-06	**12**	**700**	**1,790**	**346**	**167**	**3,440**	**17**
Dec-06	**10**	**668**	**142**	**361**	**115**	**3,100**	**73**

Notes:

Bold Number indicates cleanup level exceedances (MCL cleanup level is 10 ug/L)

B = Value within five times of the greater amount detected in the equipment or preparation blank

LTMP = Long term monitoring plan (sampled semi-annual only)

NS = Not Sampled <5 = Concentration less than the indicated method detection limit

Table 4-10
Comparison of Historic Iron, Manganese, and Sodium Concentrations (ug/L)
Shepley's Hill Landfill Compliance Point Wells
Devens, Massachusetts

Historical Concentrations for Iron (ROD Cleanup Level is 9,100)

Sample Date	Monitoring Well ID (group designation)												
	SHL-3 (1)	SHL-4 (2)	SHL-5 (1)	SHM-96-5B (2)	SHM-96-5C (2)	SHL-9 (1)	SHL-10 (2)	SHM-93-10C (1)	SHL-11 (2)	SHL-19 (2)	SHL-20 (2)	SHL-22 (1)	SHM-93-22B (2)	SHM-93-22C (1)
May-02	30	1,520	1,110	**40,100**	**49,200**	**19,300**	<17.0	71	**55,400**	**13,900**	7,010	606	**92,000**	916
Oct-02	<22.6	4,380	1,120	**18,700**	**44,800**	8,430	<22.6	53	**64,500**	**27,600**	**9,100**	707	446	778
May-03	56	2,790	1,140	**37,400**	**78,900**	3,280	47	41	**62,200**	6,740	7,720	626	**88,600**	885
Nov-03	540	1,840	1,720	**32,000**	**63,200**	7,820	<45.0	<45.5	**68,700**	**15,400**	8,190	444	**87,000**	904
May-04	30 B	4,330	1,900	**29,000**	**71,100**	5,680	<19.2	32 B	**60,500**	**13,400**	5,640	541	**59,500**	1,010
Nov-04	<35.5	6,690	2,740	**21,600**	**55,400**	8,580	39 B	48 B	**63,000**	**20,000**	6,630	469	**82,900**	1,340
Jun-05	<37.9	1,220	2,930	NS	NS	NS	<37.9	<37.9	**59,400**	6,680	5,980	NS	NS	572
Jan-06	NS	280	2,600	**39,000**	**100,000**	4,400	<50	490	**57,000**	**13,000**	5,500	650	**70,000**	740
Jun-06	640	210	2,900	**27,000**	**89,000**	7,500	<50	<50	**61,000**	**100,000**	6900	670	**67,000**	650
Dec-06	<50	160	2,200	**31,000**	**28,000**	**11,000**	<50	210	**58,000**	**13,000**	7,200	540	**74,000**	2,700

Historical Concentrations for Manganese (ROD Cleanup Level is 1715)

Sample Date	Monitoring Well ID (group designation)												
	SHL-3 (1)	SHL-4 (2)	SHL-5 (1)	SHM-96-5B (2)	SHM-96-5C (2)	SHL-9 (1)	SHL-10 (2)	SHM-93-10C (1)	SHL-11 (2)	SHL-19 (2)	SHL-20 (2)	SHL-22 (1)	SHM-93-22B (2)	SHM-93-22C (1)
May-02	14 B	573	289	**11,000**	**4,110**	446	1 B	45 B	**2,010**	**2,280**	**5,950**	1,370	1,680	425
Oct-02	<2.5	436	259	**13,000**	**4,110**	484	<2.5	47	**1,990**	**3,400**	**7,200**	**1,760**	12	407
May-03	2	843	273	**9,500**	**4,230**	364	1	37	**2,180**	1,200	**7,260**	**1,860**	1,340	324
Nov-03	20	324	340	**10,600**	**4,260**	412	<1.6	46	**3,030**	**2,100**	**7,760**	**2,110**	**1,950**	425
May-04	<1.9	856	332	**8,910**	**3,960**	336	<1.9	30	**2,340**	1,510	**6,560**	**1,960**	798	368
Nov-04	1 B	1,240	439	**10,800**	**3,970**	373	1 B	48	**2,570**	**2,950**	**5,630**	**2,460**	1,590	385
Jun-05	2 B	361	476	NS	NS	NS	2 B	28	**2,380**	1,090	**6,270**	NS	NS	218
Jan-06	NS	200	500	**7,500**	**4,600**	310	<10	60	**2,400**	980	**5,500**	**2,600**	1,700	250
Jun-06	20	400	490	**8,500**	**4,900**	380	<10	40	**2,200**	**2,400**	**6,700**	**2,900**	**2,100**	110
Dec-06	<10	198	372	**9,460**	**5,420**	580	<10	70	**2,620**	1,320	**6,370**	**3,520**	**2,070**	702

Historical Concentrations for Sodium (ROD Cleanup Level is 20,000)

Sample Date	Monitoring Well ID (group designation)												
	SHL-3 (1)	SHL-4 (2)	SHL-5 (1)	SHM-96-5B (2)	SHM-96-5C (2)	SHL-9 (1)	SHL-10 (2)	SHM-93-10C (1)	SHL-11 (2)	SHL-19 (2)	SHL-20 (2)	SHL-22 (1)	SHM-93-22B (2)	SHM-93-22C (1)
May-02	1,340 B	6,370	2,340 B	**38,600**	**34,000**	2,380 B	1,380 B	8,620	**27,600**	2,570 B	**34,000**	**43,700**	**35,900**	18,800
Oct-02	1,570	2,840	2,180	**36,200**	**35,400**	2,560	1,520	8,180	**29,800**	4,240	**35,600**	**45,500**	**114,000**	19,500
May-03	1,220	2,380	2,340	**32,600**	**32,000**	2,080	950	8,990	**31,100**	1,600	**36,800**	**43,400**	**37,300**	14,200
Nov-03	1,360 B	13,400	2,030 B	**33,500**	**34,800**	2,310 B	1,280 B	8,370	**27,000**	2,670	**35,800**	**42,700**	**36,300**	17,400
May-04	1,060 B	5,390	2,040 B	**31,000**	**30,000**	1,620 B	1,020 B	8,650	**22,500**	2,300 B	**33,300**	**40,900**	**56,900**	15,100
Nov-04	684 B	4,060	1,870 B	**32,200**	**32,200**	1,550 B	845 B	8,190	**22,800**	2,280 B	**31,900**	**41,900**	**34,300**	16,100
Jun-05	696	7,190	3,240 B	NS	NS	NS	841 B	7,840	**21,600**	1,470 B	**32,000**	NS	NS	9,910
Jan-06	NS	<2,000	2,500	**28,000**	**40,000**	2,000	<2,000	9,500	**24,000**	<2,000	**29,000**	**40,000**	**31,000**	13,000
Jun-06	<2,000	4,600	2,900	**28,000**	**38,000**	2,900	<2,000	9,000	**24,000**	2,800	**30,000**	**39,000**	**29,000**	10,000
Dec-06	<2,000	4,300	<2,000	**28,000**	**36,000**	3,700	<2,000	8,900	**25,000**	<2,000	**29,000**	**39,000**	**30,000**	**24,000**

Notes:

Bold Number indicates cleanup level exceedances

B = Value within five times of the greater amount detected in the equipment or preparation blank

<5 = Concentration less than the indicated method detection limit

LTMP = Long term montitoring plan well (sampled semi-annually)

NS = Not Sampled

Table 4-11
Monitoring Well Chemical Cleanup Level Exceedances At Monitoring Wells Previously Attaining Cleanup Goals (Group 1)
Shepley's Hill Landfill
Devens, Massachusetts

Monitoring Well Identification	Well Designation (Based on First Five-Year Review, SWEC, 8/98)	Exceedances of Cleanup Levels for Triggering Chemicals, Since Achieving Group 1 Status
SHL-3	Group 1	None
SHL-4	Group 2	Not Applicable
SHL-5	Group 1	None
SHL-9	Group 1	71.3 ug/L As (Spring 1999) 144 ug/L As (Spring 2002) 21 ug/L As (April 2006) 21 ug/L As (June 2006) 46 ug/L As (September 2006) 51 ug/L As (December 2006)
SHL-10	Group 2	Not Applicable
SHM-93-10C	Group 1	12 ug/L As (June 2006) 10 ug/L As (December 2006)
SHL-11	Group 2	Not Applicable
SHL-19	Group 2	Not Applicable
SHL-20	Group 2	Not Applicable
SHL-22	Group 1	55.9 B ug/L As (Spring 2002) 77.1 ug/L As (Fall 2002) 101 ug/L As (Spring 2003) 76.4 ug/L As (Fall 2003) 88.1 ug/L As (Spring 2004) 65.4 ug/L As (Fall 2004) 154 ug/L As (Winter 2005) 171 ug/L As (April 2006) 167 ug/L As (June 2006) 109 ug/L As (September 2006) 115 ug/L As (December 2006)
SHM-93-22C	Group 1	51.1 ug/L (Fall 1998) 17 ug/L As (June 2006) 73 ug/L As (December 2006)
SHM-96-5B	Group 2	Not Applicable
SHM-96-5C	Group 2	Not Applicable
SHM-96-22B	Group 2	Not Applicable

Notes:
Exceedances only reflect an exceedance of the existing MCL. The MCL for arsenic was changed from 50 ug/L to 10 ug/L in January 2006.
As = Arsenic
B = Value was within five times of the greater amount detected in the equipment or preparation blank samples

TABLE 5-1
Influent and Effluent Arsenic Results -- Start-up and Routine Operations
Shepley's Hill Landfill
Devens, Massachusetts

INFLUENT			EW-04		EW-04				EW-04		EW-04			EW-04							EW-04	EW-04				
EFFLUENT				EFF		EFF	EFF	EFF		EFF		EFF	EFF		EFF	EFF	EFF	EFF	EFF	EFF			EFF	EFF	EFF	EFF
LOCATION			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
SAMPLING DATE			18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	18-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05
LAB SAMPLE ID			L0509565-01	L0509565-02	L0509565-03	L0509565-04	L0509565-05	L0509565-06	L0509565-07	L0509565-08	L0509565-09	L0509565-10	L0509565-11	L0509565-12	L0509565-13	L0509565-14	L0509565-15	L0509565-16	L0509565-17	L0509565-18	L0509565-19	L0509565-20	L0509565-21	L0509565-22	L0509565-23	L0509565-24
	POTW(1)	Units																								
Arsenic, Total	30	ug/l	5857	5.8	5785	6.1	3.3	4	5873	20.6	5910	554	1109	5801	15.1	62.7	316.7	703.5	1157	1321	5791	5737	8.7	1.9	1.7	9.2
Iron, Total		ug/l	82300	158	78400	151	119	118	76900	973	75300	26200	37100	75800	144	5730	17900	28300	35900	39100	75900	74700	248	116	122	435
Manganese, Total		ug/l	1508	5.9	1541	8.7	409.8	1215	1538	1599	1520	1833	1627	1523	1183	1539	1541	1602	1566	1574	1587	1619	1184	4.9	8.2	65.1
INFLUENT																		EW-04	EW-04	EW-04			EW-1		EW-1	
EFFLUENT			EFF	EFF	EFF	EFF	EFF	EFF	EFF	EFF	EFF	EFF	EFF	EFF	EFF	EFF	EFF				EFF	EFF				EFF
LOCATION			25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	IN0825050900	EF0825050902	IN0825051500	EF0825051500
SAMPLING DATE			19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	19-AUG-05	25-AUG-05	25-AUG-05	25-AUG-05	25-AUG-05
LAB SAMPLE ID			L0509565-25	L0509565-26	L0509565-27	L0509565-28	L0509565-29	L0509565-30	L0509565-31	L0509565-32	L0509565-33	L0509565-34	L0509565-35	L0509565-36	L0509565-37	L0509565-38	L0509565-39	L0509565-40	L0509565-41	L0509565-42	L0509565-43	L0509565-44	L0509870-01	L0509870-02	L0509870-03	L0509870-04
Arsenic, Total	30	ug/l	2.1	2.2	2.6	3.2	31.7	311.3	631.2	613.7	796.1	1190	506.5	471.3	162.5	15.7	7.7	5606	5742	5844	6.2	4.6	3152	7.9	3045	5.6
Iron, Total		ug/l	122	116	114	114	2680	17200	26900	24200	27000	35900	21600	19400	7580	139	118	72400	72300	75800	115	108				
Manganese, Total		ug/l	314.7	1106	1180	680.2	2214	1786	1690	1698	1515	1732	1816	1663	1593	1378	1183	1572	1676	1640	1195	799.3				
INFLUENT			EW-1		EW-1									EW-01				EW-01					EW-01			
EFFLUENT				EFF		EFF	EFF	EFF	EFF	EFF	EFF	EFF	EFF		EFF	EFF	EFF		EFF	EFF	EW-04	EFF		EFF	EFF	EFF
LOCATION			IN0825052100	EF0825052102	IN0826050900	EF0826050902	FLUENT 08	FLUENT 08	FLUENT 08	FLUENT-09	FLUENT-09	FLUENT-09	FLUENT-09	FLUENT-09	FLUENT-09	FLUENT-09	EFF-032306	NFEW1-0323	EFF-032806	FLUENT-040	NEW2-04070	EFF-041406	NF EWI-0414	EFF-042006	FLUENT-042	EFF-052206-25
SAMPLING DATE			25-AUG-05	25-AUG-05	26-AUG-05	26-AUG-05	29-AUG-05	30-AUG-05	31-AUG-05	01-SEP-05	02-SEP-05	06-SEP-05	08-SEP-05	08-SEP-05	09-SEP-05	15-MAR-06	23-MAR-06	23-MAR-06	28-MAR-06	07-APR-06	07-APR-06	14-APR-06	14-APR-06	20-APR-06	26-APR-06	22-MAY-06
LAB SAMPLE ID			L0509870-05	L0509870-06	L0509870-07	L0509870-08	L0510043-01	L0510043-02	L0510043-03	L0510210-01	L0510210-02	L0510395-01	L0510395-02	L0510395-03	L0510470-01	L0603668-01	L0604165-01	L0604165-02	L0604300-01	L0604897-01	L0604897-02	L0605340-01	L0605340-02	L0605531-01	L0605957-01	L0607210-01
Arsenic, Total	30	ug/l	3025	2.9	3044	4	1.5	1.2	17.1	1	1	1	0.9	3035	3	2	1	2781	2	2	5090	1.3	2850	9	2	2
INFLUENT								EW-01		EW-01				EW-01			EW-01	EW-01								
EFFLUENT			EFF	EW-04	EFF	EFF	EFF		EFF		EFF	EFF	EFF		EW-04	EW-04			EW-04		EFF	EFF	EFF	EFF	EFF	EFF
LOCATION			EFF-052206-2	NFEW2-0522	EFF-052206-1	FLUENT-062	FLUENT-071	FLUENT-071	EFF-083106	INF 092806	EFF 092806	EFF-101606	EFF-111406	FW150120606	FW250120606	FW240120606	FW140120606	EW125120706	EW225120706	EFF-122606	FEFF23-122G	FEFF50-1226	EFF-010507	EFF-011607	EFF-012307	EFF-013007
SAMPLING DATE			22-MAY-06	22-MAY-06	22-MAY-06	27-JUN-06	12-JUL-06	12-JUL-06	31-AUG-06	28-SEP-06	28-SEP-06	16-OCT-06	14-NOV-06	06-DEC-06	06-DEC-06	06-DEC-06	06-DEC-06	07-DEC-06	07-DEC-06	26-DEC-06	26-DEC-06	26-DEC-06	05-JAN-07	16-JAN-07	23-JAN-07	30-JAN-07
LAB SAMPLE ID			L0607210-02	L0607210-03	L0607210-04	L0609001-01	L0609743-01	L0609743-02	L0612469-01	L0613861-01	L0613861-02	L0614822-01	L0616413-01	L0617631-01	L0617631-02	L0617631-03	L0617631-04	L0617737-01	L0617737-02	L0618769-01	L0618769-02	L0618769-03	L0700259-01	L0700743-01	L0701088-01	L0701450-01
Arsenic, Total	30	ug/l	3	4360	3	1	2	2700	13	2670	28	4	2	2760	5240	5000	2770	2640	4930	34	1	1	19	1.6	4	1.2
														25 gpm	25 gpm	20 gpm	20 gpm	12.5 gpm	12.5 gpm						
															ug/L		ug/L		ug/L							
														Avg As	4000	Avg As	3885	Avg As	3785							

*POTW Permit: Special conditions specify weekly sampling when over 30 ug/L and corrective action over 50 ug/L.

Avg Influent EW-1 (since start): 2873 ug/L
Avg Influent EW-4 (since start): 5504 ug/L

Appendix A
Landfill Inspection

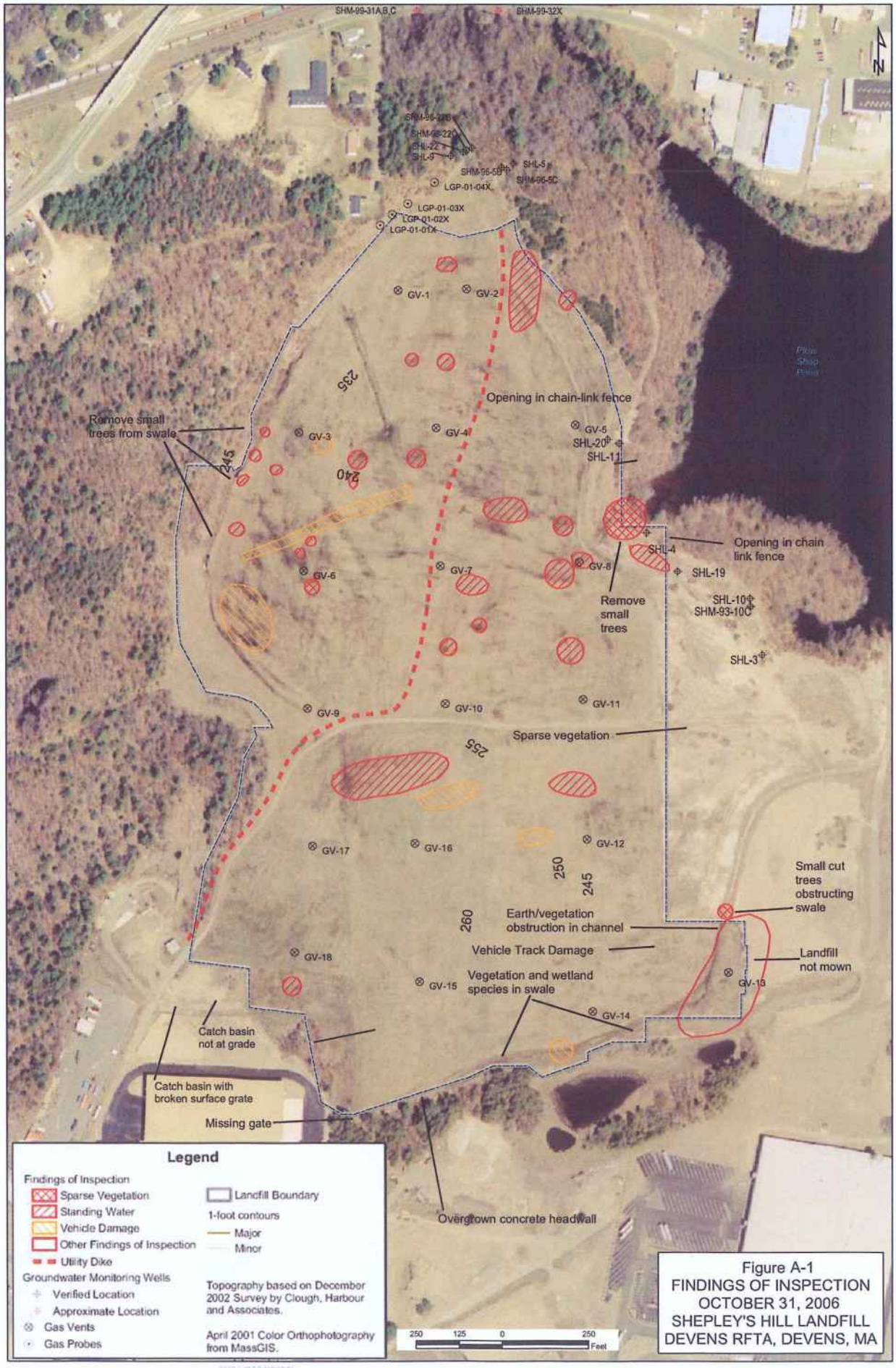


Figure A-1
FINDINGS OF INSPECTION
OCTOBER 31, 2006
SHEPLEY'S HILL LANDFILL
DEVENS RFTA, DEVENS, MA

Landfill Maintenance Checklist
Shepley's Hill Landfill Devens, Massachusetts

Date: October 31, 2006
Inpsector: Tim Bakey/ Dave Reault

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/ UNSAT
Cover Surface	1. Vegetative cover is generally satisfactory except as noted in the comments that follow. Various species growing; mowed to about four inches height (See Photo 5). 2. There are several areas where settlement has occurred. 3. Trees were removed in the fall of 2002 and 2004 in the vicinity of GV-13, the southern perimeter, and the eastern perimeter, and have not reestablished. 4. A utility berm was constructed through the middle of the landfill in 2004. It provides utility service to the pumping station at the northeastern corner of the landfill. An access path was built over the utility berm in the fall of 2006 in the middle of the landfill, near GV-9. 5. Several areas on the landfill have sustained damage by trespassing vehicles and lawn mowing equipment.	1. See specific comments under the sections that follow. 2. A Comprehensive Site Assessment (CSA) is being conducted to address this condition. 3. Monitor for tree growth in future. 4. Observe effects on drainage patterns in the vicinity of the utility berm during future inspections. This may be investigated as part of the ongoing CSA. 5. Damaged areas should be repaired as soon as possible.	SAT SAT SAT NA UNSAT

Landfill Maintenance Checklist – Page 2			
LANDFILL ATTRIBUTE	**OBSERVATIONS**	**RECOMMENDATIONS**	**SAT/ UNSAT**
Vegetative Growth	1. In the vicinity of gas vents 8, 11, and 12, the perimeter of the cap has some areas of sparse/eroded vegetation. The soil in the bare areas is mostly sand and is eroded in some areas. The areas should be graded to fill in the eroded areas and topsoil should be placed to a depth of six inches over the sand to allow grass to grow. The grass cover should extend at least twenty feet beyond the limits of the cap.	1. These areas should be reseeded, with hay or straw placed on the surface, to prevent further erosion. These areas should be addressed as part of the CSA.	UNSAT
Landfill Gas Vent Wells	1. The gas vents are in good condition. All screens and pipes are in functional condition. All of the non-galvanized vents are showing signs of rusting and corrosion. These include all gas vents except for GV-12 through GV-15.	1. All of the non-galvanized vents should be scraped, cleaned and painted.	SAT
Drainage Swales	1. Most of the drainage swale on the south side is being invaded by vegetation/wetland species. There are also intermittent zones of standing water, indicating a lack of proper channel slope and drainage. 2. In the south-east side drainage swale, in the vicinity of GV-13 and continuing downstream to the rip rap lined channel, the drainage swale is overgrown with vegetation and wetlands species. It appears to be heavily silted in and has a large area of standing water. There is an earth and vegetation obstruction just upstream of the new rock section preventing the drainage of water and turning the cannel into a pond 3. Vegetation growing in rip rap lined channel located in the northern side (under Sculley Road access road).	1. The swale should be cleared of vegetation, accumulated sediment, and debris. The swale should then be regraded to promote adequate drainage. 2. The swale should be cleared of vegetation, accumulated sediment, and debris. The swale should then be regraded to promote adequate drainage. 3. The swale should be cleared of vegetation.	UNSAT UNSAT UNSAT

Landfill Maintenance Checklist – Page 3			
LANDFILL ATTRIBUTE	**OBSERVATIONS**	**RECOMMENDATIONS**	**SAT/ UNSAT**
Culverts	1. The concrete drainage structure at the terminus of the catch basin and underground conduit system on the southwest side is overgrown with vegetation and is silting in. Standing water is present and wetland species are becoming established as well.	1. The structure and channel immediately downstream should be cleaned out and the channel regraded as required to properly drain.	UNSAT
Catch Basins	1. Catch Basin #2 near the entrance to the site has a broken surface grate. 2. Catch Basin #3 near the entrance to the site is not set at grade. The rim of the basin is about six to eight inches higher than the surrounding ground.	1. The surface grate should be replaced. 2. The rim of this catch basin should be lowered to meet the surrounding grade.	UNSAT UNSAT
Settlement	1. It appears that many areas of the landfill may be settling. The extent and its effect on the function of the landfill is unknown.	1. A CSA is underway to address this condition.	SAT
Erosion	1. No substantial erosion observed.		SAT
Access Roads	1. The access roads on the landfill road are generally in good condition. A new dense grade surface was applied to the landfill road starting from the Cook Street entrance and terminating in the middle of the landfill in the vicinity of GV-11. 2. Some small ruts and standing water was observed along the landfill road from about GV-11 to the entrance of the pumping station. Moderate erosion of the landfill road has occurred at the entrance of the pumping station.	1. None 2.	SAT UNSAT

Landfill Maintenance Checklist - Page 4			
LANDFILL ATTRIBUTE	**OBSERVATIONS**	**RECOMMENDATIONS**	**SAT/ UNSAT**
Security/ Fencing	1. Repairs have been made to the perimeter fencing. Fence sections and gates have been replaced; however, many of the gates remain unlocked, allowing unrestricted access.	1. Secure gates with chains and padlocks.	UNSAT
Wetland Encroachment	1. Wetland encroachment is taking place at several locations, but is not happening on a wide scale. Overall, the areas of encroachment are small. Theses locations have been noted in above comments.	1. Wetland encroachment should be eliminated by simple mowing in some areas, and by regarding channels in other areas. The above comments address the action to take at specific locations. A CSA is underway to address this concern at the landfill.	UNSAT
Immediate Action Required: The following problem areas, from among those mentioned in the comments above, are the most critical and should be addressed before the next inspection: 1. Secure gates with locks to control access to the site. 2. Repair damage to cover surface caused by trespassers and lawn moving equipment.			
NOTES: SAT = satisfactory UNSAT = unsatisfactory NA = not applicable			

Photo 1 - Vegetation enchroachment – northern swale.

Photo 2 - New dense-grade road across landfill.

Photo 3 – View northwest across access ramp constructed over utility berm.

Photo 4 - View southeast across access ramp constructed over utility berm.

Photo 5 – Standing water on access road on northeast side of landfill.

Photo 6 – View south of erosion/deposition of gravel from access road near northeast corner of landfill near gate for treatment plant.

Photo 7 – Older vent with limited corrosion.

Photo 8 – Ruts in surface soils on south side of landfill from trespassing vehicles or mowing equipment.

Photo 9 - Ruts in surface soils on south side of landfill from trespassing vehicles or mowing equipment.

Appendix B
Landfill Gas Monitoring and Tech. Memo - Methane Controls

Methane Controls – Shepley's Hill Landfill Groundwater Treatment Plant

PREPARED FOR: Bob Simeone/Devens BEC

PREPARED BY: CH2M HILL

DATE: March 3, 2006

PROJECT NUMBER: 284350.OM.02

Summary

This Technical Memorandum (TM) summarizes the steps CH2M HILL has designed and will be implementing to control and monitor methane gas which was detected in the influent to the new groundwater treatment system adjacent to the Shepley Hills landfill. These safety measures are focused on protecting personnel at the facility, and include upgrading affected electrical components to explosion-proof, sealing and venting process units where methane is released from the influent, installing methane/O2 detectors at key process units, and re-programming the control system to shut down the system if methane is detected and/or an oxygen-deficient atmosphere exists.

Following installation of these safety measures, the system will be re-started, and methane levels in the influent will be monitored. If these data indicate that methane concentrations have decreased or disappeared, the treatment system can be operated with no further modifications. If these data indicate that methane is present in significant concentrations over a sustained period such that health and safety conditions continue to impact plant operations, then the next phase of this approach would be to design and build a permanent methane removal system to supplement the current treatment train.

Methane Gas Control Measures

During the initial startup period in September, 2005, measurable levels of methane gas were detected in the influent tank (35% LEL), effluent sump (7% LEL) and the effluent manhole (2% LEL). Subsequent laboratory analysis of groundwater samples obtained from the plant influent indicated dissolved phase methane concentrations ranging from 4,100 to 12,000 ug/L.

Due to the presence of methane gas dissolved in the influent groundwater to the treatment system, it is necessary to provide control measures in the treatment building to address code and safety issues.

CH2M HILL has reviewed this issue as it relates to health and safety, groundwater chemistry, electrical and fire code, permitting, and the existing treatment process. The goal of this review has been to identify the most cost-effective measures to control and/or mitigate the methane so that operator safety is maintained, and the effectiveness of the existing treatment system is not compromised.

Our review indicates the following:

- Air stripping is likely the most effective technology to remove methane from the influent water.
- Existing data need to be supplemented with more detailed and comprehensive sampling to characterize the methane concentrations and to test for the potential presence of other landfill-related gases that may be present in the influent water.
- Additional methane monitoring during operation of the system will indicate whether the methane is consistently present in concentrations that will warrant the expense of a permanent removal system.
- Additional data are needed to more fully characterize the groundwater chemistry as it relates to air stripping and its potential effects on the existing treatment system.
- Air permits will not be required, as the methane emissions are well below the threshold emissions rate of 5 tons/yr.
- Installing an air stripper at the front end of the existing treatment train will alter the groundwater chemistry, which will require, at a minimum, additional treatment prior to the water flowing to the existing treatment train.

Because of the requirement for additional data, the likely adverse effects that installation of an air stripper would have on the existing treatment system, and the significant cost to add an air stripper and associated equipment, CH2M HILL recommends a phased approach to the methane issue. The first phase includes:

- Upgrading electrical service within the two extraction wells to be explosion-proof.
- Sealing and venting the three areas (influent tank, backwash tank, effluent sump) in the treatment building where methane was detected, and is likely to re-occur.
- Upgrading the electrical and instrumentation in the one area (effluent sump) that contains instrumentation.
- Installing new methane/oxygen detectors at key process units.
- Re-programming the PLC to send and autodialer alarm if either methane is detected at 10% of the LEL or an oxygen-deficient atmosphere exists, and to call for a system shutdown if methane is detected at 20% of the LEL.

The second phase includes restarting the system, and sampling/analysis of the influent water over time. These influent samples will be analyzed for methane and other gases potentially present in landfill groundwater, as well as for the additional groundwater chemistry (pH, alkalinity and CO_2) identified above. These data will be analyzed to monitor methane concentration over time. If these data indicate that methane concentrations have decreased or disappeared, the treatment system can be operated with no further modifications. If these data indicate that methane is present in significant concentrations over a sustained period such that health and safety conditions continue to impact plant operations, then the next phase of this approach would be to design and build a permanent methane removal system to supplement the current treatment train.

To implement the first phase of this approach, the following work will be completed:

- The electrical service to the extraction wells will be upgraded to explosion-proof.
- The microfilter influent tank, backwash vent and effluent sump will be sealed and vented directly to the building exterior.
- Effluent sump instrumentation will be upgraded as follows:
- Install intrinsically safe relays for each of the four float switches.
- Replace existing solenoid valve with NEMA Type 7/9 XP valve.
- Move the existing pH probe from the sump to the effluent piping within the building.
- New methane/oxygen detector units will be installed at the microfilter, lamella clarifier, effluent sump and filter bottom dumpster. New conduit and control wiring will be run from each detector to the PLC cabinet.

The PLC will be re-programmed to send an autodialer alarm if either methane is detected at 10% of the LEL or an oxygen-deficient atmosphere exists, and will call for a system shutdown (and autodialer call out) if methane is detected at 20% of the LEL.

CH2M HILL believes this phased approach to be the most prudent course of action. If additional data analysis indicates that an active methane-stripping system is required, the measures identified in this memorandum would still be required.

Modeling for Receiving Manhole

CH2M HILL performed modeling to predict the methane concentration that could be present in the discharge manhole. The modeling was run at the design flow rate of 50 gpm. The attached spreadsheet summarizes the range of potential methane concentrations that could be present in the manhole headspace. The predicted concentrations, expressed as percent by volume, were less than lower explosive limit (LEL) of 5% by volume for all cases. At the current flow rate of 25 gpm, the predicted concentration will be about 50 percent lower than the concentrations shown in the spreadsheet. The highest predicted concentration occurred with the methane concentrations in the liquid phase was the highest and the air flow rate through the manhole was at a minimum.

The concentration of methane can also be expressed as the mass of methane per unit volume of air (ug/m3). To predict the mass release rate, the Bay Area Sewage Treatment Emissions (BASTE) model was used. The observed methane concentrations in the liquid phase were used to estimate methane emissions from the treated ground water effluent as if falls into the manhole. The air flow rate through the manhole is likely to vary widely. A range of air flow rates, expressed as air exchange rates per hour (ACH), was evaluated.

Mass Emission Rate

The falling treated ground water effluent from the 4 inch effluent line into the manhole was treated as a free-falling weir drop. The observed methane concentrations in the liquid phase of 12,100, 4,190, and 910 ug/L were evaluated. Physical constants for methane were used to predict the mass transfer rate from liquid phase to the gas phase. About 6% of the methane in the liquid phase was released into the gas phase. This release rate was largely dependent on the methane concentration in the liquid phase and independent of the assumptions related to the gas flow rate across the manhole headspace (liquid phase limited).

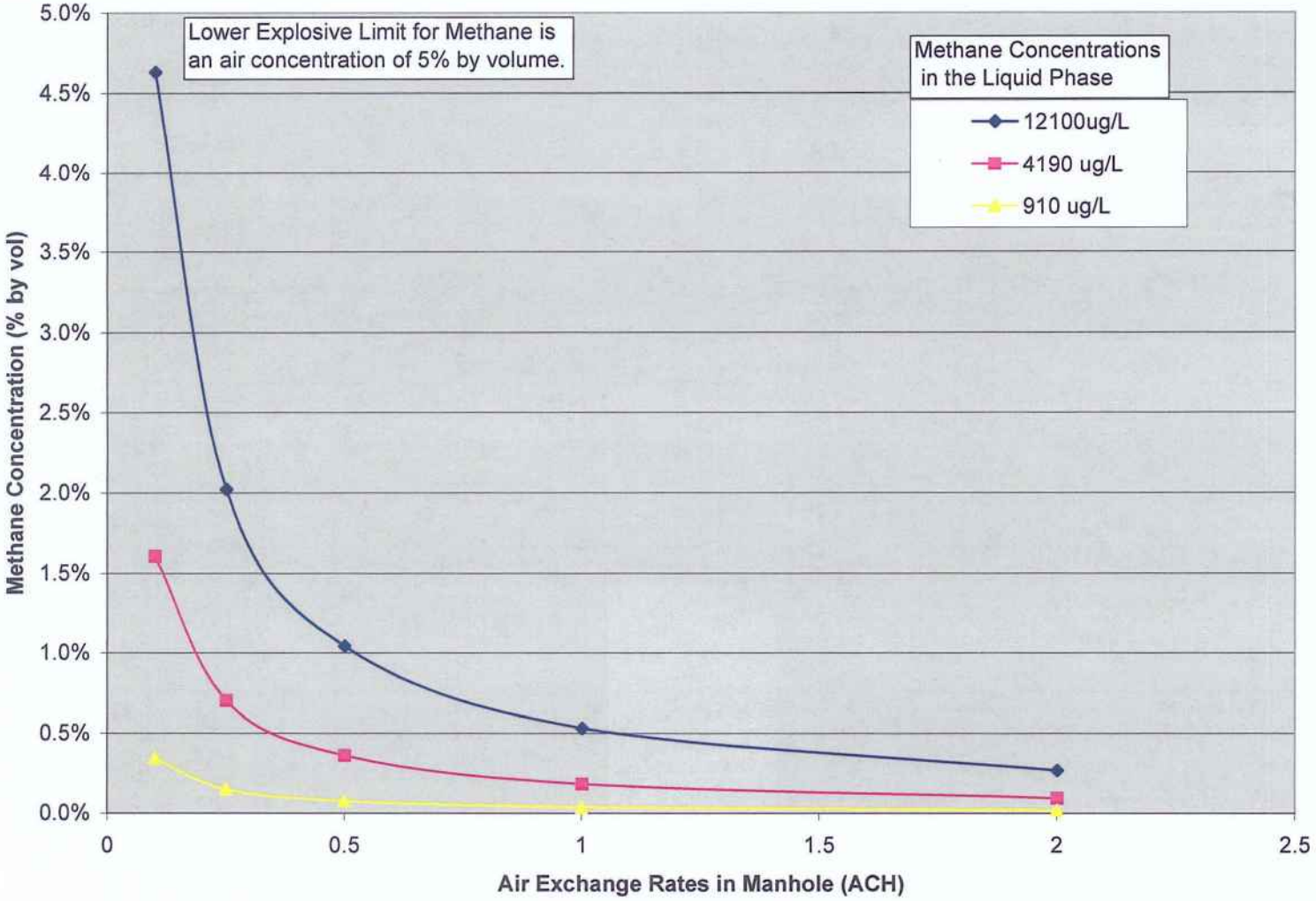
Air Flow Rate

Air flow across the manhole headspace can be driven by many factors: changes in atmosphere pressure, changes in air temperature across the collections system and air displacement or aerodynamic drag associated with the movement of wastewater through the collection system. The factors are difficult to predict and can vary widely over time. To predict the range of possible air flow rates, the volume of the manhole was crudely estimated and air flow rates were calculated based on a range of air exchange rates per hour from 0.1 to 20 ACH. The changes in air flow rates had no effect on the methane mass emission rate at air exchange rates greater than 1 ACH. Methane concentration above 1 ACH are lower because of the increased air flow rate. Air exchange rates less than 1 ACH did result in slightly lower mass emission rates as methane concentrations in the gas phase increased.

Monitoring

During re-startup of the system, CH2M HILL will perform monitoring at the discharge manhole using a VRAE four-gas meter. The LEL readings will be compared to influent methane concentrations collected at the same time to verify the model's predicted concentrations. Additional influent samples for methane will be collected during system operations to establish a data set of methane concentrations in the influent water. If influent sampling shows an increase in methane concentrations, the model will be updated accordingly and additional monitoring will be performed at the manhole.

Methane Concentrations in the Manhole Headspace



Ft. Devens, Shepley's Hill Landfill
Groundwater Treatment Plant
Methane Emissions

Influent Loading			Run 6	Run 7	Run 8	Run 1	Run 2	Run 3	Run 4	Run 5
Methane Conc. in GW (ug/L)	Influent Flow Rate (gpm)	Methane Mass Loading (Kg/day)	Methane Emission @ 0.1 ACH (Kg/day)	Methane Emission @ 0.25 ACH (Kg/day)	Methane Emission @ 0.5 ACH (Kg/day)	Methane Emission @ 1 ACH (Kg/day)	Methane Emission @ 2 ACH (Kg/day)	Methane Emission @ 5 ACH (Kg/day)	Methane Emission @ 10 ACH (Kg/day)	Methane Emission @ 20 ACH (Kg/day)
12100	50	3.30	0.181	0.198	0.204	0.208	0.211	0.211	0.211	0.211
4190	50	1.14	0.0628	0.0685	0.0708	0.0718	0.073	0.073	0.073	0.073
910	50	0.248	0.0136	0.0149	0.0154	0.0156	0.0159	0.0159	0.0159	0.0159
Air Flow through Manhole (m3/s)			0.0000692	0.000173	0.000347	0.000692	0.00138	0.00346	0.00692	0.0138
			Concentration of Methane in Manhole Headspace (mg/m3)							
12100			30,334	13,237	6,819	3,479	1,770	706	353	177
4190			10,504	4,584	2,361	1,201	612	244	122	61.2
910			2,281	995	513	261	133	53.2	26.6	13.3
			Concentration of Methane in Manhole Headspace (ppm)							
12100			46,276	20,193	10,403	5,307	2,700	1,077	538	270
4190			16,025	6,993	3,602	1,832	934	373	186	93.4
910			3,480	1,519	782	398	203	81.1	40.6	20.3
			Concentration of Methane in Manhole Headspace (% by vol)							
12100ug/L			4.628%	2.019%	1.040%	0.531%	0.270%	0.108%	0.054%	0.027%
4190 ug/L			1.602%	0.699%	0.360%	0.183%	0.093%	0.037%	0.019%	0.009%
910 ug/L			0.348%	0.152%	0.078%	0.040%	0.020%	0.008%	0.004%	0.002%
			0.1	0.25	0.5	1	2			

Response to EPA Comments
(Email dated March 27, 2006)

EPA Comments on the
Methane Controls Technical Memorandum
Groundwater Extraction, Treatment, and Discharge Contingency Remedy
Shepley's Hill Landfill
Fort Devens, MA
Dated March 3, 2006

GENERAL COMMENTS:

1. The general lack of understanding concerning the methane issue from an overall conceptual site model (CSM) perspective suggests that it would be a good idea to consider analyzing routine groundwater samples, pump and treat performance monitoring samples, and other "new" exploration samples for dissolved methane. Although methane migrated readily in groundwater, this should help the BCT develop a better understanding of the areas within the landfill where methane originates.

Army Response: Geochemical data collected at Shepley's Hill Landfill over many years, including but not limited to ORP and dissolved oxygen, indicate active biodegradation is occurring near the Shepley's Hill landfill. It has been occurring since solid waste materials (carbon sources) were implaced and may continue for many years. Redox conditions currently in the immediate vicinity of the landfill are such that terminal electron acceptors (TEAs) including dissolved oxygen; nitrate; Mn(IV) and Fe(III) coatings on aquifer materials; and sulfate are depleted and carbon dioxide has become the dominant electron acceptor. Methanogenic bacteria reduce dissolved carbon dioxide producing dissolved methane as a bioproduct. Microorganisms couple the oxidation of electron donors, materials containing organic carbon, with the reduction of the aforementioned electron acceptors.

Microorganisms as a group prefer the most energetically efficient electron acceptor (oxygen). Once sufficiently used up, nitrate (NO3) will be preferentially used over Mn(IV), then Fe(III), then sulfate (SO4), and then CO2. Once CO2 reduction becomes dominant, methane production fully develops. Although methanogenesis at Shepley's Hill is occurring, as it does beneath most, if not all landfills, the production of methane is very likely on the decline due to the age of the landfill and the time that has lapsed since solid waste emplacement and capping.

Step-wise or preferential redox reactions result in redox zonation in groundwater aquifer systems. This is apparent at Shepley's Hill. Redox zonation has been well documented in the literature, since the pioneering work of Baedecker and Back (1979). This literature includes work related to landfills, natural attenuation studies relating to fuel and solvent releases, and geochemical studies of natural systems, including wetlands and peat bogs.

Dissolved methane is not unexpected in groundwater near landfills. At Shepley's Hill the concentrations of methane in groundwater decrease with distance away from the landfill. Redox conditions in the shallow aquifer downgradient from the landfill are oxic and would not support

methanogenesis. However, deeper in the aquifer where dissolved organic carbon is available, methanogenesis may be occurring for some distance. It is important to note that data from perimeter gas wells LGP-01-01X through LGP-01-04X, installed between the landfill and the Scully Road neighborhood indicate that from 2001 through 2005 methane has not been detected. These wells were completed in the vadose zone in accordance with state and federal landfill gas perimeter monitoring guidance. In addition, landfill gas data from vents at the landfill indicate that the greatest methane concentrations from landfill vents is generally at the south end of the landfill in the areas that were capped and closed last (Phase III, IVA, and IVB). It is apparent that although dissolved methane is present in the aquifer due to methanogenic redox conditions, the concentrations have not been high enough to result in flux through the water column vertically and into the vadose zone at concentrations that would be detectable in the perimeter gas wells. Monitoring of basements along Scully Road, in August by DEP (see email dated August 18 from DEP to the BCT), indicates that detectable concentrations of methane were not present.

Operation of the extraction system at Shepley's Hill landfill resulted in the extraction of deep groundwater having dissolved methane from methanogenesis occurring at depth. Data collected at the plant indicated a range of 4,100 to 12,000 ug/L for influent samples, as indicated in the technical memo. Subsequent influent samples have been in this range (e.g. 6060 ug/l collected 6/13). Based on these data, the changes identified in the memo were made to the plant. Review of literature indicates that dissolved methane resulting from methanogenesis results in comparable levels at other landfills. Information provided by the IRP program at Massachusetts Military Reservation (MMR) for the LF-1 landfill (similar size, age, origin, and capping history) indicates groundwater methane levels as high as 8400 ug/L near the landfill and 5400 ug/L roughly 1000 ft down gradient in the glacial sand aquifer have been observed. This methane is most likely generated in situ as organic carbon from the landfill is degraded. Although dissolved methane may be present in groundwater, it does not present a hazard unless it is of sufficient concentration and is in contact with a potential headspace. Consequently, landfill gas monitoring guidance focuses methane monitoring on vadose zone gas rather than groundwater. Methane monitoring and mitigation experience from coal bed areas such as in the Applachian Plateau provides good empirical information relating to groundwater dissolved methane and expected concentrations in either vadose zone or basements settings.

The United States Department of Interior Office of Surface Mining Reclamation and Enforcement, Appalachian Regional Coordinating Center Pittsburgh, PA has produced a document entitled, *The Investigation And Mitigation Of Fugitive Methane Hazards In Areas Of Coal Mining,* (September 2001) which deals specifically with methane hazards and contains a great deal of information that may be applied to landfill situations. The document provides action levels for groundwater methane, see Table 9 below. Table 9 indicates that groundwater methane <10 mg/L, requires "no immediate action" and for levels between 10 and 28 mg/L "warning, investigation" is warranted but not immediate action. These action levels assume groundwater is in close proximity to basements or structures where a headspace could develop. The dissolved methane in groundwater near Shepley's Hill is located at depth with a fairly substantial thickness of groundwater and vadose zone above that apparently attenuates methane that may be diffusing or "off-gassing" from depth, resulting in no detections in the perimeter methane gas monitoring wells near Scully Road.

Response to EPA Comments
(Email dated March 27, 2006)

Table 9. Recommended Action Levels for Methane

Action Level	Atmospheric (Percent Volume)		Dissolved in Water (mg/liter)	Soil Gas (Percent Volume)
	Occupiable Spaces (homes)	Un-Occupiable Spaces		
Immediate Action	>1.0%	>3.0%	>28 mg/L	>5.0%
Warning, Investigate	>0.5% but <1.0%	>1.0% but <3.0%	>10 mg/L but <28 mg/L	>3.0% but <5.0%
Monitor to Determine Concentration Trends	>0.25% but <0.5%			<3.0% but >1.0%
No Immediate Action	<0.25%	<1.0%	<10 mg/L	

2. How long will the evaluation period last? When will we know that we have monitored for a sufficiently long period? EPA suggests monitoring for a least one year in order to capture a complete hydrologic cycle.

Army Response: We will continue to monitor on a quarterly basis (influent and effluent).

3. Methane is lighter than air so releases of methane will accumulate at high points in the release areas. Monitoring needs to account for this. If methane is allowed to be released in the building [if all release points (from groundwater to the building air) are not sealed], it will likely accumulate at the ceiling. Is it presumed that the building ventilation system will properly manage methane releases from processes that will not have methane controls?

Army Response: The release points in the process that were identified during the evaluation (microfilter influent tank, microfilter backwash tank, effluent sump) are sealed and vented to the building exterior. The two other process components are the lamella clarifier and the filter-bottom roll-off. The lamella clarifier receives water/solids generated during the microfilter backwash cycle. The compressed air used during the backwash cycle appears to remove the methane and the backwash tank is vented to the building exterior. The filter-bottom roll-off then receives water/solids from the lamella clarifier. Methane was not initially, nor subsequently, measured in the lamella clarifier and filter-bottom roll-off. In addition, methane monitors were installed over the lamella clarifier (approx. 11 feet above the floor) and the filter bottom roll-off (approx. 6 feet above the floor), as well as in the area near the microfilter. The methane monitor over the lamella clarifier provides monitoring close to the ceiling. The methane monitors are connected to the system control logic, which is established to sound an alarm if 10% of the LEL is detected and shut the system down if 20% of the LEL is detected.

4. There appear to be additional areas of concern for methane accumulation or methane release to the building including the recycle sump, the thickener, the floor sink for the thickener, the drain sump, and the floor drains. Will the modified treatment system design rely on the building ventilation system to manage methane releases from these areas?

Response to EPA Comments
(Email dated March 27, 2006)

Army Response: The process areas identified in this comment all receive water/solids after the backwash cycle. As stated above, the two process components are continuously monitored and methane has not been detected. The recycle sump, by design, is isolated from the effluent sump and all floor drains are connected to the recycle sump. Water received in the recycle sump is generated from the monitored lamella clarifier and filter-bottom roll-off.

5. Additional equipment to be considered for upgrading to address the presence of methane should include the drain sump pump and level controls and level controls in the thickener.

Army Response: As stated above, methane monitors have been installed in areas receiving water/flows from the backwash cycle and the system logic is established to provide an alarm at 10% LEL and system shutdown at 20% LEL. It should be noted that methane has not been measured by either monitor.

Follow-up comment (11/7/2006 email): Are these separate alarms for 10% and 20% LEL or does the system rely on a single component to signal both alarms. EPA recommends redundancy of methane monitors to avoid dangerous conditions if one of the monitors fails so that the 10% and 20% alarms cannot activate. If the existing monitoring equipment does not effectively provide the necessary redundancy, the monitoring equipment should be supplemented to do so.

Army Follow-up Response: There are three separate alarms within the facility, which provide redundancy. The two methane monitors (one above the lamella clarifier and one above the filter-bottom roll-off) are programmed to sound an audio alarm at 10% LEL and shut the system down at 20% LEL. In addition, an oxygen monitor is installed at the microfilter and is programmed to shut the system down if an oxygen-deficient atmosphere is detected.

6. Modifying the air release valve to discharge outside the building should be considered.

Army Response: The volume of air/gases from air release valve on the influent piping is minimal and releases are infrequent. The release valve only operates when the system is shut down as the piping drains down.

7. Does the methane concentration in the groundwater have a significant impact on the chlorine dioxide concentration required to treat the arsenic? Please explain if this was evaluated.

Army Response: During initial startup, chlorine dioxide concentrations were varied and effluent samples were collected to correspond with each chlorine dioxide concentration. The chlorine dioxide concentration and effluent results were plotted to determine the chlorine dioxide concentration required to meet effluent discharge limits. The system has been operated using the minimum chlorine dioxide concentration to meet the discharge limits (which have been consistently met throughout operations), while limiting any excess chlorine residual. As the methane was, and is, present in the influent water, the impact of its presence on chlorine dioxide concentration cannot be isolated, however the system has been successful meeting its treatment goals.

8. Is the air release valve suitable for service in a potentially explosive environment?

Army Response: The air release valve is a small mechanical brass valve and does not have any electrical components.

SPECIFIC COMMENTS:

9. Page 2, 2nd and 3rd Bullets: See general comment 1, above. It would be useful to perform additional monitoring/analysis (e.g., for the presence of other landfill-related gases), at individual monitoring wells in addition to the "blended" results in the treatment plant. What are the other landfill-related gases of interest?

Army Response: Hydrogen sulfide is another gas that often may be of interest in settings where sulfate reduction is significant. However, sulfate reduction in the vicinity of the landfill is not believed to be significant. Review of the past 5 years of data from monitoring of landfill vents indicates that hydrogen sulfide has not been detected. Hydrogen sulfide has a very distinct and apparent rotten egg odor; however it has not been noted at the plant during any of the operation. The human odor threshold for H2S is extremely low (.0047 ppm in air). The OSHA PEL is 10 ppm (ceiling)/50 ppm (peak). Work of the USGS, Water Resources Division indicates that levels as low as .25 ug/L H2S dissolved in groundwater are detectable, by human olfactory senses, through off-gassing of water from wells or taps. The fact that H2S has not been detected at landfill vents or the characteristic rotten egg order has not been observed at any time during start-up or operation of the plant, suggests that methanogenesis dominates in the aquifer beneath the landfill and immediately downstream where groundwater is being extracted and sulfate reduction is limited. Any H2S that is present in the influent stream that enters the plant would be oxidized by free chlorine in the treatment process producing sulfate which is sequestered. H2S will be monitored in air-spaces in the plant and at the receiving manhole in the future with the plant multigas monitor; however, H2S is not expected to register. Groundwater sulfate monitoring is being conducted to evaluate groundwater geochemistry and sulfate reduction. Hach or Chemet colormetric kits will be used to further characterize sulfide in groundwater influent and treated effluent. Dissolved VOCs in groundwater have been demonstrated historically to be very low. Monitoring of other dissolved gases at monitoring wells is not warranted.

10. Page 2, 5th bullet: Please clarify why it is thought that the allowable methane discharge rate is 5 tons per year. 310 CMR 40.0000 limits untreated air emissions to one ton per year and requires an LSP opinion for any untreated emissions. Please provide the yearly emission rates for the methane concentrations in groundwater evaluated for the subject memorandum and indicate if the one ton per year threshold is exceeded.

Army Response: 310 CMR 40.0049, Remedial Air Emissions, does not limit remedial air emissions on a tonnage basis but does require that emissions do not pose a risk to health, safety, public welfare, and the environment. Municipal solid waste landfill New Source Performance Standards (NSPS) and emission guidelines determine whether or not landfills are required to undergo active landfill gas treatment. Concentration data presented in the Tech Memo for influent at 8200 ug/L and effluent at 3200 ug/L and dissolved to vapor phase modeling indicate that at 50 gpm the projected net loss of methane at the plant would be .556 tons per year. If this is assumed to be the average concentration of influent, the loss is well below the 1 ton limit. In

addition, this is with the plant operating at 50 gpm rather than the current operating rate of 25gpm.

Follow-up Comment (11/7/2006 email): The original comment was mistaken in citing the MCP, the correct citation is Massachusetts Policy WSC#94-150, which references 310 CMR 7.0000 and DEP/Bureau of Waste Prevention (BWP) under MGL c.111, section 142 A-K. The arsenic treatment system is a remedial system. As long as the air emissions are less than one ton per year, regulations do not apply. However, the regulations are based on potential emissions and, in the case of the SHL treatment system, the potential would be calculated using the influent concentration and the higher flow rate. Using those values (8,270 µg/l and 50 gpm) the emissions could be 0.92 tons per year, which borders on the threshold (one ton per year) for a limited plan approval. If the system flow is increased to 50 gpm or more in the future or if methane concentrations increase significantly, which is not expected, a comprehensive sampling of air emission should be performed to get a handle on the air emissions from the system.

Army Follow-up Response: Comment noted.

11. Page 3, Modeling: The modeling results indicate that in six of the scenarios evaluated, the methane concentration could exceed 10% of LEL, which should be considered the action level. Although the methane concentration will not exceed the LEL (5% methane by volume) based on the modeling calculations, the LEL should not be the actionable threshold. Please revise the discussion to acknowledge this. The design should not allow for a methane concentration of 100% of the LEL since there are inherent errors in measuring devices and measurement techniques. On this basis, the methane concentration in air should not be allowed to exceed 0.5% by volume methane in air.

Army Response: The modeling was performed to evaluate the conditions in the receiving manhole at the end of the discharge pipeline. The scenarios were developed due to the lack of air flow data in the manhole and were intended to show that the LEL would not be exceeded in the manhole. Since the system was restarted, monitoring has been performed at the manhole on a regular basis. The LEL readings in the manhole average less than 4.6% of LEL over several readings. The most recent reading collected on September 29, 2006 was 3% of LEL.

Follow-up Comment (11/7/2006 email): What is the frequency of the monitoring program for the manhole? Also, to put the data presented in context, how many samples are included in the average cited?

Army Follow-up Response: The frequency of manhole monitoring averaged approximately one sample/week. The average previously presented included 27 readings collected between March 7, 2006 and September 29, 2006. Since that time an additional 12 readings have been recorded for a total of 39 readings through January 23, 2007 and an average is 4.5% of LEL.

Response to DEP Comments
(DEP letter dated August 16, 2006)

[DEP Letter to Mr. Robert Simeone, dated August 16, 2006]

RE: Technical Memorandum "Methane Controls – Shepley's Hill Landfill Groundwater Treatment Plant", March 3, 2006

Dear Mr. Simeone:

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed the Technical Memorandum "Methane Controls" (Tech Memo) submitted by CH2M Hill, contractors for the Army's Shepley's Hill Landfill Contingency Remedy, per the DSMOA for Devens. The Tech Memo documents the additional work needed at the treatment plant to address explosive conditions in the treatment building, caused by methane off-gassing from the influent groundwater. MassDEP agreed conceptually with the actions the Army and its contractors took to retro-fit the building in making it explosion proof but have the following issues/concerns with the monitoring proposal going forward in the future.

The Tech Memo proposed *a staged approach* to address methane issues encountered during the initial startup of the groundwater treatment system in Shepley's Hill Landfill. The first phase included necessary safety measures to upgrade the system, while the second phase proposes to more fully characterize the influent water after the system restarted. The data collected in the second phase will aid in characterizing methane concentration, groundwater chemistry and to test for other potential landfill-related gases in order to determine if a permanent methane removal system will be needed.

The Tech Memo has several recommendations for data collection, in the instances outlined below; please provide additional clarification and detail for the collection process:

1. Following installation of these safety measures, the system will be re-started, and methane levels in the influent will be monitored. Please provide any recently sampled data.

Army Response: Data have been provided to the BCT through the "ftp" site and BCT tech meetings. The Army will continue to provide monitoring data on a regular basis as they are collected through email notifications and ftp postings.

2. Existing data need to be supplemented with more detailed and comprehensive sampling to characterize the methane concentrations and to test for the potential presence of other landfill-related gases that may be present in the influent water. What kind of data will be sampled? Please provide the update.

Army Response: Please refer to responses to EPA Comments 1 and 9.

3. Additional methane monitoring during operation of the system will indicate whether the methane is consistently present in concentrations that will warrant the expense of a permanent removal system. What is the threshold for the evaluation?

Army Response: The methane monitoring includes readings within the building and sampling of groundwater to monitor methane levels in the influent. A threshold for determining to add treatment would be excessive alarm/shutoff conditions (based on 10% of LEL and 20% of LEL, respectively) within the building. The influent sampling would be related to influent

concentrations associated with any alarms/shutoffs. To date, there have not been any alarms and the influent concentrations have been lower than initially observed in the fall of 2005 (09/29/2005: 4,190 ug/L) and at restart in the Spring 2006 (3/10/2006: 8,270 ug/L).

4. Additional data are needed to more fully characterize the groundwater chemistry as it relates to air stripping and its potential effects on the existing treatment system. What kind of parameters will be collected, and when will these updates be made available, as they do not appear at the FTP site?

Army Response: The data collected to date do not suggest that air stripping will be necessary to manage dissolved methane in influent water.

5. Additional influent samples for methane will be collected during system operations to establish a data set of methane concentrations in the influent water. Please indicate in the Process Schematic Figure where the discharge manhole and/or receiving manhole are. Several scenarios modeled for the manhole exceeded 10% of the LEL threshold. Please explain what the impact the high methane concentration may have on the POTW, check whether the Industrial Wastewater Discharge Permit needs to be modified, and provide monitoring data to verify the model.

Army Response: The modeling was performed to evaluate the conditions in the receiving manhole at the end of the discharge pipeline. The scenarios were developed due to the lack of air flow data in the manhole and were intended to show that the LEL would not be exceeded in the manhole. Since the system was restarted, monitoring has been performed at the manhole on a regular basis. The LEL readings in the manhole average less than 4.6% of LEL over several readings. The most recent reading collected on September 29, 2006 was 3% or LEL.

[Comment:] It seems that the threshold to take action at the methane/oxygen detector in the groundwater treatment system building should be 10% of the Lower Explosive Limit (LEL). MassDEP Solid Waste regulation 310 CMR 19.117 (2) of General Design Standard, requires air quality protection systems be designed to control the concentration of explosive gases to no greater than 25% of the LEL at the property boundary at any time, excluding gas control or recovery system components, any leachate collection components, or ***10% of the LEL in any building, structure, or underground utility conduit.***

Army Response: At 10% of the LEL an alarm is triggered and at 20% of the LEL the plant shuts down and the operator is notified by the SCADA system. The building is unoccupied most of the time, except for a few hours a week during visits and maintenance. When the system shuts down, the potential source of methane (process influent) is eliminated. There have been no methane monitoring triggered alarms (10% LEL) or shutdowns (20% LEL) related to plant monitoring. If 10% LEL alarms occur, the Army will take action to evaluate and address these conditions.

[Comment:] The Army must address offsite potential risk around northern house area. Preliminary methane gas testing at the basement in each building should be initiated as soon as possible. Furthermore, the high methane concentrations in the groundwater and at several gas

vents warrant a comprehensive assessment of methane distribution at the Landfill and off the property, and the possibility of an active gas collection system to protect human health and safety. The methane delineation should be more thoroughly covered, either as part of the Contingency Remedy or the CSA but must be addressed as soon as feasible.

Army Response: Comprehensive gas characterization has been undertaken through the closure process of the landfill and gas monitoring has been conducted annually by the Army at vents and perimeter monitoring wells installed over the years. The four (4) gas wells installed between the landfill and the Scully Road neighborhood have not detected methane over the past 5 years. DEP sampled methane in basements along Scully Road in August and reported non-detects. Please refer to response to EPA Comment 1 presenting the site conceptual model for methane geochemistry and actions levels for methane in groundwater developed by US Department of Interior. Methane generation is well understood and appropriate monitoring has been conducted at Shepley's Hill over the years to evaluate it with respect to human health and safety.

[Comment:] Additionally, MassDEP had requested that methane gas be added to the field parameters when performing both the PMP and the LTMP.

Army Response: Methane gas monitoring is not warranted at monitoring wells during groundwater sampling events; however, field teams may use combustible gas indicators that enable monitoring % LEL.

Response to DEP Follow-up Comments
(DEP Letter dated November 20, 2006)

[DEP Letter to Mr. Robert Simeone dated November 20, 2006]

RE: Response to Comments dated August 16, 2006 about the Technical Memorandum "Methane Controls – Shepley's Hill Landfill Groundwater Treatment Plant", October 5, 2006 through email

Dear Mr. Simeone:

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed the responses from contractor, CH2M Hill to comments by both MassDEP and USEPA for the March 2006 Shepley's Hill Landfill Contingency Remedy Methane Tech Memo per the DSMOA for Devens. Several of the issues were discussed at the November 9, 2006 BCT meeting. CH2M Hill, Army contractors for the Shepley's Hill Landfill Contingency Remedy, electronically submitted their comments on October 5, 2006.

[Comment:] Three issues are still of a concern to MassDEP: 1) undetected methane may be migrating in sufficient concentrations to impact downstream houses or conduits, 2) the gas venting system on the landfill may not be adequately controlling landfill gas, and 3) the direct venting of landfill gas at the influent of the pump and treat facility may have potential impact to nearby houses.

Army Response: As discussed with the BCT, the Army committed to conducting additional methane monitoring/sampling following the release of the "Methane Memo", dated March 3, 2006, to further evaluate potential methane migration.

This monitoring included dissolved methane sampling of plant influent (EW-01)/effluent in March; dissolved methane sampling of plant influent (EW-01) and downstream wells 41B and 39B in June; installation and monitoring of temporary soil gas probes at the north end of the landfill in October; and sampling of dissolved methane in plant influent and 12 downstream well screens in December, 2006. In addition, the 2006 annual LTM gas vent and permanent gas probe monitoring was conducted this past December. Data and results of this work have been presented to the BCT in summaries transmitted through emails, discussed at BCT meetings (November and January, 2006), and discussed on conference calls.

These data are summarized in attachments to this document. Table 1 (attached) provides a summary of all the influent/effluent and groundwater data collected, to date, for dissolved methane/ethane. Table 2 provides a summary of landfill gas data collected during the December 2006 annual LTM sampling event and gas monitoring conducted at temporary gas probe locations during October and December. Figure 1 provides a graphical summary of the December, 2006 dissolved groundwater analytical data adjacent to wells where samples were collected. In addition, Figure 1 depicts the location of permanent and temporary gas monitoring points at the north end of the landfill. Note that temporary gas probes were also installed adjacent to each of the wellheads for the monitoring wells that were sampled for dissolved methane/ethane in December (refer to Figure 1). This was done to evaluate and compare dissolved methane/ethane detected in groundwater sampled from depth to the levels of methane gas in the shallow vadose zone. The results of all gas monitoring conducted in 2006 are summarized in Table 2. Table 3 provides a summary of well screen depths/elevations, geologic designation, and average arsenic concentration for wells sampled for dissolved methane/ethane in December, 2006.

Response to DEP Follow-up Comments
(DEP Letter dated November 20, 2006)

In response to Issue 1 raised by DEP, it should be noted that methane gas has never been detected in the vadose zone north of the landfill at permanent or temporary gas probes. The permanent soil gas probes, LGP-01-01X through LGP-01-04X, have been monitored annually since installation in November 2001 and methane has not been detected during any of these events. Temporary gas probes DP-1 through DP-10 were installed and monitored at the north end of the landfill in October, 2006 (please refer to Table 2 and Figure 1) to provide additional coverage: methane was not detected in any of these vadose zone monitoring probes. Methane gas was also not detected at temporary soil gas probes installed in December adjacent to each of the well heads downstream (please refer to Table 2). Passive vents installed through the landfill cap and connected to gas collection headers beneath the cap indicates that methane production in the landfill is generally low and consistent with that of an aging landfill – one that has not received waste over most of its area for two decades and anywhere within its footprint for 15 years. Both recent and historical data do not suggest that methane is migrating toward households in the vadose zone at detectable concentrations. Ayer Fire Department monitoring of basements along Scully Road, as requested by DEP in August, did not detect methane (Email from DEP to Army August 18, 2006).

In response to Issues 2 and 3, the passive vent system appears to operating as designed and the venting system at the plant releases methane to a passive collection system at points in the process including the microfilter influent tank, microfilter backwash tank, effluent sump. These units were sealed and vented to the building exterior. Headspace data indicate that the concentrations that previously built up in these process components, prior to venting, were well below the LEL (less than 35% LEL in microfilter tank and 7% LEL in effluent sump) and considerably less than many of the landfill vents. Passive venting above the plant provides an effective dispersive control comparable to the landfill vent system.

[Comment:] Based on the November BCT discussions the Army has agreed to, as a snapshot, field screen the monitoring wells for methane during the next groundwater monitoring event. MassDEP believes that obtaining actual data from the monitoring wells will be useful step in developing a better understanding of methane migration adjacent to and downgradient of SHL. Please provide a copy of the sampling protocol to be used when measuring methane gas concentration at the groundwater wells.

Army Response: As discussed above, the Army decided to conduct dissolved methane sampling at a number of well screens in combination with vadose zone gas sampling. This approach provided a good assessment of the three dimensional dissolved methane/ethane concentrations downgradient coupled with an assessment of whether this dissolved methane is "off-gassing" at concentrations into adose zone gas that are detectable or present hazard. No methane has been detected in the vadose zone and a number of sampling points.

[Comment:] Because the extraction wells effluent has concentrations of methane as high as 12,000 ppb that was unanticipated and the variation of landfill gas measurement results, it may be necessary to measure methane concentrations in the groundwater in addition to the well head survey. But MassDEP hopes that this screening effort will facilitate resolution on the issues outlined above. As an example, in the 2004 Shepley's Hill Landfill Annual Report (Report), the landfill gas monitoring data at vents V-2, V-3, V-9, and V-10, at northern and oldest portion of the landfill recorded more than 5 % methane concentration, and vent V-9 has methane concentration as high as 23.9 %. On the other hand vent V-18 at southern and youngest portion

of the landfill, which recorded nothing but oxygen concentration of 21.2 %, which is not consistent with previous sampling results. MassDEP requests that the Army consider installing several additional gas probes at the northern perimeter of the landfill since elevated methane concentrations from groundwater wells are present with pump and treat system.

Army Response: Please refer to the responses to the previous comments. Considerable work was conducted this past fall to further characterize groundwater dissolved methane and vadose zone methane. Vadose zone methane gas was not detected at new temporary gas probes located downgradient of the landfill (please refer to Table 2).

[Comment:] As you know, the Solid Waste Program requirements prohibit methane migration and requires gas monitoring on and surrounding a landfill. These requirements are based on landfill siting and construction per statutory requirement of a four-foot separation between the seasonal high groundwater elevation and the bottom of waste. Given that this condition does not exist at SHL and groundwater elevations did not decrease after the installation of the cap, the specific requirement for gas migration monitoring at SHL should be tailored to the site-specific circumstances, which MassDEP has requested be evaluated in the CSA.

Army Response: Army monitoring of landfill gas has been occurring annually at fixed gas probes and the landfill vents. The monitoring is consistent with DEP requirements for gas monitoring provided in the *Landfill Technical Guidance Manual,* MA DEP, Division of Solid Waste Management (Revised May, 1997) and other EPA guidance. In addition, gas probes were installed this past fall at the north end of the landfill and did not detect methane in the vadose zone near the edge of the landfill cap or at a distance toward Scully Road and to the north.

[Comment:] The methane monitoring that the Army has agreed to perform will help in developing a reasonable CSM for methane and help focus any additional gas monitoring locations. It would be prudent to develop a preliminary methane gas distribution investigation in conjunction with the gas monitoring probes at the southern perimeter of the landfill along the commercial properties and the northern perimeter of the landfill.

Army Response: Additional monitoring work related to evaluating the presence or absence of vadose zone methane gas has been conducted north of the landfill. In addition dissolved methane in groundwater data were collected in December. The permanent gas monitoring probes installed along the southern perimeter of the landfill were all 0 % methane when sampled in December, 2006. These probes were installed in late 2005.

If you have any questions or require further clarification please contact Ms. Hui Liang at the letterhead address or call (508) 767-2762.

Attachment
Data Summaries

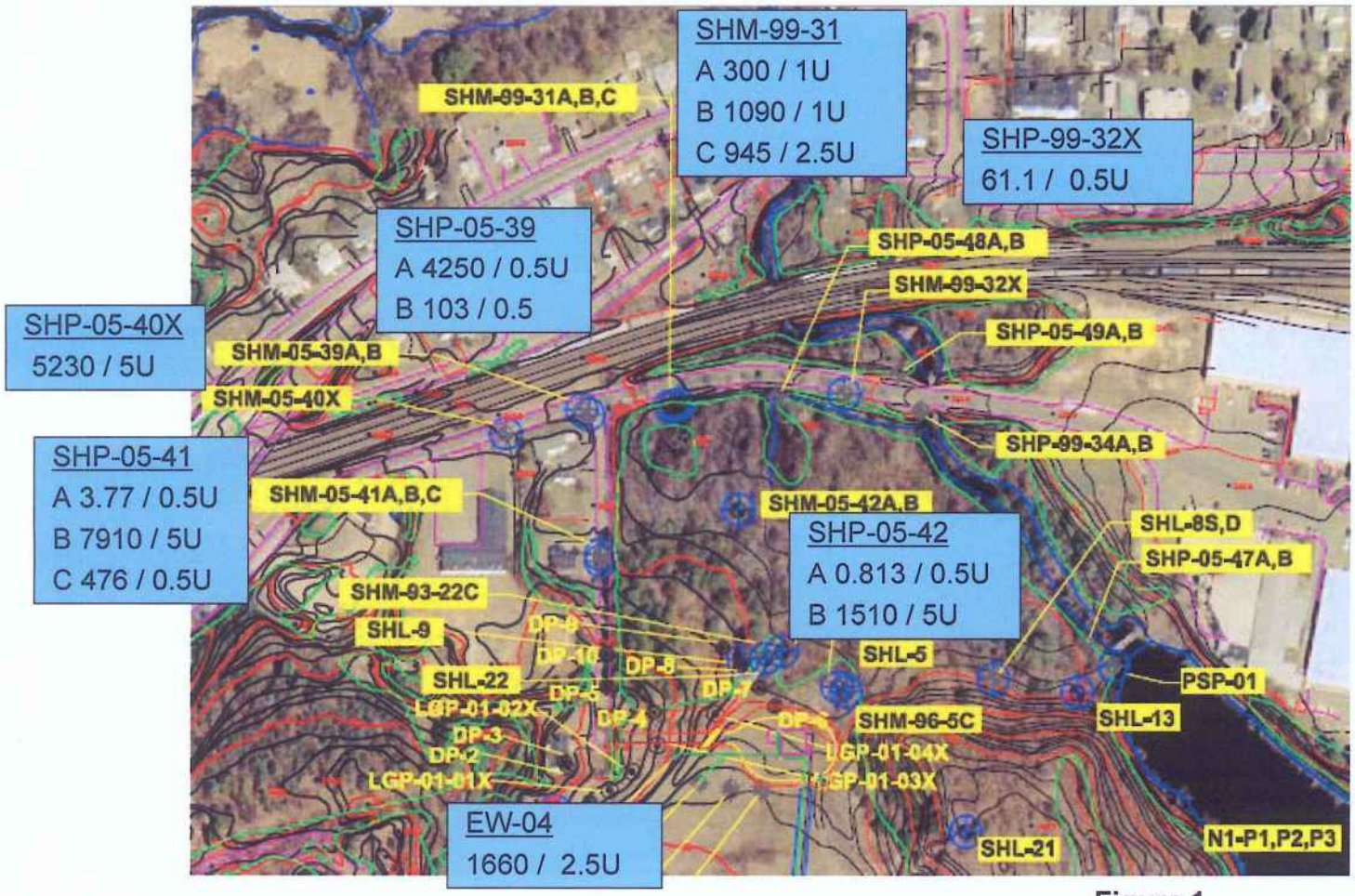


Figure 1
Shepley's Hill Landfill
12/2006 Groundwater
Dissolved Methane/Ethane Data

Note: Dissolved methane / ethane in ug/L. Groundwater monitoring wells, permanent gas probes (LGP-01-01X through LGP-01-04X), and temporary gas probes (DP-1 through DP-10) are identified.

CH2MHILL

Table 1 Dissolved Methane/Ethane in Groundwater

		Influent/Effluent Monitoring													
LOCATION/SAMPLE ID		INFLUENT 0909		INFLUENT-0929		EFFLUENT-0929		INFLUENT EW1 -0310		EFFLUENT -0310		061306INF		EW225120706	
SAMPLING DATE		09-SEP-05		29-SEP-05		29-SEP-05		10-MAR-06		10-MAR-06		13-JUN-06		07-DEC-06	
LAB SAMPLE ID		L0510469-01		L0511503-02		L0511503-01		L0603376-02		L0603376-01		L0608216-09		L0617737-02	
SAMPLE LOCATION		Influent		Influent		Effluent		Influent		Effluent		Influent		Influent	
Pumping Rate		25 gpm		25 gpm		25 gpm		25 gpm		25 gpm		25 gpm		50 gpm	
	Units		Qual		Qual		Qual		Qual		Qual		Qual		
Dissolved Gases by GC															
Methane	ug/l	12100		4190		910		8270		3200		6060		1660	
Ethane	ug/l	1.23		0.5	U	0.5	U	0.9		0.5	U	0.628		2.5	U

		Downgradient Transect (S to N)		
LOCATION/SAMPLE ID		B4SHM0541BW		B4SHM0539BW
SAMPLING DATE		08-JUN-06		13-JUN-06
LAB SAMPLE ID		L0608066-05		L0608216-07
SAMPLE LOCATION		SHM-05-41B		SHM-05-39B
	Units		Qual		Qual
Dissolved Gases by GC				
Methane	ug/l	7920		232
Ethane	ug/l	0.5	U	0.594

		Downgradient - Woods (W to E)										*Downgradient - Molumco Road (W to E)*									
LOCATION/SAMPLE ID		B6SHM0541AW		B6SHM0541BW		B6SHM0541CW		B6SHM0542AW		B6SHM0542BW		B6SHM0540XW		B6SHM0539AW		B6SHM0539BW		B6SHM9931AW		B6SHM9931BW		B6SHM9931CW		B6SHM9932XW	
SAMPLING DATE		06-DEC-06		06-DEC-06		06-DEC-06		07-DEC-06		07-DEC-06		06-DEC-06		06-DEC-06		12-DEC-06		07-DEC-06		07-DEC-06		07-DEC-06		07-DEC-06	
LAB SAMPLE ID		L0617627-04		L0617627-05		L0617627-06		L0617726-05		L0617726-03		L0617627-08		L0617627-07		L0617995-03		L0617726-08		L0617726-07		L0617726-06		L0617726-09	
SAMPLE LOCATION		SHM-05-41A		SHM-05-41B		SHM-05-41C		SHM-05-42A		SHM-05-42B		SHM-05-40X		SHM-05-39A		SHM-05-39B		SHM-05-31A		SHM-05-31B		SHM-05-31C		SHM-05-32X	
	Units		Qual		Qual		Qual		Qual		Qual		Qual		Qual		Qual		Qual		Qual		Qual		Qual
Dissolved Gases by GC																									
Methane	ug/l	3.77		7910		476		0.813		1510		5230		4250		103		300		1090		945		61.1	
Ethane	ug/l	0.5	U	5	U	0.5	U	0.5	U	5	U	5	U	0.5	U	0.5	U	1	U	1	U	2.5	U	0.5	U

Table 2

Revision: 2/12/07

2006 LANDFILL GAS MONITORING
SHEPLEY'S HILL LANDFILL
DEVENS, MA

Inspectors: Bakey/ Reault

Date:	Barometer at Start:	End:	Time Started:	End:	Weather
10/31/2006	29.99"	29.79"	0710	1400	Partly Cloudy 40 -65° F
12/11/2006	30.33"	30.37"	0830	1430	Clear, 30's
12/14/2006	30.01"	29.94"	0730	1400	Clear, 50's

ID#	VOCs ppm PID	O2 % IR	H2S ppm CGI	% LEL CGI	CO ppm CGI	CO2 % IR	Methane % IR	Remarks
V-1	0.0	6.5	0.0	95.0	4.0	10.9	1.9	12/14/2006 survey
V-2	0.0	5.2	0.0	>100	6.0	15.6	11.5	"
V-3	0.0	6.5	0.0	>100	6.0	18.9	10.9	"
V-4	0.0	10.0	0.0	52.0	2.0	8.8	1.2	"
V-5	0.6	17.9	0.0	2.0	2.0	6.3	2.0	"
V-6	0.0	1.3	0.0	>100	8.0	21.2	14.4	"
V-7	0.0	1.1	0.0	>100	8.0	17.1	6.0	"
V-8	0.0	16.3	0.0	23.0	3.0	11.6	1.2	"
V-9	0.0	6.5	0.0	>100	6.0	23.6	32.0	"
V-10	0.0	8.5	0.0	>100	7.0	17.9	9.6	"
V-11	0.0	10.7	0.0	>100	6.0	7.2	3.3	"
V-12	0.2	21.0	0.0	0.0	0.0	0.1	0.0	"
V-13	0.2	20.1	0.0	0.0	0.0	0.2	0.0	"
V-14	0.1	21.0	0.0	13.0	0.0	0.4	0.1	"
V-15	0.2	21.0	0.0	4.0	0.0	0.4	0.1	"
V-16	0.0	20.1	0.0	1.0	0.0	1.1	0.2	"
V-17	0.0	9.2	0.0	>100	5.0	16.5	17.4	"
V-18	0.0	21.0	0.0	0.0	0.0	0.2	0.0	"
LGP-01-01X	0.0	20.9	0.0	0.0	0.0	0.0	0.0	12/11/2006 survey
LGP-01-02X	0.0	20.4	0.0	0.0	1.0	1.2	0.0	"
LGP-01-03X	0.0	20.6	0.0	0.0	0.0	1.7	0.0	"
LGP-01-04X	1.5	20.6	0.0	0.0	0.0	0.5	0.0	"
LGP-05-05X	0.0	20.3	0.0	0.0	0.0	1.5	0.0	"
LGP-05-06X	0.0	18.2	0.0	0.0	1.0	2.8	0.0	"
LGP-05-07X	0.3	17.3	0.0	0.0	1.0	4.1	0.0	"
LGP-05-08X	0.0	10.4	0.0	0.0	4.0	12.3	0.0	"
LGP-05-09X	0.1	11.0	0.0	1.0	4.0	8.8	0.0	"
LGP-05-10X	0.3	12.6	0.0	2.0	4.0	10.4	0.0	"
LGP-05-11X	2.2	6.9	0.0	2.0	3.0	15.0	0.0	"
LGP-05-12X	--	--	--	--	--	--	--	not installed
LGP-05-13X	0.2	18.5	0.0	0.0	0.0	3.2	0.0	12/11/2006 survey
LGP-05-14X	0.4	8.9	0.0	0.0	3.0	5.1	0.0	"
DP-1	0.0	20.3	0.0	0.0	0.0	0.4	0.0	10/31/2006 temporary soil gas survey
DP-2	0.0	20.7	0.0	0.0	0.0	0.6	0.0	"
DP-3	0.0	21.1	0.0	0.0	0.0	0.6	0.0	"
DP-4	0.0	20.5	0.0	0.0	0.0	0.7	0.0	"
DP-5	0.0	20.9	0.0	0.0	0.0	0.7	0.0	"
DP-6	0.0	19.7	0.0	0.0	0.0	0.5	0.0	"
DP-7	0.0	17.8	0.0	0.0	0.0	2.2	0.0	"
DP-8	0.0	21.1	0.0	0.0	0.0	0.3	0.0	"
DP-9	0.0	21.0	0.0	0.0	0.0	0.3	0.0	"
DP-10	0.0	20.7	0.0	0.0	0.0	0.5	0.0	"
SHM-99-31-GP	0.0	20.6	0.0	0.0	0.0	0.4	0.0	12/11/2006 temporary soil gas survey
SHP-99-32X-GP	0.3	20.6	0.0	0.0	0.0	0.5	0.0	"
SHP-05-39-GP	0.0	20.0	0.0	0.0	3.0	1.2	0.0	"
SHP-05-40X-GP	0.1	20.2	0.0	0.0	0.0	1.2	0.0	"
SHP-05-41GP	4.6	20.6	0.0	0.0	2.0	0.4	0.0	"
SHP-05-42-GP	--	--	--	--	--	--	--	Not sampled due to standing water

Equipment and Calibration Information

Instrument: Thermo Environmental 580B PID 10.6 (Pine ID#6416);Calibrated by Pine Env. 10/31/06 w/ 100 ppm isobutylene (Lot #100 Iso 88410).
Thermo Environmental 580B PID 10.2 (S.N. 242); Calibrated by T. Bakey 12/11/06 and D. Reault 12/14/2006 w/ 100 ppm isobutylene (Lot #90295).

Instrument: Industrial Scientific TMX 412 (Pine ID# 6416); Calib'd by T. Bakey 10/31/06 w/ Cal Gas (Lot# 84993A) 50 ppm CO, 50% LEL, 20.9% O2, 25 ppm H2S.
Industrial Scientific TMX 412 (S.N. 9809009-444); Calib'd by T. Bakey 12/11/06 and D. Reault 12/14/2006 w/ US Env. Cal Gas (Lot# 004266) 50 ppm CO, 50% LEL, 20.9% O2, 25 ppm H2S.

Instrument: GEM 2000 (S.N. GM07991105); Calib'd by Pine Env. on 10/27/06 with 35 ppm CO2, 50ppm CH4, and 20.9 % O2 (Lot #1).
GEM 500 (S.N. E0985); Calibrated by US Env. on 12/11/06 with 35 ppm CO2, 50ppm CH4, and 20.9 % O2; Calibrated by D. Reault on 12/14/06 with 35 ppm CO2, 50ppm CH4, and 20.9 % O2.

NOTES:

V= Landfill gas vent
LGP= Landfill gas well point
DP = Direct push soil gas survey point
GP= Temporary gas point at select downgradient monitoring well locations

Barometric pressures were obtained from http://www.widespread.com for Ayer, MA
Unless otherwise indicated, LEL readings from the GEM 2000 and TMX 412 were the same. If two readings given, the first reading represents the GEM 2000 and the second reading represents the TMX 412 reading.

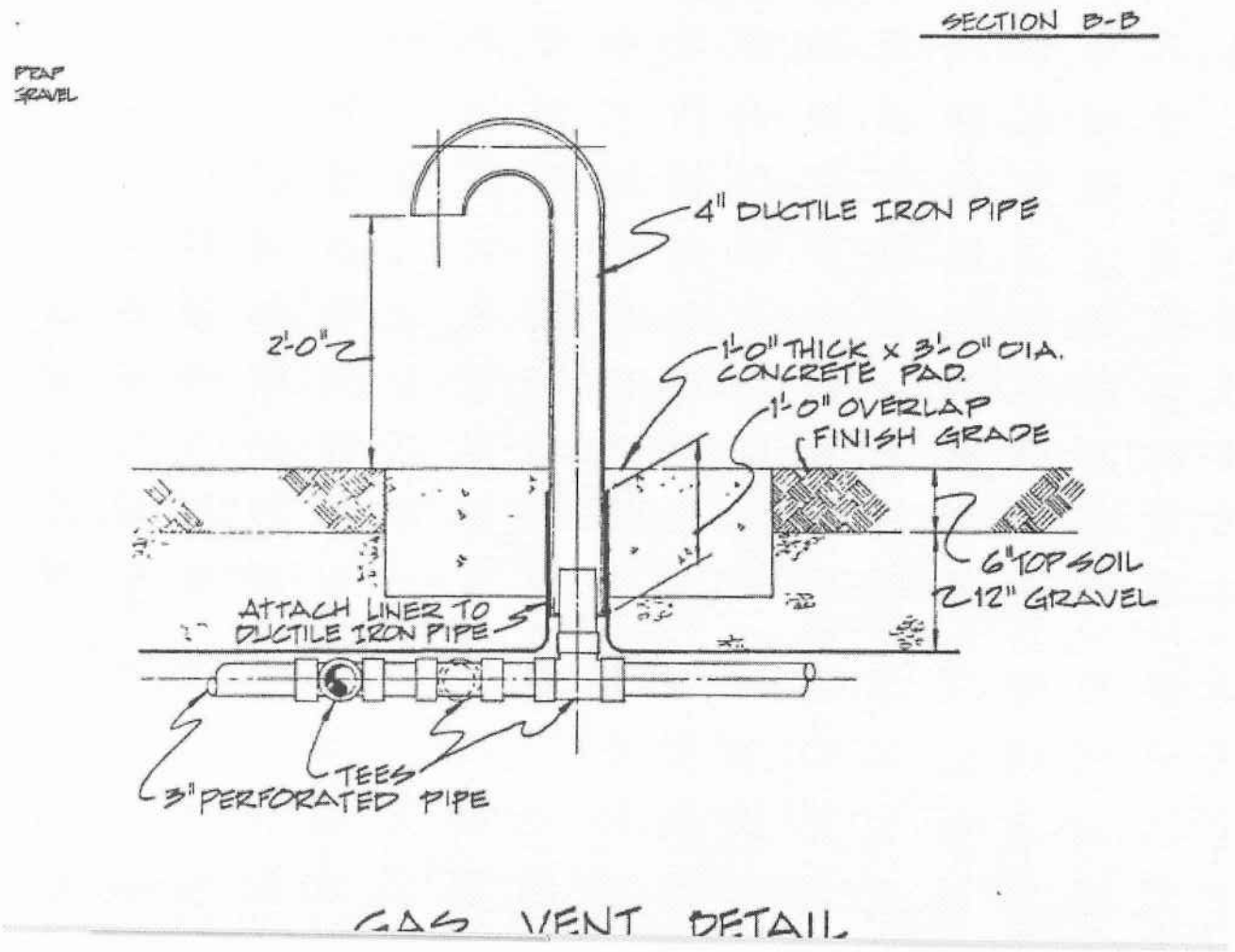
Table 3 Well Construction Summary -- Downgradient Wells Sampled for Methane/Ethane (December, 2006)

``	Ground Surface(1)	Screened Interval	Screened Elevation	Geologic Designation	Average Arsenic (2)) ug/L
DOWNGRADIENT (MOLUMCO ROAD)					
SHM-05-40X	**224.6**	32.0 - 34.0	192.6 - 190.6	Mid-Depth Overburden/Till	**3638**
SHM-05-39A	**222.9**	37.0 - 39.0	185.9 - 183.9	Mid-Depth Overburden	**283**
SHM-05-39B	**222.9**	66.0 - 68.0	156.9 - 154.9	Deep Overburden	**485**
SHP-99-31A	**213.8**	4.0 - 14.0	209.8 - 199.8	Shallow Overburden/WT	**17**
SHP-99-31B	**213.5**	50.0 - 60.0	163.5 - 153.5	Mid-Depth Overburden	**67**
SHP-99-31C	**213.5**	68.0 - 78.0	145.5 - 135.5	Deep Overburden	**294**
SHX-99-32X	**220.1**	72.0 - 82.0	148.1 - 138.1	Deep Overburden	**183**
DOWNGRADIENT (WOODS)					
SHM-05-41A	**223.8**	42.0 - 44.0	181.8 - 179.8	Shallow Overburden	**51**
SHM-05-41B	**223.6**	62.0 - 64.0	161.6 - 159.6	Mid-Depth Overburden	**2445**
SHM-05-41C	**224.0**	88.0 - 93.0	136.0 - 131.0	Deep Overburden/Till	**613**
SHM-05-42A	**214.5**	40.0 - 42.0	174.5 - 172.5	Shallow Overburden	**5 U**
SHM-05-42B	**214.5**	70.0 - 72.0	144.5 - 142.5	Mid-Depth Overburden	**254**
EXTRACTION WELLS					
EW-04	**228.5**	70.0 - 95.0	158.5 - 133.5	Mid to Deep Overburden	**4793**
EW-01	**228.2**	60.0 - 85.0	168.2 - 143.2	Mid to Deep Overburden	**2757**

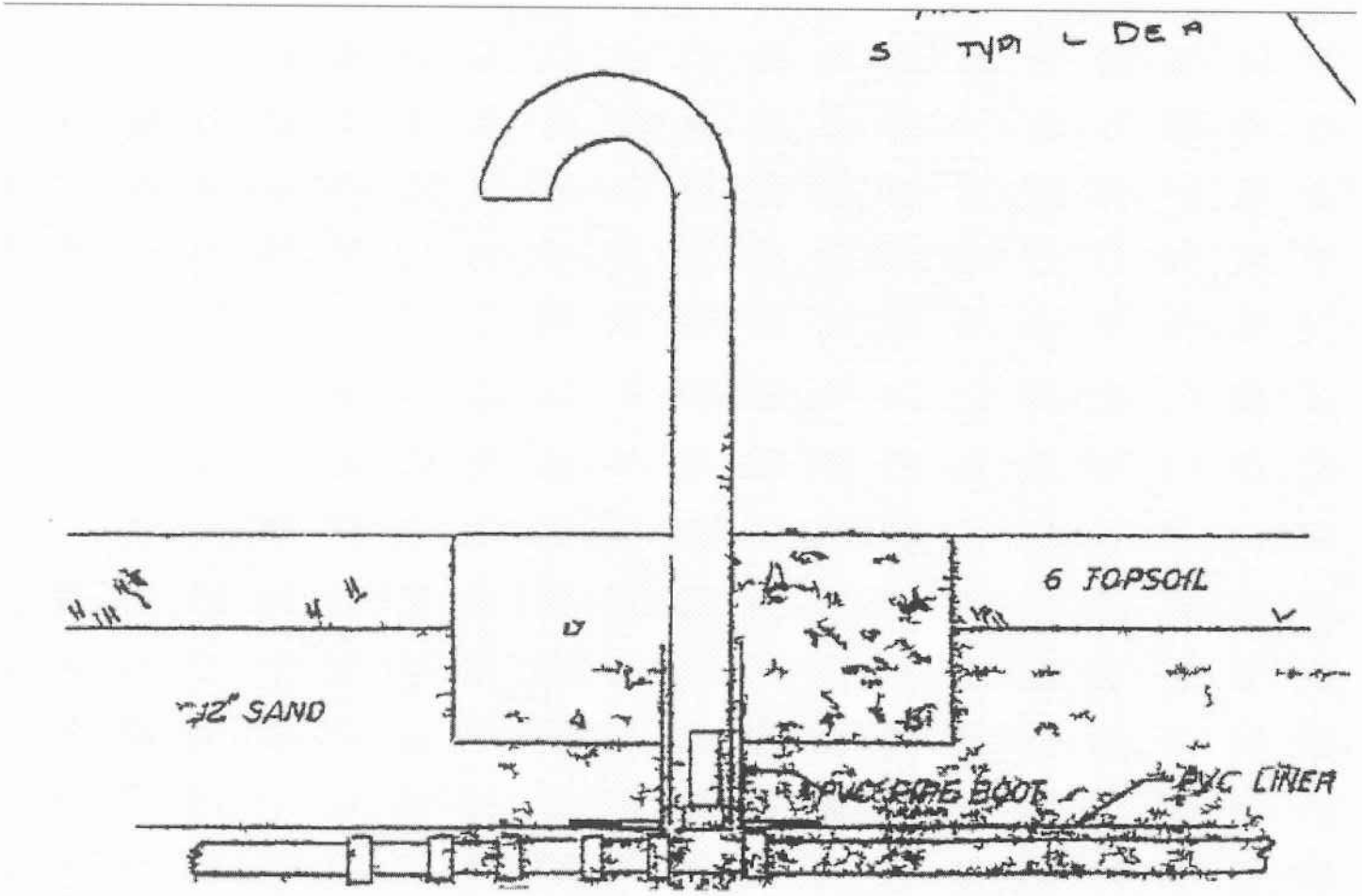
(1) Includes ground surface from published well completion log . If not available, ground surface elevation from Meridian Associates Inc. survey July/Aug 2005 used.

(2) Average for PMP wells 4 events 8/05-9/06; EW-01 and EW-04 arsenic levels based on 3 events with either well operating at 25 gpm alone.

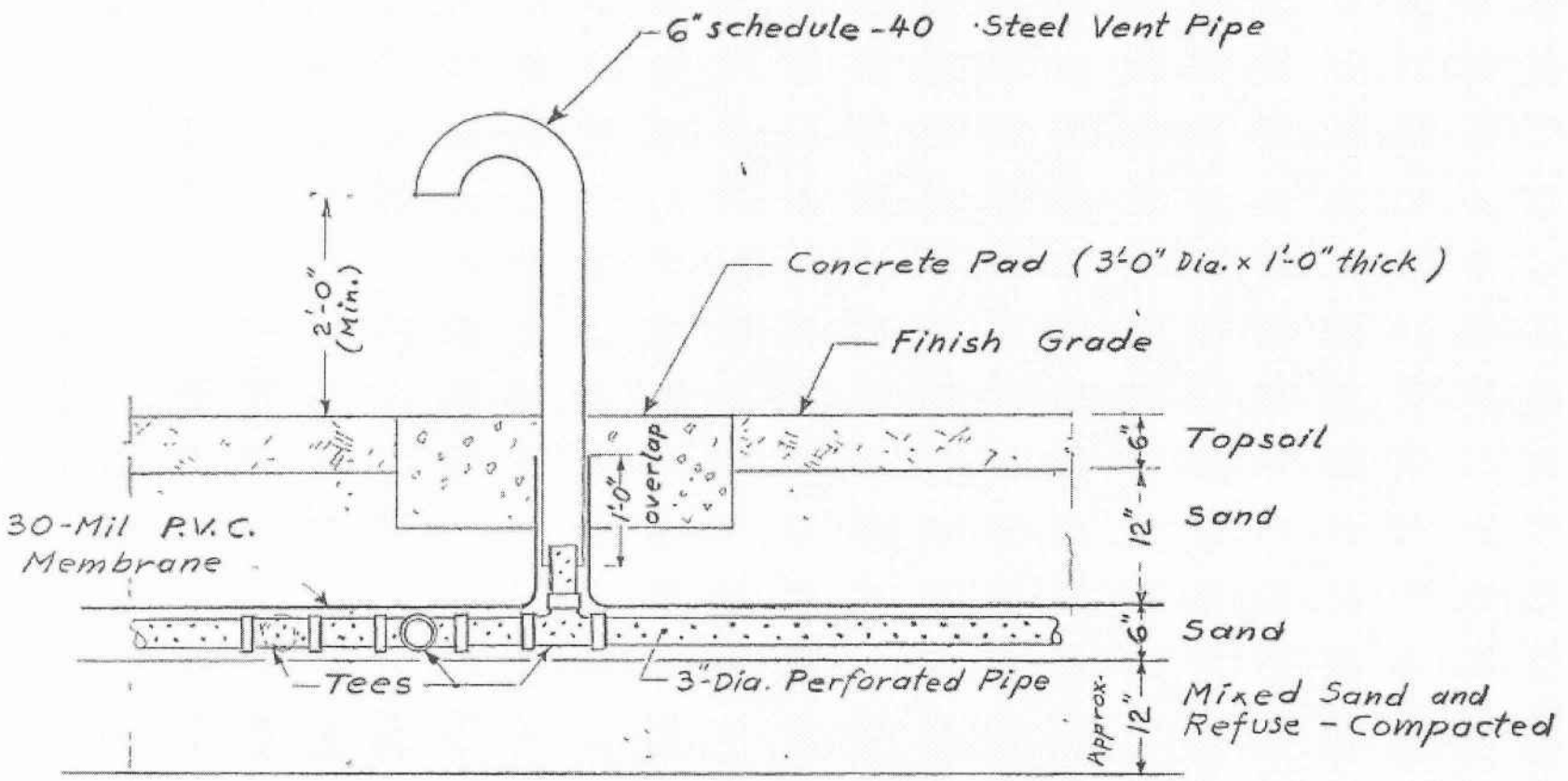
Phase I – Vent Detail



Phase II – Vent Detail

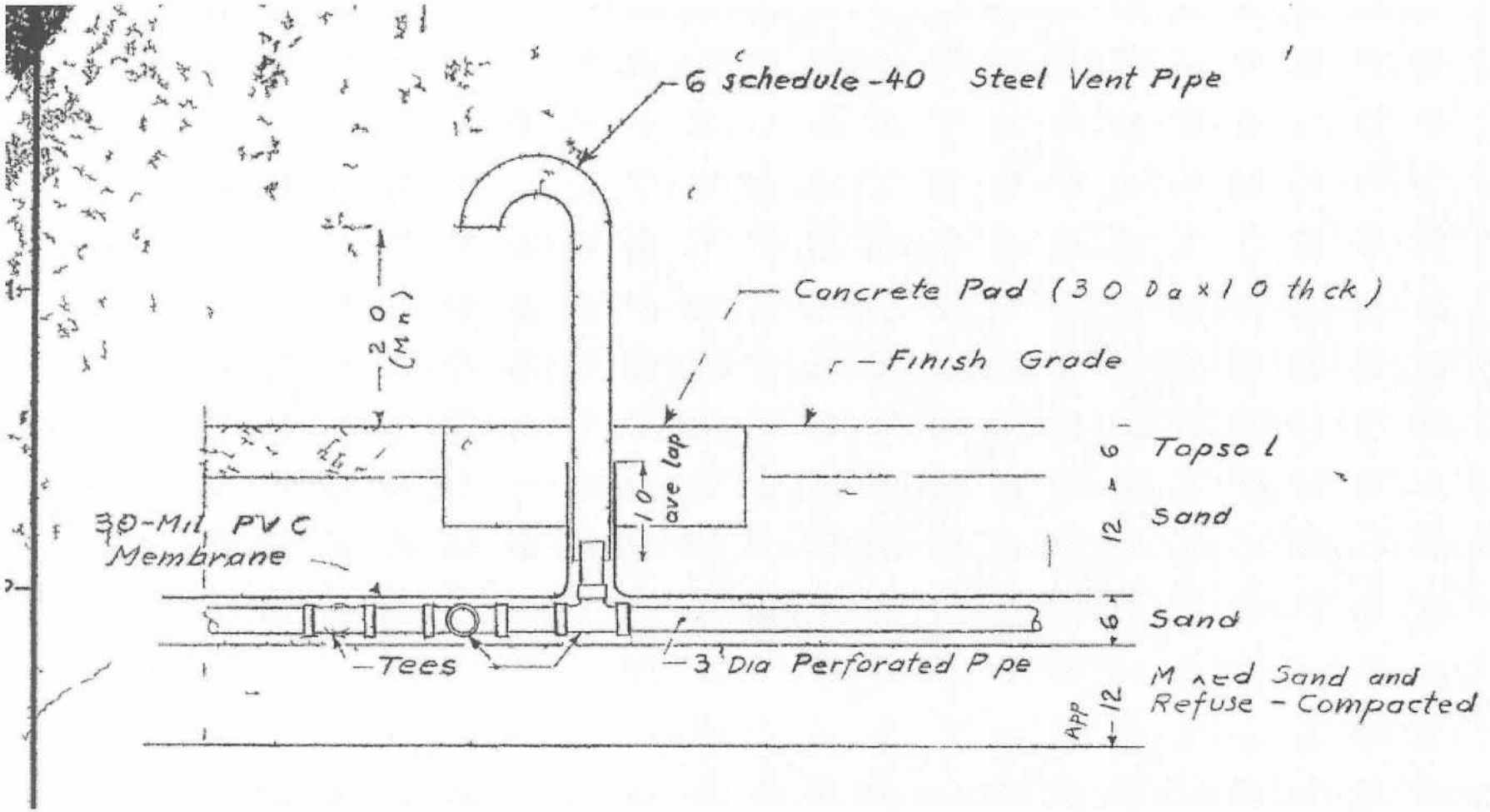


Phase III – Vent Detail



GAS VENT DETAIL

Phase IV – Vent Detail



Harding ESE
A MACTEC COMPANY

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January 11, 2002

Mr. David Margolis
U.S. Army Corps of Engineers
696 Virginia Road
Concord, Massachusetts 01742-2751

Subject: **Installation of Landfill Gas Monitoring Probes**
Shepleys Hill Landfill
Devens RFTA, Devens, MA

Dear Mr. Margolis:

On November 7, 2001, Harding ESE and its subcontractor, Environmental Drilling, Inc., installed four landfill gas monitoring probes at the northwest edge of Shepley's Hill Landfill as directed by USACE. These probes were located to monitor landfill gas migration from Shepley's Hill Landfill towards Sculley Road in Ayer. The probes were installed by Geoprobe at depths and at a horizontal spacing consistent with the Massachusetts Landfill Technical Guidance Manual, revised May 1997.

Enclosed is a figure showing the surveyed locations of the probes and a second figure showing typical construction details. The location and elevation coordinates of the points are listed below.

Description	North	East	Ground Elevation
LGP-01-01X	567264.5354	573388.7461	241.80
LGP-01-02X	567281.4696	573505.5082	235.01
LGP-01-03X	567344.7430	573587.1202	231.30
LGP-01-04X	567405.3548	573663.4810	222.69

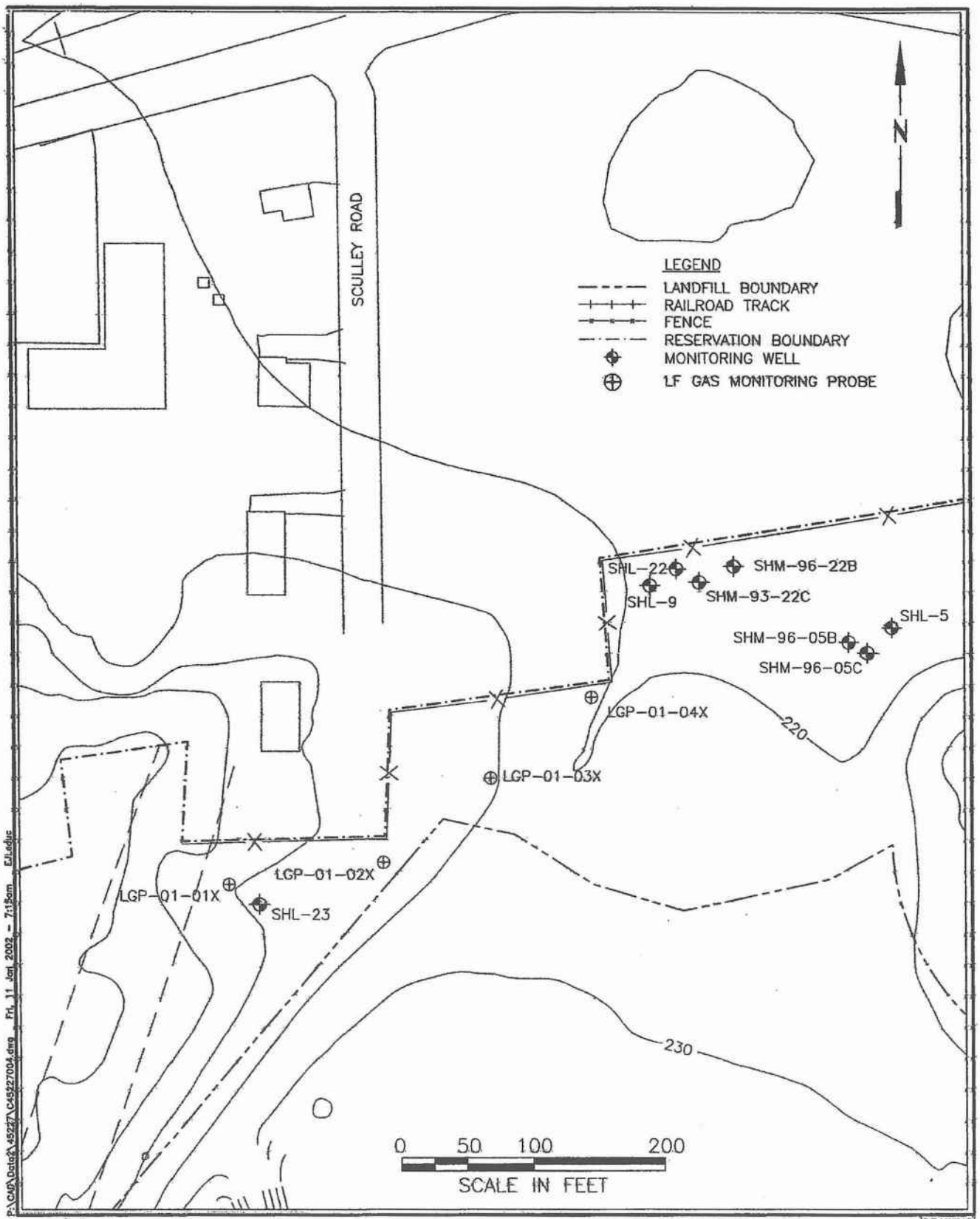
1. Survey by Martinage Engineering Associates, Inc. Reading, Massachusetts, January 2002.
2. Coordinates based on survey points established by Golden Land Survey and noted as Massachusetts Coordinate System. Elevations are NGVD Datum.

Please contact me if you have any questions concerning the landfill gas monitoring points, this leter, or the enclosed figures.

Sincerely,
Harding ESE, Inc.
A MACTEC Company

Stanley W. Reed, P.E.
Project Manager

enc.



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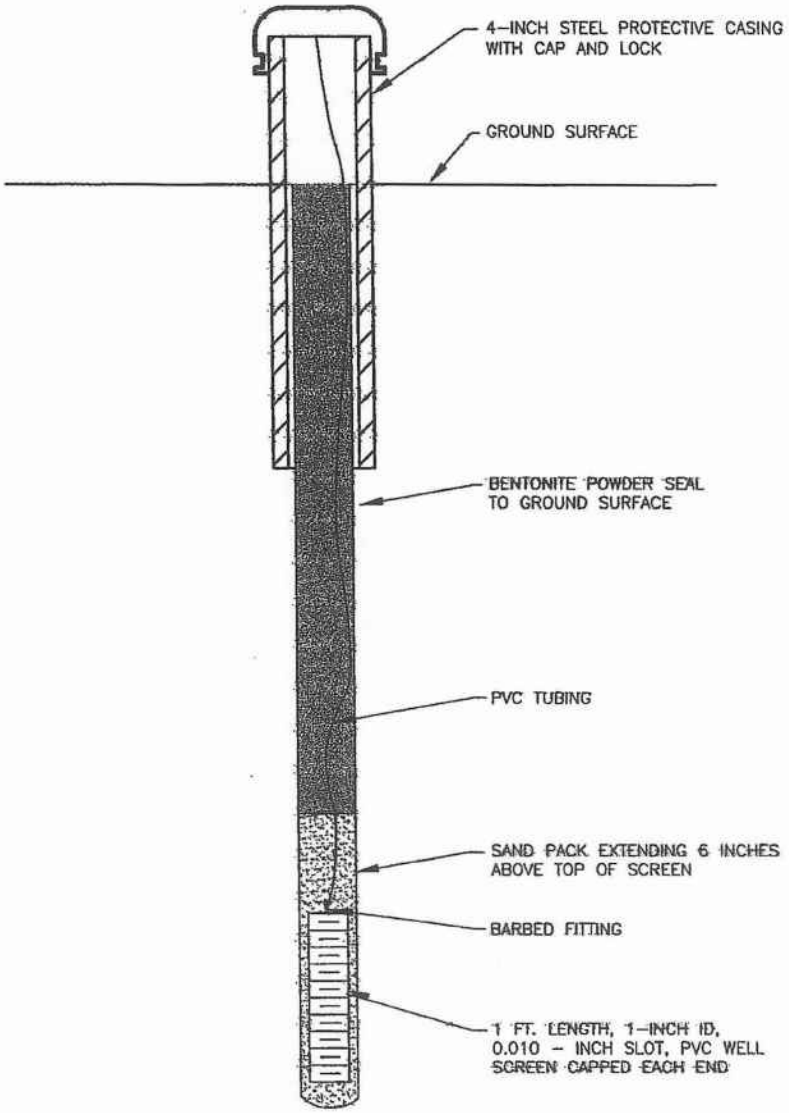
Harding ESE
A MACTEC COMPANY

LANDFILL GAS MONITORING PROBE LOCATIONS
SHEPLEY'S HILL LANDFILL
DEVENS RFTA, DEVENS MA.

DRAWING C-1 1/2

DRAWN	PROJECT NUMBER	APPROVED	DATE	REVISED DATE
EJL	45227/9938-03		01/10/02	



NOTE:
SCREENED INTERVALS

LGP–01–01X	5 TO 6 Ft. bgs
LGP–01–02X	5 TO 6 Ft. bgs
LGP–03–01X	5 TO 6 Ft. bgs
LGP–01–04X	3 TO 4 Ft. bgs

NOT TO SCALE

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Harding ESE
A MACTEC COMPANY

TYPICAL DETAIL
~~LANDFILL GAS MONITORING PROBE~~
SHEPLEY'S HILL LANDFILL
DEVENS RFTA, DEVENS MA.

DRAWING C–2 2/2

DRAWN	PROJECT NUMBER	APPROVED	DATE	REVISED DATE
EJL	45227/9938–03		01/11/02	

TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE *(Read instructions on reverse side prior to initiating this form)*	DATE December 9, 2005	TRANSMITTAL NO: 05-007

SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS (This section will be initiated by the Contractor)

TO:	FROM:	CONTRACT NO:	CHECK ONE:
U.S. Army Corps of Engineers 50 MacArthur Avenue Building 689, Section A Devens, MA 01434	Nobis Engineering, Inc. 439 South Union Street Building 2, Suite 207 Lawrence, MA 01843	DACA33-03-D-0005	X THIS IS A NEW TRANSMITTAL THIS IS A RESUBMITTAL OF TRANSMITTAL -

SPECIFICATION SECTION NO: (Cover only one section with each transmittal)	PROJECT TITLE AND LOCATION: **Shepley's Hill Landfill Cap Maintenance Shepley's Hill Landfill Devens, Massachusetts**

ITEM NO. a.	DESCRIPTION OF ITEM SUBMITTED (Type, size, model number, etc.) b.	MFG. OR CONTR. CAT. CURVE DRAWING OR BROCHURE NO. (See instruction No. 8) c.	NO. OF COPIES d.	CONTRACT REFERENCE DOCUMENT SPEC. PARA. NO. e.	CONTRACT REFERENCE DOCUMENT DRAWING SHEET NO. f.	FOR CONTRACTOR USE CODE g.	VARIATION (See instruction No. 6) h.	FORCE USE CODE i.
1	Cut Sheet-Typical Detail, Landfill Gas Monitoring Probe	---	1	---	---	---	---	

REMARKS

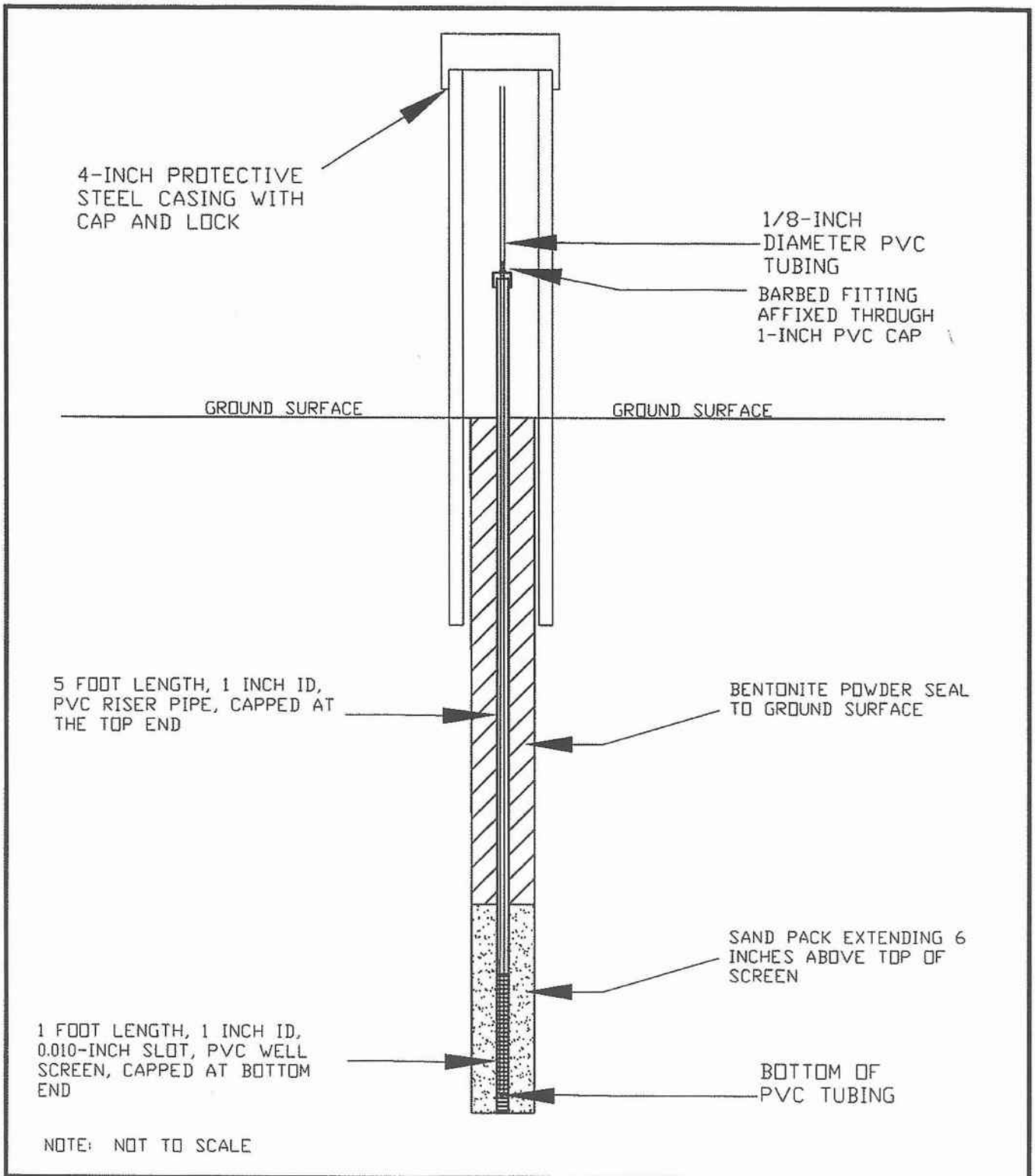
I certify that the above submitted items have been reviewed in detail and correct and in strict conformance with the contract drawings and specifications except as otherwise stated.

Adam Roy

NAME AND SIGNATURE OF CONTRACTOR

SECTION II - APPROVAL ACTION

ENCLOSURES RETURNED (List by Item No.)	NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY	DATE



Nobis Engineering, Inc.
18 Chenell Drive
Concord, NH 03301
Tel (603) 224-4182
Fax (603) 224-2507
www.nobisengineering.com

FIGURE 1

TYPICAL DETAIL

LANDFILL GAS MONITORING PROBE
SHEPLEY'S HILL LANDFILL
DEVENS, MA

PROJECT 74040 | DECEMBER 2005

Appendix C
Groundwater Field Analysis Forms
(See Enclosed CD)

Appendix C
Groundwater Field Analysis Forms

Downgradient

SHM-05-40X

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHM-05-40X Date: 4-11 Time: 1125
Weather Conditions Sunny, 60's
PID Clear 60 F (ppm) Condition good - NO LOCK
Sample Team TB + DR

Well Stabilization Data

Well Depth 33.98 (FT.) Datum BTOPVCC
Static Water Level 14.03 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: Low Flow / peristaltic

Time Purging begins (T_o): 1125
Water Level at time T_o: 14.03
Time Purging ends: (T_1) 1200
Water Level at time T_1: 14.06

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate - (Lpm) 0.3 to 0.5LPM	Appearance
1143	5L	6.74	.345	12.68	-128.2	14.06	.55	24.2	0.38	
1148	7L	6.70	.340	12.73	-129.8	14.06	.53	13.0		
1153	9L	6.66	.339	12.84	-129	14.06	.53	7.4	.38	
1157	11L	6.65	.337	12.70	-130	14.06	.52	6.38	.38	
	AFTER SAMPLING	[redacted]						[redacted]		

SAMPLING

Date: 4/11/06
Time: 1215
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha Method of Shipment: Courier
Remarks: ID = BBSHM0540X(W)

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.L (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM - 05 - 39A

Downgradient.

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHM-05-39A Date: 4/11/06 Time: 1105
Weather Conditions clear 60°F
PID N/A (ppm) Condition good - no lock
Sample Team TB/DR

Well Stabilization Data

Well Depth 39.47 (FT.) Datum BTOC
Static Water Level 11.21 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: low-flow/peristaltic

Time Purging begins (T_o): 1050
Water Level at time T_o: 11.21
Time Purging ends: (T_1) 1150
Water Level at time T_1: 11.39

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) <0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1110	2.561	6.75	.629	11.81	-95	11.39	2.10	1.15	0.5	clear
		6.44	.583	11.48	-106	11.39	.65	1.33	0.5	
1122		6.45	.593	11.53	-109	11.39	.63	1.56	0.5	clear
1126		6.44	.586	11.63	-109	11.39	.63	0.83	0.5	
1130		6.45	.589	11.59	-110	11.39	.64	0.63	0.5	clear
	AFTER SAMPLING									

SAMPLING

Date: 4/11/06
Time: 1135
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.l. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks: ID = B3SHM0539A(W)

SHM-99-39B

Downgradient.

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: Date: Time:
Weather Conditions
PID (ppm) Condition
Sample Team

Well Stabilization Data

Well Depth (FT.) Datum
Static Water Level 12.19 (FT.) Diameter:
Water Column (FT.) Purge Method:

Time Purging begins (T_o): 1045
Water Level at time T_o: 12.19
Time Purging ends: (T_1)
Water Level at time T_1:

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1101		6.83	.687	11.46	-74	20.02	0.56	10.19	0.4	clear
1108		6.84	.663	11.59	-81.8	22.60	0.90	7.15	.31	clear
		Water level dropped below 25' couldn't								
		Sample w/ peristaltic								
	AFTER SAMPLING									

SAMPLING

Date: **Time:** **Field Filtering:**
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (Inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

ID = B39H9939BW

SHM-05-39B

.163 90 670

Dewatered.

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHM-05-39B Date: 4/13/06 Time: 1249
Weather Conditions Clear 60°F
PID WA (ppm) Condition good - no lock
Sample Team TB / DR

Well Stabilization Data

Well Depth 68.02 (FT.) Datum BTOC
Static Water Level 12.90 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: Redi-Flow II / low-flow

Time Purging begins (T_o): 1250
Water Level at time T_o: 12.90
Time Purging ends: (T_1) 1340
Water Level at time T_1: 35.61

Time	Volume Removed	pH (+/- 0.1)	Conductivity (mS/cm) (+/- 3%)	TEMP.(C) (+/- 0.2 or 3%)	Redox (mV) (+/- 10 mV)	Water level (Ft) (< 0.3 ft)	D.O. (mg/L) (+/- 10%)	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
									0.5	Cloudy
		Pumping down w.t.								
1321	≈3.5gal	6.82	.765	13.49	-101	28.91		7999	0.5	Cloudy
1330	≈5.06	6.81	.773	13.88	-103	30.49	0.57	7999		
1340						35.61				
		Water level would not stabilize pumped dry &								
		Sampled								
	AFTER SAMPLING	[redacted]						[redacted]		

SAMPLING

Date: 4/13/06
Time: 1351
Field Filtering: _____
Sampling Methodology: Low Flow Sampling purge & sample
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B
Remarks: Also collected MS/MSD

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Actual S.T. = 1450

& DUP2

SHM-99-31A

Downgradient

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHM-99-31A Date: 4/11/06 Time: 1320
Weather Conditions Clear 60°F
PID NA (ppm) Condition Good
Sample Team TB/DR

Well Stabilization Data

Well Depth 15.72 (FT.) Datum BTOCP
Static Water Level [redacted] (FT.) Diameter: 2"
Water Column 2.68 (FT.) Purge Method: Low-flow/peristaltic

Time Purging begins (T_0): 1245
Water Level at time T_0 [redacted] 2.68
Time Purging ends: (T_1) [redacted] 1341
Water Level at time T_1 2.90

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1324	14L	6.22	.159	6.59	-1.9	2.90	0.49	1.14	0.4	
1329		6.00	.112	6.30	12.1	2.90	0.39	0.76		
1335	19L	5.99	.106	6.27	14.5	2.90	.39	.76	0.4	
1341	21L	5.97	.107	6.31	14.3	2.90	.39	[redacted].78		
		* reads 0.36 mg/L w/ YSI 55 in-situ probe								
	AFTER SAMPLING	[redacted]						[redacted]		

SAMPLING

Date: 4/11/06
Time: 1355
Field Filtering: No
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1 gallon = 3.78 liters

Remarks: ID = B3SHM9931AW

SHM-99-31B

Down gradient

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHM-99-31B Date: 4/11/06 Time: 1400
Weather Conditions Clear 60°F
PID NA (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth 61.41 (FT.) Datum BTOC (PVC)
Static Water Level 3.85 (FT.) Diameter: 2"
Water Column _____(FT.) Purge Method: low flow/ peristaltic

Time Purging begins (T_o): 1328
Water Level at time T_o 3.85
Time Purging ends: (T_1) 1412
Water Level at time T_1 + 3.68

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1400	14L	6.36	.162	9.98	-51	3.68	.37			
1404	16L	6.34	.169	10.02	-52	3.68	.38	.41	.45	clear
1408	18L	6.37	.178	10.12	-52	3.68	.40	.44	.45	clear
1412	20L	6.35	.173	9.98	-52	3.68	.40	.42	.45	clear
	AFTER SAMPLING									

SAMPLING

Date: 4/11/06
Time: 1421
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.L (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

LowFlowDataSheet.xlstemplate-low flow

ID = B3SHM99 31BW

SHM-99-31C

Downgradient.

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHM-99-31C Date: 4/11/06 Time: 1300
Weather Conditions Clear 60°F
PID NA (ppm) Condition good
Sample Team TB / BD

Well Stabilization Data

Well Depth 80.39 (FT.) Datum BTOC
Static Water Level 3.93 (FT.) Diameter: 2"
Water Column _____(FT.) Purge Method: low-flow / peristaltic

Time Purging begins (T_o): 1245
Water Level at time T_o ~~2.67~~ 3.93
Time Purging ends: (T_1) 1318
Water Level at time T_1 4.05

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1305	8L	6.56	.667	10.37	-105	4.05	.75	32.9	0.38	cloudy
1309	9L	6.55	.666	10.37	-106	4.05	.63	25.0	0.35	↓
1312	10L	6.55	.667	10.47	-106	4.05	.61	18.4	.35	↓
1315	11L	6.57	.670	10.53	-106	4.05	.57	17.1	.35	↓
1318	12L	6.56	.671	10.58	-107	4.05	.57		.35	
	AFTER SAMPLING									

SAMPLING

Date: 4/11/06
Time: 1329
Field Filtering: NO
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1 gallon = 3.78 liters

ID = B351993 1CW

SHM-99-32X

Downgradient.

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHM-99-32X Date: 4/11/06 Time: 1210
Weather Conditions clear 60°F
PID NA (ppm) Condition good - NO Lock
Sample Team TB/DR

Well Stabilization Data

Well Depth 85.49 (FT.) Datum BTOPJCC
Static Water Level 9.54 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: low - flow peristaltic

Time Purging begins (T_o): 1142
Water Level at time T_o: 9.54
Time Purging ends: (T_1) 1225
Water Level at time T_1: 9.59

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1212	~2.5L	6.56	.720	10.72	-101	9.59	.85	15.3	.35	clear
1217	~5L/2.5	6.56	.720	10.81	-103	9.59	.69	14.3	↓	clear
1221	11.5L	6.57	.718		-104	9.59	.68	14.7	↓	clear
1225	13L	6.55	.719	10.74	-104	9.59	.65	14.6	↓	
	AFTER SAMPLING	[redacted]						[redacted]		

SAMPLING

Date: 4/11/06
Time: 1245
Field Filtering: No
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

ID = B3 SHM 9932XW

LowFlowDataSheet.xlstemplate-low flow

SHM-05-41A

Downgradient (new)

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHM-05-41A Date: 4/11/06 Time: 1009
Weather Conditions Clear 50°F
PID NA (ppm) Condition No odor
Sample Team TB/DR

Well Stabilization Data

Well Depth 44.65 (FT.) Datum BTOPVCC
Static Water Level 9.94 (FT.) Diameter: 2"
Water Column _____(FT.) Purge Method: low-flow- peristaltic

Time Purging begins (T_o): 0930
Water Level at time T_o: 9.94
Time Purging ends: (T_1) 1033
Water Level at time T_1: 10.09

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1011	12 L	6.46	.127	9.61	-22.8	10.09	0.91	95.0	0.33	clear
1016	14 L	6.37	.106	9.63	-9.1	10.09	0.46	41.6		
1022	16 L	6.35	0.094	9.69	-11.7	10.09	0.42	24.1	.34	
1027	17 L	6.33	0.093	9.67	-12.7	10.09	0.42	11.6		
1032	19 L	6.32	0.090	9.73	-13.6	10.09	0.40	6.62	.34	
	AFTER SAMPLING									

SAMPLING

Date: 4 / 11 / 06
Time: 1035
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks: ID = BBSHM0541AW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-05-41B

Downgradient (needs)

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHM-05-41B Date: 4-11-06 Time: 9:23
Weather Conditions: Sunny, 50's
PID: NA (ppm) Condition: no lock
Sample Team: DR + TB

Well Stabilization Data

Well Depth: 9.91 ≈ 70' (FT.) Datum: SHM-05-41B BTOPVC
Static Water Level: 10.02 (FT.) Diameter: 2"
Water Column: ______ (FT.) Purge Method: low-flow / peristaltic

Time Purging begins (T_0): 9:23
Water Level at time T_0: 9.91
Time Purging ends: (T_1) 9:55
Water Level at time T_1: 7.93

Time	Volume Removed	pH	Conductivity (mS/cm)	TEMP.(C)	Redox (mV)	Water level (Ft)	D.O. (mg/L)	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
		+/- 0.1	+/- 3%	+/- 0.2 or 3%	+/- 10 mV	< 0.3 ft	+/- 10%			
937	4 L	6.32	.578	9.52	-84.7	9.92	.71	23.4	0.38	
942	6 L	6.32	.580	9.55	-87.3	9.93	.69	16.8		
947	7.5	6.32	.582	9.56	-88.3	9.93	.68	9.50	0.34	
953	10 L	6.32	.584	9.61	-89.4	9.93	.66	5.61		
	AFTER SAMPLING									

SAMPLING

Date: 4/11/06
Time: 1003
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

ID = B3SH054BW

Downgradient well

SHM-05-41C

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHM-05-41C Date: 4/13/06 Time: 1350
Weather Conditions Cloudy / showers 50°F
PID NA (ppm) Condition NO ODOR
Sample Team TBLOR

Well Stabilization Data

Well Depth 93.47 (FT.) Datum BTOPVCC
Static Water Level 10.10 (FT.) Diameter: 2"
Water Column _____(FT.) Purge Method: low-flow peristaltic

Time Purging begins (T_o): 1259
Water Level at time T_o: 10.10
Time Purging ends: (T_1) 1402
Water Level at time T_1: 10.25

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1354	20L	6.99	.598	11.46	-146	10.25	.60	2.07	.45	
1358	22L	6.88	.595	11.37	-146	10.25	.56	1.99	.45	Clear
1402	24L	6.99	.595	11.49	-147	10.25	0.57	1.91	.45	
	AFTER SAMPLING									

SAMPLING

Date: 4/13/06
Time: 1415
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks: ID = B35HM0541C

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-05-42A

Downgradient (weeks)

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHM-05-42A Date: 4/14/06 Time: 0900
Weather Conditions Partly cloudy, 60's
PID NA (ppm) Condition good - no lock
Sample Team TB & DR

Well Stabilization Data

Well Depth ~42' (FT.) Datum BTOPVCC
Static Water Level 4.45 (FT.) Diameter: 1"
Water Column _____(FT.) Purge Method: low-flow/peristaltic

Time Purging begins (T_0): 848
Water Level at time T_0: 4.45
Time Purging ends: (T_1) 726
Water Level at time T_1: 4.55

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
905	5.5L	6.05	.049	9.06	122.9	4.55	5.09	7.03	.35	
912	9L	6.03	.048	9.33	117.2	4.55	5.15	11.3	.34	
919	11L	6.02	.047	9.46	120.0	4.55	5.26	3.82	.34	
	AFTER SAMPLING	[redacted]						[redacted]		

SAMPLING

Date: 4/14/06
Time: 0920
Field Filtering: No
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.l. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks: SAMPLED @ 0920

42B

Drawing (not to scale)

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHM-05-42B Date: 4/14/06 Time: 0927
Weather Conditions partly cloudy 60°F
PID NA (ppm) Condition No Lock
Sample Team TB, DR

Well Stabilization Data

Well Depth 172 (FT.) Datum BTOPVCC
Static Water Level 4.41 (FT.) Diameter: 2"
Water Column _____(FT.) Purge Method: 1gpm - 5 rpm / peristaltic

Time Purging begins (T_o): 0913
Water Level at time T_o: 4.41
Time Purging ends: (T_1) 0946
Water Level at time T_1: 4.49

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) <0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
931	5L	6.54	.610	10.11	-98	4.49	5.51	3.11	.35	
938	7.5L	6.57	.618	10.21	-93.7	4.49	acl	6.01	.35	
0941	8.5L	6.57	.618	10.25	-92	4.49	0.40	4.42	.35	clear
0946	9.5L	6.56	.620	10.27	-95	4.49	.59	4.26	.35	
	AFTER SAMPLING									

SAMPLING

Date: 4/14/06
Time: 0955
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks: ID = BSHM05 42BW

SHL-23

Field

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHL-23 Date: 4/14/06 Time: 1015
Weather Conditions partly cloudy 45
PID N/A (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth 35.5 (FT.) Datum BTOPVCC
Static Water Level 27.35 (FT.) Diameter: 4"
Water Column _____(FT.) Purge Method: grundfos/low-flow

Time Purging begins (T_o): 1007
Water Level at time T_o: 27.53
Time Purging ends: (T_1) 1037
Water Level at time T_1: 27.47

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1017	4L	5.64	.027	12.07	152.6	27.47	10.93	14.9	.43	
1022	6L	5.53	.027	12.98	170.9	27.47	10.99	11.1	.40	
1027	7.5L	5.47	.027	13.08	183	27.47	11.02	6.87	.40	
1032	9L	5.43	.025	13.08	193.5	27.47	11.00	4.75		
1037	11.5	5.40	.026	13.22	199.4	27.47	11.02	4.03	.40	
				SAMPLED @ 10:40						
	AFTER SAMPLING									

SAMPLING

Date: 4/14/06
Time: 1040
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks: ID = B3000SHL23

Nov/17/10

SHL-9

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts
Project Number: 284350.om.02
Well ID: SHL-9 **Date:** 4/10/06 **Time:** 0824
Weather Conditions: Sunny, 50's
PID: NA (ppm) Condition: lock is cut
Sample Team: DR-TB

Well Stabilization Data

Well Depth: ~~9.06~~ 26.25 (FT.) Datum: TOC
Static Water Level: 9.06 (FT.) Diameter: 2"
Water Column: ____ (FT.) Purge Method: low-flow

Time Purging begins (T_0): 0824
Water Level at time T_0: 9.06
Time Purging ends: (T_1) 0947
Water Level at time T_1: 9.26

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0928	15L+3=18L	6.61	0.134	7.29	-40	9.26	0.60	1.12	.32	clear
0939	20L	6.59	0.135	7.39	-45	9.26	0.47	1.31	.32	
0943	21L	6.59	.135	7.36	-45	9.26	0.46	1.22	.32	clear
0947	22L	6.59	0.135	7.37	-45	9.26	0.49	1.21	.32	clear
	AFTER SAMPLING									

SAMPLING

Date: 4/10/06
Time: 0950
Field Filtering: no
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w L (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

ID: B3000SHL9W

Newfield.

SHL-22

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHL-22 Date: 4/10/06 Time: 0955
Weather Conditions: clear 50°F
PID: NA (ppm) Condition: good
Sample Team: TB/DR

Well Stabilization Data

Well Depth: 110.6 (FT.) Datum: Top of GP
Static Water Level: 6.71 (FT.) Diameter: 4"
Water Column: ______ (FT.) Purge Method: low-flow/peristaltic

Time Purging begins (T_o): ~~0826~~ 0926
Water Level at time T_o: 6.71
Time Purging ends: (T_1) 1014
Water Level at time T_1: 7.31

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0957	[illegible]	6.74	0.527	9.15	-71		.96		.45	
1005	17L	6.73	.530	9.32	-63	7.31	.67		.45	
1010	19L	6.74	.532	9.37	-61	7.31	.66	.81	.45	clear
1014	22L	6.74	.533	9.36	-61	7.31	0.65	.57	.45	clear
	AFTER SAMPLING									

SAMPLING

Date: 4/10/06
Time: 1020
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.L (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		

1gallon = 3.78 liters

ID= B300SHL22W

LowFlowDataSheet.xlstemplate-low flow

Northfield.

SHM-96-22B

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHL-22B Date: 4/10/06 Time: 0735
Weather Conditions clear 40° F
PID dry (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth 6.68 (FT.) Datum TOC
Static Water Level 12.42 (FT.) Diameter: 4"
Water Column _____(FT.) Purge Method: low-flow/peristaltic

Time Purging begins (T_o): ~~0624~~ 0724
Water Level at time T_o: 6.68
Time Purging ends: (T_1) 0812
Water Level at time T_1: 6.60

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0742		6.79	0.498	7.52	0.114	6.55	0.76	1.14 6.55	0.3	
0803	¼ Gal	6.79	0.511	8.55	-106	6.60	0.67	0.89	0.35	clear
0807		6.78	0.511	8.54	-106	6.60	0.67	0.99	0.35	clear
0812	¼ gal	6.79	0.511	8.58	-107	6.60	0.66	0.82	0.35	
	AFTER SAMPLING									

SAMPLING

Date: 4/10/06
Time: 0815
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1 gallon = 3.78 liters

ID = B3SHL9622BW

Near field

SB SHM-96-5B

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.om.02
Well ID: SHM-96-5B **Date:** 4/10/06 **Time:** 1130
Weather Conditions Clear 40°F
PID NA (ppm) Condition No odor
Sample Team TB/DR

TOC 292.47

Well Stabilization Data

Well Depth 14.62 (FT.) Datum BTOPVCC
Static Water Level 5.80 (FT.) Diameter: 4"
Water Column ___ (FT.) Purge Method: low-flow / peristaltic

Time Purging begins (T_o): 1045
Water Level at time T_o: 5.80
Time Purging ends: (T_1) 1159
Water Level at time T_1: 6.01

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1134	1L	6.60	.493	10.41	-52	6.00	0.82	2.57	0.33	
1143		6.57	.501	11.15*	-53	6.00	.72		0.33	
1153		6.51	.497	10.74	-50	6.01	.71	1.79	.33	Clear
1156	1L	6.55	.498	10.77	-52	6.01	.70	1.93	.33	
1159		6.57	.495	10.58	-54		.70	1.33		
	AFTER SAMPLING									

SAMPLING

Date: 4/10/06
Time: 1201
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks: ID: ~~B3SHM5B~~ B3SHM965B6

* Had to adjust b/c 1st battery died during initial purge
** 2nd battery dying so flow slowed; replaced battery

NPC + Field

5C

SHM-96-5C

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHM-96-5C Date: 4/10/06 Time: 1055
Weather Conditions Clear 45°F
PID NA (ppm) Condition No lock
Sample Team TB/DR

Well Stabilization Data

Well Depth 79.62 (FT.) Datum BTOPVCC
Static Water Level 5.23 (FT.) Diameter: 4"
Water Column _____(FT.) Purge Method: low-flow / peristaltic

Time Purging begins (T_0): 1038
Water Level at time T_0: 5.23
Time Purging ends. (T_1) 1121
Water Level at time T_1: 5.28

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1100	4L	6.62	.751	9.33	-90	5.28	0.81	1.94	0.4*	Clear
1110	7.5L	6.61	.736	9.50	-88	5.28	.91	1.89	0.4	
1117	10L	6.60	.732	9.54	-85	5.28	.91	1.91	.4	
1121	11.5L	6.60	.734	9.60	-86	5.28	.88	1.	.4	
	AFTER SAMPLING									

SAMPLING

Date: 4/10/06
Time: 1125
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.L (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks: * Battery died during initial purge

ID = B3SHM96-5C B3SHM96SCW

85

Kel v Field

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHL-85 Date: 4/10/06 Time: 1255
Weather Conditions clear 50°F 4/10/06
PID NA (ppm) Condition good - can't secure cap
Sample Team JB/DR

Well Stabilization Data

Well Depth 26.25 (FT.) Datum BTOPVCC
Static Water Level 7.48 (FT.) Diameter: 2"
Water Column _____(FT.) Purge Method: low-flow/peristaltic

Time Purging begins (T_0): 1228
Water Level at time T_0: 7.48
Time Purging ends: (T_1) 1328
Water Level at time T_1: 9.45

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +7- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1258	1L	6.36	.041	9.71	149	9.45	4.60	1.81	.4L	clear
1309		6.31	.041	9.75	154	9.45	3.02	1.79	.4L	clear
1317	20L	6.27	.059	10.04	150	9.45	2.49	1.22	.4L	↓
1324	23L	6.25	.059	10.12	149	9.45	2.32	1.29	↓	↓
1328	24.5L	6.25	.059	10.13	152	9.45	2.29	1.19	↓	↓
	AFTER SAMPLING	[redacted]						[redacted]		

SAMPLING

Date: 4/10/06
Time: 1331
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B
Remarks: collected MS/MSD & DUP 1

Diameter (inch)	Gallon / Foot	* delta w t (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

ID = B3005HL85W
& B3000DUP1W

LowFlowDataSheet.xlstemplate-low flow

Merrifield

SHL-8D

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHL 8D Date: 4/11/06 Time: 0825
Weather Conditions Clear
PID NA (ppm) Condition NO LOCK/can't secure cap
Sample Team TR/OR

Well Stabilization Data

Well Depth 53.70 (FT.) Datum BTOC PVCC
Static Water Level 7.41 (FT.) Diameter: 2"
Water Column _____(FT.) Purge Method: low-flow/peristaltic

Time Purging begins (T_o) 0812
Water Level at time T_o: 7.41
Time Purging ends: (T_1) 0901
Water Level at time T_1: 7.69

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0830	5 L	6.17	.091	8.87	181	7.69	2.62	1.04	0.4	Clear
0837	9L	6.13	.096	8.89	165	7.69	1.96	1.31	0.4	Clear
0843	11L	6.11	.098	8.95	170	7.69	1.76	0.46	0.4	
0848	13L	6.09	.101	9.00	176	7.69	1.55	0.34	0.4	
0854	15L	6.08	.102	9.02	185	7.69	1.44		0.4	
0858	16.5	6.08	.103	9.04	187	7.69	1.42	0.31	↓	
0901	18.0L	6.07	.103	9.04	189	7.69	1.39	0.18	↓	
	AFTER SAMPLING									

SAMPLING

Date: 4/11/06
Time: 0901
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

ID = B300SHL08D

SHL-21

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHL-21 Date: 4/14/06 Time: 1125
Weather Conditions _____
PID NA (ppm) Condition good
Sample Team JD/DR

Well Stabilization Data

Well Depth 61.10 (FT.) Datum BTOPVC
Static Water Level 45.32 (FT.) Diameter: 4"
Water Column _____(FT.) Purge Method: low flow / ~~peristaltic~~ Grundfos

Time Purging begins (T_0): 11:17
Water Level at time T_0: 45.32
Time Purging ends: (T_1) 1145
Water Level at time T_1: 45.22

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1128	5L	5.94	.053	13.76	114.2	45.22	9.10	7.40	.43	
1135	7.8 L	5.93	.054	14.54	135.7	45.22	9.09	3.80	.38	
1140	10L	5.92	.054	14.64	145.9	45.22	8.92	3.24	.38	
1145	12L	5.89	.054	14.87	153.8	45.22	8.61	3.49	.38	
	AFTER SAMPLING									

SAMPLING

Date: 4/14/06
Time: 1150
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks: ID = B3000SHL21(W)

Pond Area

SHC-13

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHC-13 Date: 4/10/06 Time: 1425
Weather Conditions clear 50°F
PID NA (ppm) Condition good
Sample Team TB / DR

Well Stabilization Data

Well Depth 21.95 (FT.) Datum BTOPVCC
Static Water Level 6.85 (FT.) Diameter: 2"
Water Column _____(FT.) Purge Method: low-flow/peristaltic

Time Purging begins (T_o): 1415
Water Level at time T_o: 6.85
Time Purging ends: (T_1) 1300
Water Level at time T_1: 6.98

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1436	10L	6.32	.181	11.82	104	6.94	.72	0.51	0.5	clear
1440	12L	6.32	.181	11.76	100	6.99	.56	0.51	0.5	clear
1445	15L	6.30	.180	11.55	98	6.99	.44	0.50	0.5	clear
1449	17.5L	6.33	.180	11.47	95	6.99	.42	0.49	↓	
1454	19.5	6.32	.180	11.56	103	6.98	.38	0.49	↓	
1300	22.5L	6.31	.180	11.73	103.1	6.98	.40	0.48		clear
						* rechecked				
						w/ 451 55 = .48 mg/L				
	AFTER SAMPLING									

SAMPLING

Date: 4/10/06
Time: 1531
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

ID = B300SHL13W

SHP-01-36X

Pond Area.

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shegley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHP-01-36X Date: 4/13/06 Time: 1155
Weather Conditions Clear 60°F
PID NA (ppm) Condition Good
Sample Team TB/DR

Well Stabilization Data

Well Depth 12.84 (FT.) Datum BTOC
Static Water Level 7.95 (FT.) Diameter: 1/2" Steel
Water Column _____ (FT.) Purge Method: Low-Flow

Time Purging begins (T_o): 1143
Water Level at time T_o: 7.95
Time Purging ends: (T_1) 1209
Water Level at time T_1: 7.95

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1156	5L	6.52	.155	9.51	-47	7.85	1.70		0.4	Clear
1204		6.52	.156	9.60	-48.3	7.75	1.67	1.30	0.4	
1209	8L	6.51	.156	9.65	-48.0	7.95	1.58	.73	0.4	
	AFTER SAMPLING	[redacted]						[redacted]		

SAMPLING

Date: 4/13/06
Time: 1227
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks: ID = B3SHP0136XW

SHP-01-37X

Pond Area.

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHP-10-37X Date: 4/13/06 Time: 1125
Weather Conditions Clear 60°F
PID NA (ppm) Condition good
Sample Team TB/DB

Well Stabilization Data

Well Depth 11.02 (FT.) Datum TOC
Static Water Level 6.52 (FT.) Diameter: 1"
Water Column _____ (FT.) Purge Method: low-flow

Time Purging begins (T_o): 1106
Water Level at time T_o: 6.52
Time Purging ends: (T_1) 1148
Water Level at time T_1: 6.78

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1127	6L	6.85	.049	9.90	-75	6.78	1.20	1.05	0.3	
1131		6.82	.047	9.37	-86	6.78	0.45	2.18	0.4	
1136	9L	6.82	.047	9.52	-93	6.78	.37	1.20	0.4	
1141	11L	6.84	.047	9.49	-89	6.79	.30	.81		
1144	12L	6.83	.047	9.53	-89	6.78	.30	.63		
1148	14L	6.83	.047	9.53	-93	6.78	.29	.61	↓	
	AFTER SAMPLING									

SAMPLING

Date: 4/13/06
Time: 1157
Field Filtering: no
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks: ID = B3SHP0137X(2)

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		

1gallon = 3.78 liters

Pond Area.

~~SHAA~~ SHP-01-38A

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHP-01-38A Date: 4/13/05 Time: 1100
Weather Conditions Clear 60°F
PID NA (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth 9.05 (FT.) Datum BTOC
Static Water Level 4.24 (FT.) Diameter: 1"
Water Column _____(FT.) Purge Method: low-flow

Time Purging begins (T_0): 1056
Water Level at time T_0: 4.24
Time Purging ends. (T_1) 1116
Water Level at time T_1: 4.26

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1104	5L	6.23	.290	10.03	-46	4.26	.61	.73	0.5	Clear
1108	7.5L	6.23	.291	10.17	-50	4.26	.58	.81	.5	↓
1112	9.0L	6.23	.291	10.16	-52	4.26	.57	.78	.5	
1116	10.5L	6.22	.290	10.16	-53	4.26	.56	0.78	.5	↓
	AFTER SAMPLING									

SAMPLING

Date: 4/13/05
Time: 1125
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		

1gallon = 3.78 liters

Remarks: ID = B3SHP01 38AW

SHL - 15

upgradient.

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHL-15 Date: 4/13/00 Time: 0855
Weather Conditions Clear 60°F
PID NA (ppm) Condition
Sample Team TD/DR

Well Stabilization Data

Well Depth 26.44 (FT.) Datum BTOC (PVC)
Static Water Level 18.20 (FT.) Diameter: 2" & 4"
Water Column (FT.) Purge Method: low-flow/peristaltic

Time Purging begins (T_o): 0842
Water Level at time T_o: 18.20
Time Purging ends: (T_1) 0916
Water Level at time T_1: 18.28

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) <0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
857	4L	5.75	.128	10.52	86	18.28	1.64	1.60	.35	
0902		5.73	.128	10.53	56.6	18.28	1.58	.91	.35	
0908		5.73	.128	10.52	44.9	.56 → 18.28	.77	.35	clear	
0912	9L	5.73	.128	10.54	44	18.28	.58	.88	.35	↓
0916	10.5L	5.74	.128	10.56	40	18.28	.58	.74	.35	↓
	AFTER SAMPLING	[redacted]						[redacted]		

SAMPLING

Date: 4/13/00
Time: 0921
Field Filtering: no
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Upgrad. Pond Area

N5-P1

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: N5 - 01 Date: 4/13/06 Time: 0945
Weather Conditions cloudy, showers 50°F
PID N/A (ppm) Condition good - NO LOCK
Sample Team TB / DR

Well Stabilization Data

Well Depth 100.65 (FT.) Datum BTOPVCC
Static Water Level 22.39 (FT.) Diameter: 1"
Water Column _____(FT.) Purge Method: peristaltic/low-flow

Time Purging begins (T_o): 0945
Water Level at time T_o: 22.39
Time Purging ends: (T_1) 1022
Water Level at time T_1: 22.98

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1005	6L	6.43	.651	11.19	-104.2	22.96	1.16	.49	.35	clear
1011	7L	6.58	.555	11.24	-108.6	22.98	0.79	.37	.30	
1017		6.56	.542	11.36	-108.5	22.98	0.72	.24	.30	
1022	10L	6.53	.539	11.33	-107.8	22.98	0.72	.35	.30	
	AFTER SAMPLING	[redacted]						[redacted]		

SAMPLING

Date: 4/13/06
Time: 1037
Field Filtering: NO
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B; Alkalinity via SW-846/2320B, Chloride via SW-846/9251 and Turbidity via SW-846/2130B
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Diameter (inch)	Gallon / Foot	* delta w.l. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

N5 - P2

upgradient from

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: N5 P2 Date: 4-13 Time: 0935
Weather Conditions Cloudy, 50's
PID NA (ppm) Condition NO LOCK
Sample Team DR + TB

Well Stabilization Data

Well Depth 32.43 (FT.) Datum STICKUP
Static Water Level 22.21 (FT.) Diameter: 1"
Water Column _____(FT.) Purge Method: low-flow/peristaltic

Time Purging begins (T_o): 939
Water Level at time T_o: 22.21
Time Purging ends: (T_1) 1000
Water Level at time T_1: 22.35

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0950	3.5L	6.16	1.007	11.28	-93	22.35	1.16	1.21	.34	clear
955	5.0	6.16	1.008	11.30	-95	22.35	1.09	.89	.34	
1000	6.5L	6.16	1.009	11.31	-96	22.35	1.06	.79	.34	clear
	AFTER SAMPLING									

SAMPLING

Date: 4/13/06
Time: 1010
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHL - 93 - 10D

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHL-93-10D **Date:** 4/14/06 **Time:** 1208
Weather Conditions
PID NA (ppm) Condition good
Sample Team TB JDR

Well Stabilization Data

Well Depth 60 (FT.) Datum BTOC
Static Water Level 31.45 (FT.) Diameter: 4"
Water Column (FT.) Purge Method: Grundfos / low-flow

Time Purging begins (T_o): 1224
Water Level at time T_o: 31.45
Time Purging ends: (T_f)
Water Level at time T_f:

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1237	4.5L	10.75	.302	16.33	-43.5	32.65	.56	25.2	.38	slight orange color
1243	5.0L	10.79	.295	14.72	-37	33.33	.47	37.2	.35	↓
1308		10.89	.272	12.20	-6	[redacted]	.76	29.6	.45	↓
1311					* WL would'nt stabilize, pumped dry & sampled					
1316						56.0				

e 125.6 @ 138.8

SAMPLING

Date: 4/14/06
Time: 1405
Field Filtering: No
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID =

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.l. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

(Divider Page)

PMP

SHM-05 -40X

Purge protocol

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-05-407 Date: 6/8/06 Time: 1230
Weather Conditions Showers 60°F
PID NA (ppm) Condition good - NO Lock
Sample Team TB/DR

Well Stabilization Data

Well Depth 33.98 (FT.) Datum BTORVCC
Static Water Level 12.52 (FT.) Diameter: 2"
Water Column _____(FT.) Purge Method: peristaltic

Time Purging begins (T_o): 1235
Water Level at time T_o: 12.52 * 6/6/06 w.l.
Time Purging ends: (T_1) 1306
Water Level at time T_1 12.49

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1241		6.72	.302	11.40	-114.4	12.49	.47	69.0	.5LPM	~~clear~~ Slightly cloudy
1251		6.77	.302	11.22	-84.2	12.49	.16	38.0		
1256	10L	6.75	.306	11.32	-110.9	12.49	0.14	16.5	.5LPM	
1301	12L	6.76	.306	11.29	-118.1	12.49	0.13	8.23		
1306	14 L	6.76	.306	11.27	-113.3	12.49	0.13	10.08	.5LPM	

SAMPLING

Date: 6/8/06
Time: 1315
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4SHM05 40XW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B
Alkalinity by 2320B, Chloride by 9251, Sulfate by
9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-05-39A (PMP) Downgradient

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts　　Project Number: 284350.OM.02
Well ID: SHM-05-39A　Date: 6/12/06　　Time: 0945
Weather Conditions
PID NA (ppm)　Condition Good - no Crack
Sample Team TD/DR

Well Stabilization Data

Well Depth 39.47 (FT.)　Datum BTOPVCC
Static Water Level 9.33 (FT.)　Diameter: 2"
Water Column ______ (FT.)　Purge Method: low-flow/peristaltic

Time Purging begins (T_o): ~~9.3~~ 0945
Water Level at time T_o: 9.33
Time Purging ends: (T_1) 1012
Water Level at time T_1: 9.49

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0953	4L	6.39	.590	10.97	-77.2	9.49	0.62	7.4	0.5	clear / Few floatics
1000	7L	6.36	.595	11.21	-88.6	9.49	0.20	5.7	0.5	clear
1004	9L	6.35	.597	11.36	-81.2	9.49	0.19		0.5	clear
1008	11L	6.35	.597	11.36	-77.8	9.49	0.19	4.7	0.5	"
1012	13L	6.35	.599	11.48	-81.8	9.49	0.20	4.6	0.5	"

SAMPLING

Date: 6/12/06
Time: 1040
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha　**Method of Shipment:** Courier
Remarks:
Sample ID = BY SHM05J39AW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-05-39B PMP Downgradient

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: Showers 60°F Date: 6/13/06 Time: 0820
Weather Conditions SHM-05-39B
PID N/A (ppm) Condition No Locn.
Sample Team TB/DE

Well Stabilization Data

Well Depth 68.02 (FT.) Datum BTOPVCC
Static Water Level 11.39 (FT.) Diameter: 2"
Water Column _____(FT.) Purge Method: ~~10ml Flow~~ purge & sample (Grundfos)

Time Purging begins (T_0): 0825
Water Level at time T_0: 11.39
Time Purging ends: (T_1) _____
Water Level at time T_1: _____

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
Pumped	dry [well	water level	will	not	Stabilize					
0833		6.47	.734	12.00	-80.0			>100		Cloudy olive gray
0843		6.62	.772	13.85	-92.9		0.83			"
	* Could only	Filled	Flow	cell	temporarily					

SAMPLING

Date: 6/13/06
Time: 0845
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B45HM05 39B(e)

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w t (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-99-31A

PMP

Downgradient

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-99-31A Date: 6/12/06 Time: 1150
Weather Conditions
PID NA (ppm) Condition good
Sample Team JB JDR

Well Stabilization Data

Well Depth 15.72 (FT.) Datum BTOC
Static Water Level 0.94 (FT.) Diameter: 2"
Water Column (FT.) Purge Method: peristaltic / low-flow

Time Purging begins (T_o): 1106
Water Level at time T_o: 0.94
Time Purging ends: (T_1) 1208
Water Level at time T_1: 1.15

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1153	23 L	6.03	0.118	12.00	-39.6	1.15	0.16	1.9	0.5	Clear
1158	26 L	6.01	0.118	12.00	-40.3	1.15	0.17		0.5	
1203	28 L	6.01	0.118	12.00	-40.5	1.15	0.16	1.2	0.5	

SAMPLING

Date: 6/12/06
Time: 1221
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4SHM9931AW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		

1gallon = 3.78 liters

SHM-99 31B PMP Downgradient

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-99-31B Date: 6/12/06 Time: 1045
Weather Conditions
PID NA (ppm) Condition Good
Sample Team TB/DR

Well Stabilization Data

Well Depth 61.41 (FT.) Datum BTOPVCC
Static Water Level 2.41 (6/6) (FT.) Diameter: 2"
Water Column (FT.) Purge Method: low-flow/peristaltic

Time Purging begins (T_o): 1030
Water Level at time T_o: 2.41 (* 6/6 value) 1.90 on 6/12
Time Purging ends: (T_1) 1130
Water Level at time T_1: 1.90

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1048	9L					1.90			.5	
1104	16L	6.70	.164	11.19	-107.1	1.90	0.16	2.7	.5	clear
1111	19L	6.52	.158	11.23	-84.9	1.90	0.11	1.4	.5	clear
1115	21L	6.46	.176	11.24	-86.2	1.90	0.11	1.6	0.5	clear
1119	23L	6.47	.188	11.16	-86.0	1.90	0.12	1.6	0.5	clear
1124	25L	6.39	.197	11.16	-85.0	1.90	0.11	1.6	0.5	clear
1127	26L	6.36	.214	11.32	-84.9	1.90	0.12	1.5	0.5	clear
1130	27.5L	6.35	.224	11.40	-85.2	1.90	0.12	1.4	0.5	J

SAMPLING

Date: 6/12/06
Time: 1133
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4SHM 99 31BW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

* Cond did Not stabilize

SHM-99-31C PMP

Duplicate

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-99-31C Date: 6/12/06 Time: 1040
Weather Conditions _____
PID NA (ppm) Condition good
Sample Team TG/JOR

Well Stabilization Data

Well Depth 80.39 (FT.) Datum TOP PVCC
Static Water Level 2.27 (FT.) Diameter: 2"
Water Column _____(FT.) Purge Method: low flow / peristaltic

Time Purging begins (T_o): 1030
Water Level at time T_o 2.27
Time Purging ends: (T_1) 1058
Water Level at time T_1 2.28

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1045		6.53	.665	10.82	-96.5	2.28	.19	65	.5	slightly cloudy
1050	8L	6.54	.666	10.81	-97.8		.19	34	.5	slightly cloudy
1054	10L	6.54	.666	10.86	-97.5	2.28	.17	24	.5	slightly cloudy
1058	12L	6.54	.661	10.68	-98.0	2.28	.17	13		

SAMPLING

Date: 6/12/06
Time: 1115
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4 SHM99 31C W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w t (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

LowFlowDataSheet.xlstemplate-low flow

CO 176

PMP

SHM-99-32X Downgradient

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHM-99-32X **Date:** 6/8/06 **Time:** 1235
Weather Conditions showers 60°F
PID NA (ppm) Condition Good - NO LOCK
Sample Team TB/DD

Well Stabilization Data

Well Depth 85.49 (FT.) Datum BTO PVC
Static Water Level 7.93 (FT.) Diameter : 2"
Water Column ____ (FT.) Purge Method: peristaltic

Time Purging begins (T_o): 1241
Water Level at time T_o: 8.44 *(6/6) 7.93 on 6/12
Time Purging ends: (T_1) 1334
Water Level at time T_1: 7.94

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1319	16 L	6.37	.752	10.30	-72.6	7.95	1.76	3.48	.46	clear
1323	18 L	6.41	.755	10.06	-71.8	7.95	0.43	3.39	.46	clear
1328	20.5 L	6.43	.757	10.06	-67.8	7.95	0.17	3.38	.46	↓
1331	22 L	6.45	.757	10.09	-76.2	7.95	.16	2.31	.46	↓
1334	24 L	6.45	.757	10.05	-77.7	7.95	.16	.	.46	↓

SAMPLING

Date: 6/8/06
Time: 1351
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4SHM9932XW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

LowFlowDataSheet.xlstemplate-low flow

PMP

SHM-05-41A Downgradient (Wood)

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-05-41A Date: 6/8/06 Time: 1115
Weather Conditions Showers 60°F
PID NA (ppm) Condition good — no lock
Sample Team TB/DR

Well Stabilization Data

Well Depth 44.65 (FT.) Datum BTOPVCC
Static Water Level _____ (FT.) Diameter: 2
Water Column _____ (FT.) Purge Method: low-flow peristaltic

Time Purging begins (T_o): 1046
Water Level at time T_o: 8.44 *6/6 level
Time Purging ends: (T_1) 1140
Water Level at time T_1: 8.18

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1120	9 Gal	6.77	.117	10.36	-41.2	8.18	.15	.62	.5	clear
1128	19L	6.40	.116	10.31	-12.8	8.18	.22	.32	.5	"
1132	21L	6.36	.116	10.29	-11.5	8.18	.13	.04	.5	"
1136	24L	6.32	.116	[illegible]	-9.0	8.18	.13	.18	.5	"
1140	26L	6.30	.116	[illegible]	-8.[illegible]	8.18	.13		.5	

SAMPLING

Date: 6/8/06
Time: 1150
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4 SHM05 41AW
B4 SHM05 41AW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

PMP

SHM-05-41B

Downgradient (Wood)

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: Showers 60°F Date: 6/8/06 Time:
Weather Conditions Showers
PID NA (ppm) Condition good - No lock
Sample Team TB/DR

Well Stabilization Data

Well Depth ~70 (FT.) Datum BTOPVC
Static Water Level (FT.) Diameter: 2"
Water Column (FT.) Purge Method: low-flow/peristaltic

Time Purging begins (T_o): 1126
Water Level at time T_o: 8.23* 6/6 level
Time Purging ends: (T_1) 1155
Water Level at time T_1: 7.96

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1140	32Gal					7.96			.5	
1146	~9L*	6.17	.587	10.58	-65.0	7.96	.22	9.50	.5	
1151	10L	6.25	.599	10.59	-75.8	7.96	0.19	7.31	.5	clear
1155	12L	6.27	.599	10.58	-78.8	7.96	.20	5.18	.5	clear

*Tube fell out of bucket

SAMPLING

Date: 6/8/06
Time: 1230
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4SHM0541BW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

PMP

SHM-05-41C

Downgradient (WELL) B4 SHM05 41AW

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHM-05-41C **Date:** 6/8/06 **Time:** 1035
Weather Conditions Showers 60°F
PID NA (ppm) **Condition** good - NO Lock
Sample Team TB | DR

Well Stabilization Data

Well Depth 93.47 (FT.) Datum BTOPVC
Static Water Level 8.46 (FT.) Diameter : 2"
Water Column ______ (FT.) Purge Method: peristaltic / low-flow

Time Purging begins (T_o): 1040
Water Level at time T_o: 8.46 (* * used 6/6 data)
Time Purging ends: (T_1) 1114
Water Level at time T_1: 8.29

Time	Volume Removed	pH + / - 0.1	Conductivity (mS/cm) + / - 3%	TEMP.(C) + / - 0.2 or 3%	Redox (mV) + / - 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) + / - 10%	Turbidity (NTU) <5 NTU preferred and + / - 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1051	4L	6.88	.567	10.61	-133.3	8.29	3.43?	11.1	.41	clear
1058	7.5L	6.89	.566	10.66	-123.8	8.29	1.80	7.22	.40	clear
1102	8.5L	6.95	.569	10.61	-134.9	8.29	0.32		.40	clear
1106	10L	6.99	.570	10.66	-139.8	8.29	0.17	3.00	.40	
1110	12L	7.00	.571	10.64	-141.9	8.29	0.16	2.13	.40	
1114	14L	7.01	.572	10.65	-141.6	8.29	0.15	1.59	.40	

* Pulled probe & cleaned flow cell

SAMPLING

Date: 6/8/06
Time: 1123
Field Filtering: NO
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4 SHM05-41CW

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-05-42 (Shallow) A PMP Downgradient (wooded)

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHM-05 42A **Date:** 6/9/06 **Time:** 1255
Weather Conditions overcast 65°F
PID NA (ppm) **Condition** good - NO LOCK
Sample Team TB/DR

Well Stabilization Data

Well Depth ~42 (FT.) Datum BTOPVC
Static Water Level 2.50 (FT.) Diameter : 1"
Water Column ______ (FT.) Purge Method: low-flow/peristaltic

Time Purging begins (T_0): 1250
Water Level at time T_0: 2.50
Time Purging ends: (T_1) 1228
Water Level at time T_1: 2.52

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1259	4L	6.02	.043	10.35	116.0	2.52	4.65	11.7	0.5	Clear
1303		5.96	.043	10.34	122.3	2.52	4.72		↓	↓
1306	7L	5.94	.042	10.30	128.7		4.86	4.52	↓	
1310	9L	5.91	.042	10.30	132.0	2.52	4.93	1.60	.5	
1316	12.5L	5.88	.042	10.26	137.1	2.52	5.00	1.04	↓	
1320	14 L	5.87	.042	10.35	140.2		5.03	1	↓	
124	16L	5.87	.042	10.39	142.0	2.52	5.05	1.22	↓	
1228	20L	5.86	.042	10.41	142.9	2.52	5.07		↓	↓

SAMPLING

Date: 6/9/06
Time: 1345
Field Filtering: ______
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4SHM0542AW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

LowFlowDataSheet.xlstemplate-low flow

SHM-05-42 deep PMP Downgradient (well 5)

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-05-42B Date: 6/9/06 Time: 1300
Weather Conditions Overcast ~ 70°F
PID NA (ppm) Condition good
Sample Team TJ / DR

Well Stabilization Data

Well Depth ~72' (FT.) Datum BTOPVCC
Static Water Level 2.39 (FT.) Diameter: 1"
Water Column _____ (FT.) Purge Method: low-flow / peristaltic

Time Purging begins (T_o): 1258
Water Level at time T_o: 2.39
Time Purging ends: (T_1) 1349
Water Level at time T_1: 2.42

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1306						2.42			0.5	
1310						2.42			0.5	
1334	18L	6.25	.556	10.43	-82.1	2.42	0.17	7.51	0.5	Clear
1341	22	6.38	.558	10.53	-92.6	2.42	0.13	7.81	0.5	clear
1345	24	6.41	.558	10.52	-95.0	2.42	0.12	7.84	0.5	↓
1349	26	6.43	.557	10.47	-96.3	2.42	0.12	7.76	0.5	↓

SAMPLING

Date: 6/9/06
Time: 1400
Field Filtering: No
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4SHM0542BW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		

1gallon = 3.78 liters

SHL-23 PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 28435[illegible].02
Well ID: SHL-23 Date: 6/12/06 Time: 1430
Weather Conditions Clear 70°F
PID N/A (ppm) Condition good
Sample Team TS/DR

Well Stabilization Data

Well Depth 35.5 (FT.) Datum BTOPVCC
Static Water Level 24.39 (FT.) Diameter: 4"
Water Column _____(FT.) Purge Method: Grundfos / low-flow

Time Purging begins (T_o): ~~1458~~ 1454
Water Level at time T_o: 24.39
Time Purging ends: (T_1) 1545
Water Level at time T_1: 24.55

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 ~~NTU~~	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance	
1505	4L	7.09	.022	11.64	198.3	24.48	11.41		.38	clear	@110
1509	6L	6.58	.021	11.00	215.3	24.55	11.58		.45		@115.6
1515	9L	6.26	.021	11.91	221.4	24.55	11.48		.5		@111.0
1519	11L	6.13	.021	11.25	223.7	24.55	11.46		.5		@111.0
1524	13L	6.00	.021	11.32	224.8	24.55	11.48		.5		@111.0
1528	15L	5.91	.021	11.43	226.8	24.55	11.47				
1531	16.5L	5.87	.021	11.55	228.7		11.45		.5		
1539	20.5L	5.74	.021	11.51	231.4	24.55	11.40				

SAMPLING

Date: 6/12/06
Time: 1600
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks: BH0005HL23W
Sample ID = 5

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot
1	0.040
1.5	0.091
2	0.163

* delta w.t. (ft)	= volume lost (gallons)

1gallon = 3.78 liters

1542 (4B)	22L	5.71	.021	11.43	231.4	24.55	11.45		.5
1545	24L	5.68	.021	11.43	233.7	24.55	11.44	3.9	

LowFlowDataSheet.xlstemplate-lowflow

SHL-9 LTMP/PMP Needed.

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL 9 Date: 6-9-06 Time: 1050
Weather Conditions overcast
PID N/A (ppm) Condition good
Sample Team DRE/TB

Well Stabilization Data

Well Depth 22.25 (FT.) Datum BTOPVCC
Static Water Level 7.75 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: peristaltic/low-flow

Time Purging begins (T_o): 1052
Water Level at time T_o: 7.75
Time Purging ends: (T_1) 1120
Water Level at time T_1: 7.78

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1105	6L	6.75	0.117	9.40	-47.9	7.77	0.26	10.12	.43 LPM	clear
1110	8L	6.58	0.114	9.30	-36.5	7.78	0.22	5.01	.43	
1115	10L	6.49	0.119	9.19	-37.0	7.78	0.26	3.51		
1120	3.5 Gallons or 13.5L	6.46	0.122	9.16	-37.6	7.78	0.23	3.27	.43	

SAMPLING

Date: 6/9/06
Time: 1200
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B40005HL9W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHC-22

LTM /PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHC-22 Date: 6/9/06 Time: 1000
Weather Conditions Overcast 70°F
PID NA (ppm) Condition Good
Sample Team TB/DR

Well Stabilization Data

Well Depth 110.6 (FT.) Datum Top of Guard Pipe
Static Water Level 5.55 (FT.) Diameter: 4".
Water Column _____(FT.) Purge Method: low-flow/peristaltic

Time Purging begins (T_o): 1005
Water Level at time T_o: 5.55
Time Purging ends: (T_1) 1030
Water Level at time T_1: 5.30

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1015	5L	6.44	0.574	10.77	-39.1	5.30	2.1	0.99	.5	
1020	7.5	6.47	0.574	10.77	-46.7	5.30	0.15	0.31	.5	
1025	10	6.49	0.571	10.68	-52.9	5.30	0.13		.5	
1030	12.5	6.50	0.571	10.71	-52.9	5.30	0.13	0.50	.5	

SAMPLING

Date: 6/9/06
Time: 1030
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4000SHL22W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-22B

PMP

Antifreeze

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-96-22B Date: 6/9/06 Time: 1005
Weather Conditions overcast 60°F
PID NA (ppm) Condition good
Sample Team TB / DR

Well Stabilization Data

Well Depth 92.42 (FT.) Datum BTOPVCC
Static Water Level 4.56 (FT.) Diameter: 4"
Water Column _____ (FT.) Purge Method: peristaltic / low-flow

Time Purging begins (T_o): 1008
Water Level at time T_o: 4.56
Time Purging ends: (T_1) 1057
Water Level at time T_1: 4.59

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1044	18L	6.49	.565	10.17	-110.2	4.57	0.13	3.23	0.5	clear
1049	20.5L	6.51	.564	10.17	-111.5	4.58	0.12	2.91	0.5	clear
1053	23L	6.52	.562	10.17	-111.5	4.59	0.12	1.70	0.5	clear
1057	26L	6.53	.561	10.08	-111.7	4.59	0.12	1.75	0.5	clear

SAMPLING

Date: 6/9/06
Time: 1130
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = ~~B400SHL22BW~~ FB

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

B4SHM9622BW

SHM-96-5B

LTMP/PMP

Monitored

30 4

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-96-5B Date: 6/8/06 Time:
Weather Conditions showers 60°'s
PID NA (ppm) Condition good - no lock
Sample Team TB/JDR

Well Stabilization Data

Well Depth 92.47 (FT.) Datum STOVCC
Static Water Level 4.25 (FT.) Diameter: 4"
Water Column (FT.) Purge Method: low - flow / peristaltic

Time Purging begins (T_o): 1351
Water Level at time T_o: 4.25 6/6/06
Time Purging ends: (T_1) 1445
Water Level at time T_1: 4.25

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1424	14L	6.63	.527	10.53	-84.4	4.25	1.32	.90	0.4 LPM	
1430	17L	6.60	.523	10.52	-79.2	4.25	.34	.43		clear
1435	19L	6.58	.522	10.47	-76.6	4.25	.25			"
1440	21L	6.58	.523	10.54	-76.3	4.25	.14			"
1445	23.5	6.57	.522	10.49	-75.7	4.25	.17			

SAMPLING

Date: 6/8/06
Time: 1515
Field Filtering: ND
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4SHM9605BW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-96-5C

PMP/LTM P well

Manifold

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-96-5C Date: 6/8/06 Time: 1345
Weather Conditions showers
PID NA (ppm) Condition good - NO LOCK
Sample Team TB MK

Well Stabilization Data

Well Depth 79.62 (FT.) Datum BTOPVCC
Static Water Level 3.70* (FT.) Diameter: 4"
Water Column _____(FT.) Purge Method: peristaltic / low-flow

Time Purging begins (T_o): 1347
Water Level at time T_o: 3.70* (6/6/06)
Time Purging ends: (T_1) _____
Water Level at time T_1: _____

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1351		6.59	.805	10.49	-105.2	3.34	.86	10.45	.4	clear
1400	5L	6.56	.784	10.22	-102.7	3.34	.32	3.80	.4	clear
1404	6.5L	6.55	.779	10.19	-102.6	3.34	.19	1.91	.4	clear
1408	8.0L	6.55	.776	10.15	-102.5	3.34	.16		.4	clear
1413	10L	6.55	.777	10.22	-104.5	3.34	.15	1.72	.4	"
1417	11.5L	6.55	.769	10.20	-104.8	3.34	.15	.97	.4	"

SAMPLING

Date: 6/7/06
Time: 1445
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4 SHM9605CW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		

1gallon = 3.78 liters

SHL-8S

can't secure cap

PMP

Nearfield

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts
Project Number: 284350.OM.02
Well ID: SHL-8S Date: 6/8/06 Time: 0915
Weather Conditions: Showers 60°F
PID: NA (ppm) Condition: good/no lock
Sample Team: TB/DR

Well Stabilization Data

Well Depth: 7.95 (FT.) Datum: BTOPVC
Static Water Level: 26.25 (FT.) Diameter: 2"
Water Column: ____ (FT.) Purge Method: peristaltic/low flow

Time Purging begins (T_o): 0916
Water Level at time T_o: [illegible, crossed out] 7.95
Time Purging ends: (T_1): 0951
Water Level at time T_1: 7.99

Time	Volume Removed	pH	Conductivity (mS/cm)	TEMP.(C)	Redox (mV)	Water level (Ft)	D.O. (mg/L)	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
		+/- 0.1	+/- 3%	+/- 0.2 or 3%	+/- 10 mV	< 0.3 ft	+/- 10%			
0930	7.5L	6.52	.046	9.80	209.6	7.99	2.36	2.45	0.45	
0935	9.5L	6.41	.047	9.82	209.3	8.09?	1.70	1.43	.45	clear
0939	12L	6.32	.04 7	9.83	207.9	7.99	1.38	1.06	.¢4	
0947	14.5L	6.27	.047	9.86	207.1	7.99	1.23	1.16	0.4	clear
0951	16.0L	6.24	.047	9.92	206.7	7.99	1.26	0.53	0.4	clear

SAMPLING

Date: 6/8/06
Time: 1000
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment**: Courier

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w t (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163	.10	= .0163 Gal
			1gallon = 3.78 liters

Remarks:
Sample ID = B4000SHL8SW

4 L .9 / 4

.0163 × 378 = 1304 / 1141 / 489 / .061614

.06 Liters

LowFlowDataSheet.xlstemplate-low flow

SHL-8D

PMP

Duplicate

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-8D Date: 6/8/06 Time: 0950
Weather Conditions showers 60°F
PID NA (ppm) Condition
Sample Team TB/DR

Well Stabilization Data

Well Depth 97.97 (FT.) Datum BTOPVCC
Static Water Level 53.70 (FT.) Diameter: 2"
Water Column (FT.) Purge Method: low-flow / peristaltic (can't secure cap broke)

Time Purging begins (T_o): 0928
Water Level at time T_o: 53.97
Time Purging ends: (T_1) 1015
Water Level at time T_1: 53.97

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0958	3 Gal	6.06	.116	10.02	163.8	53.97	.35		0.5	clear
1004	4 Gal	6.05	.116	10.05	144	53.99	.33	.65	.5	clear
1015	4 Gal	6.07	.116	10.09	145.2	53.97	.32	.39	.5	clear

SAMPLING

Date: 6/8/06
Time: 1025
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B; Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B
Remarks:
Sample ID = B4000 SHL8D W

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

LowFlowDataSheet.xlstemplate-low flow

* Tubing fell out of bucket for undisclosed time

SHL-13 (PMP)

Pond

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-13 Date: 6/6/06 Time: 1450
Weather Conditions Clear 70°F
PID NA (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth 21.95 (FT.) Datum TOP VCC
Static Water Level 5.78 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: low-flow

Time Purging begins (T_o): 1454
Water Level at time T_o 5.78
Time Purging ends: (T_1) 1531
Water Level at time T_1: 5.83

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1513	7L	6.53	.175	12.34	118.1	5.81	0.42	2.34	.5	Clear
1517	9.0L	6.44	.172	11.99	126.2	5.83	0.18	1.14	.5	
1522	12.0L	6.39	.172	11.90	130.0	5.83	0.18	0.40	.5	
1527	14.5L	6.37	.171	11.82	131.6	5.83	0.14		0.5	
1531	16.5L	6.35	.172	11.84	130.8	5.83	0.14		0.5	

SAMPLING

Date: 6/6/06
Time: 1545
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4000SHL13W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

* Lots of dead ants in well *

LowFlowDataSheet.xlstemplate-low flow

SHP-01-36X

PMP

Picnic Area

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHP-01-36X Date: 6-9-06 Time: 0855
Weather Conditions Overcast
PID N/A (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth 12.84 (FT.) Datum BTOSC
Static Water Level 6.95 (FT.) Diameter: 1"
Water Column _____(FT.) Purge Method: peristaltic

Time Purging begins (T_o): 0855
Water Level at time T_o: 6.95
Time Purging ends: (T_1) 0921
Water Level at time T_1: 6.95

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0911	5.5	6.58	0.091	11.94	-72.0	6.95	0.79	0.20?	0.5	clear
0916	8	6.57	0.091	11.94	-67.5	6.95	0.80	4.73	0.5	
0921	10.5	6.55	0.092	11.90	-64.1	6.95	0.81	4.13		

SAMPLING

Date: 6/9/06
Time: 0953
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4 SHP0136XW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Penn Area

PMP

SHP-01-37X

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHP-01-37X Date: 6-9-06 Time: 0831
Weather Conditions overcast
PID N/A (ppm) Condition Good
Sample Team TB/DR

Well Stabilization Data

Well Depth 11.02 (FT.) Datum BTOSC
Static Water Level 5.196 (FT.) Diameter: 1"
Water Column _____(FT.) Purge Method: peristaltic

Time Purging begins (T_o): 0831
Water Level at time T_o: 5.196
Time Purging ends: (T_1) 0903
Water Level at time T_1: 5.190

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
853	11 L	6.71	0.054	11.15	-102.9	5.96	0.11	1.56	0.5	clear
858	13.5	6.69	0.053	11.14	-105.9	5.96	0.10		0.5	"
0903	16 L	6.68	0.053	11.11	-106.8	5.96	0.09	2.92	0.5	"

SAMPLING

Date: 6/9/06
Time: 0925
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B45HP0137XW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHP-01-38A

RINSE

Pond Area.

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHP-01-38A Date: 6/9/06 Time: 0810
Weather Conditions OVCST Last
PID N/A (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth 9.05 (FT.) Datum
Static Water Level 3.50 (FT.) Diameter: ~~3~~ 1"
Water Column (FT.) Purge Method: peristaltic

Time Purging begins (T_o): 0813
Water Level at time T_o: 3.50 * 6/6
Time Purging ends: (T_1) 0840
Water Level at time T_1: 3.50

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0828	7.5L	6.20	.225	11.41	-74.0	3.50	0.16	4.13	.5	clear
0832	10L	6.20	.225	11.38	-75.8	3.50	0.15	1.63	.5	clear
0836	12L	6.20	.225	11.38	-77.0	3.50	0.14	0.43	.5	
0840	14L	6.20	.225	11.36	-76.8	3.50	0.14	.61	.5	clear

SAMPLING

Date: 6/9/06
Time: 0855
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4SHP0138AW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

PMP Well SHL-15

upgradient

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-15 Date: 6/6/06 Time: 0920
Weather Conditions clear 60°F
PID N/A (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth 26.44 (FT.) Datum TOPVC
Static Water Level 16.03 (FT.) Diameter: 4"
Water Column _____ (FT.) Purge Method: Peristaltic

Time Purging begins (T_o): 0925
Water Level at time T_o 16.03
Time Purging ends: (T_1) ~~0955~~ 1005
Water Level at time T_1: 16.16

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0934	5L	6.02	.104	10.70	191.8	16.16	0.38	1.85	0.48	Clear
0939	7.5L	5.97	.103	10.51	194.5	16.19	0.34		0.48	clear
0945		5.95	.103	10.71	196.5	16.16	0.34		0.45	Clear
0948	11L	5.95	.103	10.62	195.1	16.16	0.35		0.45	clear
0951		5.96	.102	10.69	194.2	16.16	0.40	[redacted]	0.45	
0956	14L	5.98	.101	10.51	8.4↓	16.16	0.61	1.10	0.45	
1001	16L	5.99	.100	10.65	-12.0	16.16	0.64	0.95	0.45	
1005	18.5L	6.00	.100	10.61	-28.7	16.16	0.63	[redacted]	0.45	

Dropped Flow

* ORP dropping

(over)

SAMPLING

Date: 6/6/06
Time: 0955
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B40SHL15W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Sample time actually ~~1007~~ 1016 but label says 0955

N5-P1 PMP 22.48 upgradient

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: N5-P1 Date: 6/6/06 Time: 1245
Weather Conditions cloudy/ 70°F
PID N/A (ppm) Condition good no lock
Sample Team TB/DR

Well Stabilization Data

Well Depth 100.65 (FT.) Datum TOP VCC
Static Water Level 22.49 (FT.) Diameter: 1"
Water Column _____(FT.) Purge Method: peristaltic

Time Purging begins (T_o): 1249
Water Level at time T_o: 22.59
Time Purging ends: (T_1) 1327
Water Level at time T_1: 22.89

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1314	5.5L	6.62	.496	12.96	-78.1	22.89	0.19	1.51	0.4	clear
1318	7.0L	6.63	.473	13.01	-92.3	22.89	0.19		0.4	
1321	8.5L	6.63	.464	12.56	-92.7	22.89	0.19	0.	0.4	clear
1324	9.5	6.63	.457	12.54	-94.4	22.89	0.19	0.72	0.4	clear
1327	11.0L	6.62	.454	12.53	-95.2	22.89	0.19	0.70	0.4	clear

few air bubbles

SAMPLING

Date: 6/6/06
Time: ~~1330~~ 1325
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B40000N5P1W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Time on label = 1325 but actual sample time is 1330

NS-P2 PMP

upgradient

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: NSP2 Date: 6/6/00 Time: 1245
Weather Conditions Cloudy 70°F
PID N/A (ppm) Condition good/no lock
Sample Team TB/DR

Well Stabilization Data

Well Depth 32.43 (FT.) Datum TOPVCC
Static Water Level 22.48 (FT.) Diameter: 1"
Water Column _____(FT.) Purge Method: peristaltic

Time Purging begins (T_o): 1250
Water Level at time T_o: 22.48
Time Purging ends: (T_1) 1306
Water Level at time T_1: 22.32

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1254	1L	6.65	.004	14.93	-67.0	22.32	6.56	80.7	0.3	~~Clear~~ slightly cloudy
1300	3.5L	6.35	.935	13.12	-77.1	22.32	0.29		0.32	↓
1303	4.5	6.34	.941	13.23	-77.8	22.32	0.24		0.32	
1306	5.5	6.33	.936	13.12	-78.2	22.32	0.23	81.2	0.32	↓

Air Bubbles

SAMPLING

Date: 6/6/00
Time: 1307
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B40000NSP2W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B
Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-93-10D PMP

V. hydrocarbon.

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-93-10D Date: 6/13/00 Time: 1040
Weather Conditions clear 75°F
PID N9 (ppm) Condition good
Sample Team TB JDR

Well Stabilization Data

Well Depth 300 (FT.) Datum ISTD 85
Static Water Level 53.02 (FT.) Diameter: 4"
Water Column _____ (FT.) Purge Method: ~~low flo~~ Grundfos/purge & sample

Time Purging begins (T_o): 1035
Water Level at time T_o: 53.02
Time Purging ends: (T_1) _____
Water Level at time T_1: none

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1105		5.51	.093	13.33	60.5		7.14	55		slightly cloudy
	* well immediately went dry (this is what historically happens									

SAMPLING

Date: 6/13/00
Time: 1105
Field Filtering: NO
Sampling Methodology: ~~Low Flow Sampling~~ TD purge & sample
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4 SHM 9310D W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHL-3 LTMP well

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-3 Date: 6/13/06 Time: 0910
Weather Conditions clear 70°F
PID _____ (ppm) Condition no lock
Sample Team TB/DR

Well Stabilization Data

Well Depth 32.29 (FT.) Datum BTOC
Static Water Level 28.95 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: ~~peristaltic~~ / low flow Grundfos

Time Purging begins (T_o): 0915
Water Level at time T_o 28.95
Time Purging ends: (T_1) 0953
Water Level at time T_1: 29.69

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0920	4.5L	7.37	.032	13.24	52.8	29.72	10.71		0.5	clear
0926	8.0L	7.14	.026	13.46	83.7	29.81	10.91		0.5	
Pump stopped		restarted				0934			0.7	e 125.7
0938	14L	6.78	.025	14.24	124.4	29.71	10.91		0.5	e 12.37
0942	16L	6.72	.027	14.44	127.3	29.69	11.00		0.6	
0946	18.5L	6.67	.024	14.53	129.5	29.69	11.01		0.6	
0950	20L	6.64	.024	14.43	132.3	29.69	11.03		0.6	
0955	22.5	6.61	.024	14.54	133.1	29.69	11.01	1.6	0.6	

SAMPLING

Date: 6/13/06
Time: 0955
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks:
Sample ID = 061306SHL13 Collected DUP04 @ this well

SHL-4 LTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-4 Date: 6/6/06 Time: 1050
Weather Conditions partly cloudy 79°F
PID N/A (ppm) Condition good / NO Lock
Sample Team TB / DR

Well Stabilization Data

Well Depth 14.65 (FT.) Datum BTOPVCC
Static Water Level 8.94 (FT.) Diameter: 2"
Water Column _____(FT.) Purge Method: low flow / peristaltic

Time Purging begins (T_o): 1052
Water Level at time T_o: 8.94
Time Purging ends: (T_1) 1136
Water Level at time T_1: 9.75

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1124	~~31.5~~ 32L	6.43	.067	9.29	64.0		0.42		0.5	clear
1128	34L	6.40	.067	9.22	64.7	9.75	0.16	1.46	0.5	clear
1132	38L	6.39	.067	9.23	63.4	9.75	0.15		0.5	clear
1136	42L	6.38	.067	9.24	61.0	9.75	0.14	1.07	0.5	clear

SAMPLING

Date: 6/6/06
Time: 1140
Field Filtering: No
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = 060606SHL4

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHC-5 &TMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHC-5 Date: 6/9/06 Time: 1445
Weather Conditions
PID NA (ppm) Condition good
Sample Team TB/DR

Well Casing full of ANTS

Well Stabilization Data

Well Depth 13.75 (FT.) Datum BTOPVCC
Static Water Level 1.80 (FT.) Diameter: 2"
Water Column (FT.) Purge Method: low-flow peristaltic

Time Purging begins (T_o): 1455
Water Level at time T_o: ~~1.94~~ ~~4.616~~ 1.80
Time Purging ends: (T_1) 1522
Water Level at time T_1: 1.81

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1455	7L	6.03	.087	12.00	40.3	1.81	.14	.26	.5	Clear
1500	13L	5.82	.089	12.03	38.8	1.81	.14	.25	.5	
1510	15L	5.79	.089	12.02	38.2	1.81	.17	.23	.5	Clear
1514	17L	5.77	.089	11.96	37.7	1.81	.18	.19	.5	Clear
1518	19L	5.76	.088	11.92	36.3	1.81	.19	.21	.5	
1522	20.5L	5.75	.089	11.95	36.0	1.81	.19	.18	.5	

SAMPLING

Date: 6/9/06
Time: 1537
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = 0609D6SHC5

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B
Alkalinity by 2320B, Chloride by 9251, Sulfate by
9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHL-10 LTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-10 Date: 6/13/06 Time: 1335
Weather Conditions clear 75°F
PID NA (ppm) Condition good
Sample Team TAlor

Well Stabilization Data

Well Depth 39' BGS (FT.) Datum BTOP VSC
Static Water Level 27.96 (FT.) Diameter: 2
Water Column _____ (FT.) Purge Method: Grundfos / low-flow

Time Purging begins (T_o): 1345
Water Level at time T_o: 29.46
Time Purging ends: (T_1) 1411
Water Level at time T_1: 29.56

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1349	4L	7.31	.026	13.20	110.5	29.56	10.65		.55	Clear
1356	8L	6.87	.027	13.52	139.7	29.56	10.76		.55	
1400	10L	6.89	.027	13.28	149.1		10.84		.55	
1404	12.5L	6.86	.028	13.48	153.5	29.56	10.87			
1408	14.5L	6.84	.028	13.33	156.0	29.56	10.93		.55	Clear
1411	16.0L	6.81	.028	13.44	156.9	29.56	10.95	1.36	✓	Clear

e125

SAMPLING

Date: 6/13/06
Time: 1450
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = 061306 SHL10

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

10C

TMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM93-10C Date: 6/13/06 Time: 1235
Weather Conditions Clear 75°F
PID NA (ppm) Condition NO LOCK
Sample Team TB/DR

Well Stabilization Data

Well Depth 56.31 (FT.) Datum Bedrock
Static Water Level 27.78 (FT.) Diameter: 4"
Water Column ____ (FT.) Purge Method: low-flow/grundfos

Time Purging begins (T_o): 1238
Water Level at time T_o: 27.78
Time Purging ends: (T_1) 1313
Water Level at time T_1: 29.61

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance	
1245	5L	7.19	.345	12.36	134.4	~~28~~ 28.82	1.71		.55	Clear	@120
1249	7L	7.20	.356	12.67	135.5	29.11	1.32		.42		@119.5
1253	8.5L	7.16	.353	12.85	138.4	29.22	0.96		.42	↓	@119.5
1258	10.5L	7.11	.355	13.04	147.8	~~28~~ 29.41	0.82				
1303	12.5	7.08	.355	13.02	151.9	29.45	.78				
1307		7.07	.356	13.13	152.9	29.51	.68		.42		@119.5
1310	15L	7.06	.357	13.20	154.5	29.55	.65				
1313	16.5L	7.04	.358	13.21	155.7	29.61	.63	3.8		↓	

3.14 × 4 = 12.56

SAMPLING

Date: 6/13/06
Time: 1330
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = 061306SHM9310C

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.l. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

πr^2 $12.56\ in^2 * \frac{12}{144} = .87\ cf * 7.48$

SHL-11 / LTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHL-11 **Date:** 6/6/00 **Time:** 1340
Weather Conditions Cloudy 70°F
PID NA (ppm) Condition Good
Sample Team TB / DR

Well Stabilization Data

Well Depth 30 (FT.) Datum TOPVCC
Static Water Level 17.98 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: peristaltic / low-flow

Time Purging begins (T_o): 1344 1405
Water Level at time T_o 17.98
Time Purging ends: (T_1) 1426
Water Level at time T_1 18.02

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1414	4L	6.39	.360	11.71	-38.6	18.02	0.38	139	0.45	Slightly cloudy
1418	6L	6.35	.368	11.64	-42.6	18.02	0.51	90.4	0.45	↓
1422	8L	6.35	.382	11.65	-49.0	18.02	0.49	59.8	0.45	↓
1426	9.5L	6.36	.388	11.58	-51.7	18.02	0.48	45.7	0.45	↓

SAMPLING

Date: 6/6/00
Time: 1505
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = 060606 SHL11

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHL-19 / LTMP well

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-19 Date: 6/6/06 Time: 1030
Weather Conditions Clear 70°F
PID N/A (ppm) Condition good / no lock
Sample Team TB, DR

Well Stabilization Data

Well Depth 32.37 (FT.) Datum top of PVC
Static Water Level 21.49 (FT.) Diameter: 4"
Water Column _____(FT.) Purge Method: low-flow peristaltic

Time Purging begins (T_o): ~~1029~~ 1035
Water Level at time T_o: 21.49
Time Purging ends: (T_1) 1114
Water Level at time T_1: 21.59

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1046	3.0L	6.27	.169	12.13	-39.3	21.55	0.67		0.5	Lots of Iron ppt
1051	5.01	6.23	.160	11.56	-15.0	21.59	0.44		0.5	↓
1054		6.22	0.155	11.30	-6.1	21.59	0.53	79999	0.5	↓
1100		6.22	0.152	11.06	-2.6	21.59	0.56	79999	0.5	↓
1103		6.21	0.142	11.09	9.0	21.59	0.83	>9999	0.5	↓
1106	11.5	6.19	0.141	11.16	18.3	21.59	0.94	1100	0.5	↓
1109	12.5	6.19	0.140	11.17	21.4	21.59	0.95	768	0.5	↓
1114	14.0L	6.19	0.139	11.23	23.4	21.59	0.97	702		

SAMPLING

Date: 6/6/06
Time: 1120
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = 060606 SHL19

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHL-20 / LTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-20 Date: 6/6/06 Time: 1335
Weather Conditions cloudy 75°F
PID N/A (ppm) Condition good / no lock
Sample Team TB / DR

Well Stabilization Data

Well Depth 50.55 (FT.) Datum BTOPVC
Static Water Level 18.31 (FT.) Diameter: 4"
Water Column _____(FT.) Purge Method: low-flow / peristaltic

Time Purging begins (T_o): 1338
Water Level at time T_o 18.31
Time Purging ends: (T_1) 1405
Water Level at time T_1: 18.35

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1342	1.5	6.58	.372	12.39	-20.7	18.35	0.09	14.7	0.48	
1348	4 L	6.55	.374	12.18	-23.5	18.35	0.57			
1355	6 L	6.54	.378	12.21	-26.6	18.35	0.27	5.43	0.48	
1400	8 L	6.55	.383	12.51	-28.9	18.35	0.23	4.23	0.48	
1405	10 L	6.54	.386	12.46	-30.2	18.35	0.25	3.02	0.48	

SAMPLING

Date: 06 JUN 06
Time: 1430
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = 060606 SHL20

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-93-22C

LTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-93-22C Date: ~~6/12/06~~ 6/13/06 Time: 1250
Weather Conditions 6/12/06/
PID NA (ppm) Condition good
Sample Team TD/DR

Well Stabilization Data

Well Depth 137.5 (FT.) Datum BTOPVCC
Static Water Level 4.98 (FT.) Diameter: 4"
Water Column _____(FT.) Purge Method: grundfos

Time Purging begins (T_o): 1230
Water Level at time T_o: 4.98
Time Purging ends: (T_1) ——
Water Level at time T_1: ——

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1252	Ø*					31.52*				e) 138.05
1312	3.16L	7.52	.511	11.79	-138.4	37.00	0.13		.38	slightly cloudy
1320						61.19 ↓				Pumped down to
1321						6.3 ↓			.35	e 180.05
1330						89.33** ↓			.47	e 214
										e
1340						111.3** ↓			.40	

SAMPLING

Date: 6/12/06
Time: 1345
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier FED
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks:
Sample ID = ~~BHSHM9322C~~ 061206 SHM9322C

* Historically, W.L. drops to 25-30' before stabilizing, so pumped to 30' & started low flow sampling

** W.t. wouldn't stabilize

PSP-01 / PMP

Pond

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: PSP-01 Date: 6/6/06 Time: 1510
Weather Conditions clear 70°F
PID N/A (ppm) Condition ~~good~~ NA
Sample Team TB / DR

Well Stabilization Data

Well Depth NA (FT.) Datum NA
Static Water Level NA (FT.) Diameter: NA
Water Column NA (FT.) Purge Method: NA - grab w/peristaltic

Time Purging begins (T_o): ____
Water Level at time T_o: ____
Time Purging ends: (T_1) ____ NA
Water Level at time T_1: ____

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1520	—	6.91	.147	18.79	84.3	—	6.52	1.44	—	clear

SAMPLING

Date: 6/6/06
Time: 1525
Field Filtering: N/A
Sampling Methodology: ~~Low Flow Sampling~~ Grab Sample
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B4000PSP1W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w t (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Also collected MS/MSD & DUP1

(Divider Page)

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: NSP1 **Date:** 10/25 **Time:** 1400
Weather Conditions partly cloudy 70°F
PID NA (ppm) Condit ion Good
Sample Team TB JDR

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOGP
Static Water Level 24.52 (FT.) Diameter : 1"
Water Column _____ (FT.) Purge Method: low-flow

Time Purging begins (T_o): 1400
Water Level at time T_o: _____
Time Purging ends: (T_1) NA
Water Level at time T_1 _____

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1425	6.0L	6.60	.777	12.66	-116.7	*	.26	—	.25	Clear
1430	8.0L	6.65	.712	12.58	-120.4	*	0.22	—	.25	"
1435	9.0L	6.62	.693	12.73	-120.8	*	.21	—	.25	"
1440	10.5L	6.61	.680	12.63	-121.6	*	.23	—	.25	"

SAMPLING

Date: 10/25/06
Time: 1455
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B50000NSP1W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (Inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

MW-P-2 24.52

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: MW P-2 Date: 9/12/06 Time:
Weather Conditions clear
PID ppm) Condition good
Sample Team FB/DP

Well Stabilization Data

Well Depth (FT.) Datum BTOC
Static Water Level 24.38 (FT.) Diameter: 1"
Water Column (FT.) Purge Method: low-flow

Time Purging begins (T_o): 1349
Water Level at time T_o: 23.38
Time Purging ends: (T_1)
Water Level at time T_1

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1356	1.5L	6.29	1.331	13.91	-98.0	*	0.39	—	0.25	clear
14.00		6.31	1.356	14.28	-101.4		0.32	—	0.25	
1400	5.0L	6.29	1.362	13.73	-102.7		0.33	—	0.25	
1413	6L	6.29	1.358	13.60	-102.9		0.33	—	0.25	
1417	7.0L	6.28	1.358	13.48	-103.3		0.32	—	0.25	
1420	8.0L	6.28	1.359	13.41	-103.5		0.33	—	0.25	
			* can't fit D.O. probe down well							

SAMPLING

Date: 9/15/06
Time: 1420
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID =

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

pulling in air bubbles b/c of w.t. depth, due to depth can only pull @ .25 LPM, can't fill water probe in

SHL-10D

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHL-10D **Date:** 10/25/06 **Time:**
Weather Conditions: partly cloudy 70°F
PID: NA (ppm) Condition: good
Sample Team: [illegible]

Well Stabilization Data

Well Depth ______ (FT.) Datum: BTOSC
Static Water Level: 30.56 (FT.) Diameter: 4"
Water Column ______ (FT.) Purge Method: ~~low flow~~ / G FB Purge & Bail Grundfos

Time Purging begins (T_o): 1205
Water Level at time T_o: 30.50
Time Purging ends: (T_1) NA
Water Level at time T_1

Time	Volume Removed	pH +/- 0.1	Sp Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1219		10.98	.337	12.83	-38	45.80	0.36	—	0.35	@ 150.20
1220						46.02				

SAMPLING

Date: 10/25/06
Time: 1243
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B5000SHL10DW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

water level dropping @ .35 LPM pumped dry, let recharge & sample

SHL-13

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHL-13 **Date:** 10/21/06 **Time:**
Weather Conditions Clear 60°F
PID (ppm) Condition good
Sample Team TB / DR

Well Stabilization Data

Well Depth (FT.) Datum BTOPVCC
Static Water Level 7.24 (FT.) Diameter: 2"
Water Column (FT.) Purge Method: low-flow

Time Purging begins (T_o): 0740
Water Level at time T_o: 7.24
Time Purging ends: (T_1) 0821
Water Level at time T_1: 7.28

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0748	5L	7.54	.212	11.50	-67.5	7.27	2.17*	—	.45	clear
0758	8L	6.82	.212	11.55	-281.3	7.28	*	—	.45	clear
0803	10.5L	6.68	.212	11.56	-265.9	7.28	*	—	.45	clear
0811	14.0L	6.65	.212	11.57	-302.7	7.28	*	—	.45	"
0815	15.5	6.52	.212	11.61	-316.6	7.28	*	—	"	"
0818	17.0L	6.50	.212	11.62	-322.6	7.28	*	—	"	"
0821	18.5L	6.49	.212	11.63	-326.1	7.28	*	—	"	"

SAMPLING

Date: 10/21/06
Time: 0845
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks:
Sample ID = B5000 SHL13W
* D.O. probe stopped working

SHL-22

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-22 Date: 10/21/06 Time:
Weather Conditions Clear 70°F
PID — (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVCC
Static Water Level 7.22 (FT.) Diameter: 4"
Water Column _____ (FT.) Purge Method: low-flow

Time Purging begins (T_o): 0940
Water Level at time T_o: 7.22
Time Purging ends: (T_1) 10:31
Water Level at time T_1: 7.86

Time	Volume Removed	pH	Conductivity (mS/cm)	TEMP.(C)	Redox (mV)	Water level (Ft)	D.O. (mg/L)	Turbidity (NTU)	Purge rate (Lpm)	Appearance
		+/- 0.1	+/- 3%	+/- 0.2 or 3%	+/- 10 mV	< 0.3 ft	+/- 10%	<5 NTU preferred and +/- 10% > 1 NTU	0.3 to 0.5LPM	
0958	7.0L	6.71	.752	10.95	-36.2	7.90	*	—	0.4	clear
1015	14L	6.83	.739	11.15	-28.7	7.86	.38	—	0.4	
1020	16L	6.79	.739	11.05	-28.4	7.86	.31	—	0.4	
1024	17.5	6.78	.739	10.99	-28.0	7.86	.26	—	0.4	
1028	19.0L	6.78	.738	10.97	-27.5	7.86	.25	—	0.4	
1031	20.5L	6.78	.738	10.97	-27.0	7.86	.22	—	0.4	

SAMPLING

Date: 10/21/06
Time: 1032
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B; Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B
Remarks:
Sample ID = 135 000SHL22W

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		

1gallon = 3.78 liters

Also collected DUP(2)

LowFlowDataSheet.xlstemplate-low flow

* (changed out / New YSI Probe

SHM-05-39A

B5SHM0539A(J)

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-05-39A **Date:** 9/20/00 Time:
Weather Conditions clear 70°F
PID NA (ppm) Condition good
Sample Team TB | DR

Well Stabilization Data

Well Depth (FT.) **Datum** BTOPVCC
Static Water Level 11.44 (FT.) Diameter: 2"
Water Column (FT.) Purge Method: Low-Flow

Time Purging begins (T_o) 1155
Water Level at time T_o: 11.44
Time Purging ends: (T_1) 1227
Water Level at time T_1: 11.63

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1220	10L	6.49	.628	12.41	-132.1	11.63	*	-	.45	Clear
1223	11L	6.48	.635	12.31	-132.0	11.63	*	—	.45	"
1227	13L	6.48	.638	12.30	-132.2	11.63	*	—	.45	"
					* =	Broken				

SAMPLING

Date: 9/20/00
Time: 1227
Field Filtering: No
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID =

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w l (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-99-31A

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-99-31A Date: 9/20/06 Time: _____
Weather Conditions Clear 70°F
PID N/A (ppm) Condition good
Sample Team TB LAB

Well Stabilization Data

Well Depth _____ (FT.) Datum TOPVCC
Static Water Level 3.25 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: Low-Flow

Time Purging begins (T_o): ~~1138~~ 1138
Water Level at time T_o 3.25
Time Purging ends: (T_1) 1146
Water Level at time T_1 3.45

Time	Volume Removed (L)	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1128						~~3.49~~ 3.41		—	0.5	clear
1128						3.45		—		
1138	20	6.14	0.178	14.36	-64.1	3.45	*	—	0.5	"
1142	22	6.07	0.176	14.42	-68.7	3.45		—	0.5	clear
1146	24	6.06	0.175	14.46	-72.9	3.45		—	0.5	clear
					* =	Broken				

SAMPLING

Date: 9 / 20 / 06
Time: 1149
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks: BS SHM 99 31A (L)
Sample ID =

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9036, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-99-31B

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHM-99-31B **Date:** 9/20/06 **Time:** 0435
Weather Conditions Clear 70's
PID — (ppm) Condition Good
Sample Team DR + TG

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVCC
Static Water Level 3.90 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: Peristaltic

Time Purging begins (T_0): 0935
Water Level at time T_0: 3.90
Time Purging ends: (T_1) 1135
Water Level at time T_1: 3.94

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1120	36 L	6.70	0.383	11.99	-87.5	3.94	*	—	0.45	clear
1125	38 L	6.39	0.360	11.22	-80.6	3.94	*	—	0.45	"
1130	41	6.37	0.362	11.15	-80.6	3.94	*	—	0.45	clear
1135	43	6.36	0.363	11.22	-80.5	3.94	*	—	0.45	"
				*	= Broken					

SAMPLING

Date: 9/20/06
Time: 1130
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BGSHM9931BW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

3.25 = A

LowFlowDataSheet.xlstemplate-low flow

41.5
8
36.0

SHM-99-31C

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHM-99-31C **Date:** 9/20/06 **Time:**
Weather Conditions Clear
PID N/D (ppm) Condition
Sample Team TB/DC

Well Stabilization Data

Well Depth (FT.) Datum TOPVCC
Static Water Level 4.19 (FT.) Diameter: 2"
Water Column (FT.) Purge Method: low-flow

Time Purging begins (T_0): 0912
Water Level at time T_0 4.19
Time Purging ends: (T_1)
Water Level at time T_1

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0941	10L	6.69	.731	11.08	-115.6	4.34	0.00	<1	0.4	Clear
0946		6.67	.733	11.07	-119.5	4.34	0.00	<1	0.4	
0950	14.5L	6.68	.731	11.11	-123.4	4.34	0.00*	<1	0.4	Clear

SAMPLING

Date: 9/20/06
Time: 1005
Field Filtering:
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Couner
Remarks:
Sample ID = B5SHM9931C(W)

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta WL (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

D.O. probe reading negative; pulled probe & checked @ 100% saturated; probe only reading 2.68 mg/L will recondition

SHM-99-32X

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHM-99-32X **Date:** 9-20-06 **Time:** 0845
Weather Conditions Clear, 70's
PID ____ (ppm) **Condition** Good
Sample Team DR + TB

Well Stabilization Data

Well Depth ____ (FT.) **Datum** BTOPVCC
Static Water Level 9.82 (FT.) **Diameter:** 2"
Water Column ____ (FT.) **Purge Method:** Peristaltic

Time Purging begins (T_o): 0850
Water Level at time T_o: 9.82
Time Purging ends: (T_1) 0925
Water Level at time T_1: 9.88

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0900	3.5L	6.49	0.758	11.11	-120.1	9.88	4.73		0.35	clear
0905		6.53	0.755	10.98	-124.4	9.88	3.53		↓	"
0910	7.0L	6.54	0.754	10.95	-126.0	9.88	3.37	<1	↓	"
0915		6.56	0.748	10.90	-129.0	9.88	3.06		0.35	clear
0920	14.0L	6.57	0.747	10.91	-130.3	9.88	2.87	<1	.35	"
0925	16.0L	6.59	0.749	10.90	-131.5	9.88	0.0*	<1	.35	clear

38

SAMPLING

Date: 9/20/06
Time: 0935
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.l. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks:
Sample ID = B5SHM9932X(D) SAMPLED AT 0935

SHM-05-39B

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHM-05-39B **Date:** 9/25/06 **Time:**
Weather Conditions partly cloudy 70's F
PID N.D. (ppm) Condition good
Sample Team TR / DS

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVCC
Static Water Level 15.11 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: Low-Flow

Time Purging begins (T_o): 0815
Water Level at time T_o: 19.91
Time Purging ends: (T_1) 0853
Water Level at time T_1: 47.71

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0815	5L	6.90	.944	11.96	-127	19.91	0.22		0.4	
	water level not stabilizing pumped to						~48' bg TOPVCC			
0840		6.98	.928	13.98	-117.7	48.25	0.17	—	.4	light gray silty
0846		7.00	.931	14.02	-123.1	47.71	0.14		.4	↓
0850		7.00	.934	14.01	-123.2	47.71	0.15		.4	
0853		7.00	.935	13.99	-123.3	47.71	0.14		.4	

SAMPLING

Date: 9/25/06
Time: 0855
Field Filtering: N/A
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BSSHM05539BG

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B
Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w t (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-05-40X

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-05-40X Date: 9/20/06 Time: 1145
Weather Conditions Clear 70°F
PID NA (ppm) Condition good
Sample Team JTD / DB

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVCC
Static Water Level 14.18 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: Low-Flow

Time Purging begins (T_o): 11:50
Water Level at time T_o 14.18
Time Purging ends: (T_1) 1215
Water Level at time T_1 14.22

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1200	4L	6.76	0.392	13.09	-170.6	14.22	4	—	0.40	clear
1205		6.77	0.395	13.08	-169.6	14.22	Broken	—	0.40	
1210	8L	6.78	0.398	13.05	-167.5	14.22	↓	—	0.40	
1215	10L	6.79	0.398	13.04	-164.6	14.22	↓	—	0.40	↓
			SAMPLED			AT	1215			

SAMPLING

Date: 9/20/06
Time: 1215
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B5SHM0540XW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.l. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		

*gallon = 3.78 liters

SHM-05-41A

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHM-05-41A **Date:** 9/20/06 **Time:**
Weather Conditions Clear 70°F
PID NA (ppm) **Condition** good
Sample Team TB / DR

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVC
Static Water Level 10.61 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: low-flow

Time Purging begins (T_o): 1239
Water Level at time T_o 10.61
Time Purging ends: (T_1) 1343
Water Level at time T_1: 10.65

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1323	15.0	6.61	.163	11.99	-82.7	10.65	*	—	.375	clear
1330	17.5	6.42	0.130	11.94	-67.5	10.65	*	—	.375	clear
1338	20.5	6.37	0.130	11.66	-67.7	10.65	*	—	.375	↓
1343	22.5	6.37	0.129	11.91	-67.8	10.65	*	—	.375	↓
			* D.O. probe not working							
				SAMPLED AT 1345						

SAMPLING

Date: 9/20/06
Time: ~~1340~~ 1345
Field Filtering: No
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B
Remarks:
Sample ID = B5SHM05 41AW

Diameter (inch)	Gallon / Foot	* delta w.t (ft)	* volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Also collected MS / MSD

98.8 8.78mg/L 21.78°C

SHM-05-41B

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: ~~284350.OM.02~~

Well ID: SHM05-41B Date: 9/20/12 Time: 1235

Weather Conditions Clear 70°F

PID NR (ppm) Condition Good

Sample Team DR/TB

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVCC

Static Water Level 10.42 (FT.) Diameter: 2"

Water Column _____ (FT.) Purge Method: _____

Time Purging begins (T_o): 1239

Water Level at time T_o: 10.42

Time Purging ends: (T_1) 1319

Water Level at time T_1: 10.48

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1258	7.5L	6.40	.797	12.98	-114.5	10.48	0.76	—	0.40	silty/light brown
1302	9.5	6.38	.793	12.50	-120.0	10.48	0.29	—	.375	"
1307	10.0L	6.39	.792	12.60	-123.9	10.48	0.21	—	.375	"
1310	11.5L	6.39	.791	12.50	-125.4	10.48	0.16	—	.375	"
1315	13.0L	6.41	.791	12.51	-127.3	10.48	0.07	—	.375	"
1319	15.0L	6.40	.790	12.66	-127.6	10.48	*	—	.375	"

SAMPLING

Date: 9/20/12

Time: ~~1328~~ 1333

Field Filtering: NO

Sampling Methodology: Low Flow Sampling

Laboratory: Alpha **Method of Shipment:** Courier

Remarks:

Sample ID = B5SHM05-41B

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

D.O. probe crapped out again, reading neg.

SHM-05-41C

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHM-05-41C **Date:** 9/20/06 **Time:**
Weather Conditions
PID (ppm) **Condition** good
Sample Team TB/DR

Well Stabilization Data

Well Depth (FT.) **Datum** BTOPSCC
Static Water Level 10.68 (FT.) **Diameter :** 2"
Water Column (FT.) **Purge Method:** low-flow

Time Purging begins (T_o): 1330
Water Level at time T_o: 10.68
Time Purging ends: (T_1) 1401
Water Level at time T_1 10.81

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) <0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1349	7L	6.99	.756	11.82	-173.3	10.81	*	—	.375	clear
1353	8.5L	7.04	.761	11.72	-174.3	10.81	*	—		clear
1358	10.5L	7.10	.763	11.73	-173.6	10.81	*	—	.375	✓
1401	11.5L	7.11	.764	✓	✓		*	—	.375	
				11.69	-172.4	10.81		—	.375	
				*	D.O. probe not working					

SAMPLING

Date: 9/20/06
Time: 1401
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BSSHM0541C

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-05-42A

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-05-42A Date: 9/21/06 Time:
Weather Conditions Clear 70°F
PID NA (ppm) Condition Good
Sample Team TB/DR

Well Stabilization Data

Well Depth 48 (FT.) Datum BTOPVCC
Static Water Level 4.89 (FT.) Diameter: 1"
Water Column (FT.) Purge Method: low-flow

Time Purging begins (T_o): 1210
Water Level at time T_o: 4.89
Time Purging ends: (T_1) 1245
Water Level at time T_1: 4.99

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1223	6L	6.17	.050	10.53	106.1	4.99	4.99	—	.475	Clear
1227	9L	6.13	.050	10.44	130.6	4.99	4.96	—	.475	"
1232	12L	6.10	.050	10.41	152.8	4.99	4.94	—	.475	
1236	13.5L	6.10	.050	10.34	162.4	4.99	4.93	—	.475	
1239	15.0L	6.09	.050	10.31	170.7	4.99	4.91	—	.475	
1242	16.5	6.09	.050	10.34	175.3	4.99	4.91	—	.475	
1245	17.5L	6.09	.050	10.35	180.3	4.99	4.90	—	.475	↓

SAMPLING

Date: 9/21/06
Time: 1250
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BSSHM0542AW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM05-42B

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM05-42B Date: 9/21/05 Time:
Weather Conditions Clear 70°F
PID N/A (ppm) Condition good
Sample Team TB MD

Well Stabilization Data

Well Depth (FT.) Datum BTOPVCC
Static Water Level 4.83 (FT.) Diameter: 1"
Water Column (FT.) Purge Method: low-flow

Time Purging begins (T_o): 1220
Water Level at time T_o: 4.83
Time Purging ends: (T_1) 1305
Water Level at time T_1: 4.93

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1238	8.0L					4.93		—	.43	clear
1250	13.0L	6.72	0.773	10.79	-96	4.93	0.22	—	.43	
1255	15.5L	6.71	0.777	10.83	-105.0	4.93	0.18	—	0.43	
1300	17.5L	6.73	0.777	10.82	-108.4	4.93	0.17	—	.43	
1305	20L	6.74	0.778	11.03	-110.2	4.93	0.16	—	.43	

SAMPLING

Date: 9/21/05
Time: 1305
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BSSHM05 42BW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B
Alkalinity by 2320B, Chloride by 9251, Sulfate by
9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHL-9

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHL-9 **Date:** 9/21/00 **Time:**
Weather Conditions clear 70°F
PID N/A (ppm) **Condition** good
Sample Team TB / DB

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOC
Static Water Level 10.28 (FT.) Diameter: 4"
Water Column _____ (FT.) Purge Method: Grdr

Time Purging begins (T_o): 1013
Water Level at time T_o: 10.23
Time Purging ends: (T_1) 1107
Water Level at time T_1 10.50

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1057	7 L	6.80	.211	10.71	-82.4	10.50	0.17	—	0.5	
1101	9.0L	8.74	.209	10.70	-75.3	10.50	0.16	—	0.5	
1104	10.5	8.73	.208	10.70	-73.8	10.50	0.16	—	0.5	
1107	11.5	6.72	.208	10.69	-73.3	10.50	0.15	—	0.5	

SAMPLING

Date: 9/21/00
Time: 1144
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B50000 SHL9G

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w t (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-96-22B

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-96-22B Date: 9/21/06 Time:
Weather Conditions Clear 70°F
PID N/A (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth (FT.) Datum TOC
Static Water Level 8.39 (FT.) Diameter: 4"
Water Column (FT.) Purge Method: low-flo

Time Purging begins (T_o): 1000
Water Level at time T_o: 8.41
Time Purging ends: (T_1) 1048
Water Level at time T_1: 8.45

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1035	5L	6.71	0.728 ~~1.071~~	10.71	-103.9	8.45	0.25	—	0.4	Clear
1040	7L	6.75	0.724	10.64	-126.6	8.45	0.25	—	0.4	clear
1044	9.5L	6.77	0.724	10.63	-129.2	8.45	0.20	—	0.4	↓
1048	10L	6.77	0.724	10.63	-129.3	8.45	0.20	—	0.4	↓
			SAMPLED	AT	1059					

SAMPLING

Date: 9/21/06
Time: 1059
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BSSHM96-22B(D)

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHM-96-5B

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: 35 SHM965B **Date:** 9/20/06 **Time:**
Weather Conditions Clear 70°F
PID N/A (ppm) **Condition** good
Sample Team TBIM

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVCC
Static Water Level 6.37 (FT.) Diameter: 4"
Water Column _____ (FT.) Purge Method: low-flow

Time Purging begins (T_o): 1429
Water Level at time T_o: 6.37
Time Purging ends: (T_1) 1504
Water Level at time T_1: 6.68

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1440	3L	6.59	.678	12.22	-135.1	6.67	—	—	0.4	clear
1448	7L	6.54	.678	12.48	-145.8	6.68	—	—	0.4	
1455	9L	6.54	.679	12.18	-156.4	6.68	—	—	0.4	
1458	10L	6.54	.679	12.16	-157.0	6.68	—	—	0.4	
1502	12L	6.53	.680	12.09	-160.5	6.68	—	—	0.4	
				* D.O. probe			not	working		

SAMPLING

Date: 9/20/06
Time: 1507
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = 35 SHM965BW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.l. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1 gallon = 3.78 liters

SHM-96-5C

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-96-5C Date: 9/20/06 **Time:**
Weather Conditions clear 70°F
PID N/A (ppm) Condition good
Sample Team TB/DM

Well Stabilization Data

Well Depth (FT.) Datum BTOPVCC
Static Water Level 5.83 (FT.) Diameter: 4"
Water Column (FT.) Purge Method: Low-flow

Time Purging begins (T_o): 1435
Water Level at time T_o: 5.83
Time Purging ends: (T_1)
Water Level at time T_1

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1447					-1	5.85				
1508	12L	6.47	.907	11.78	-178.3	5.85	—	—	.325	clear
1513	13L	6.48	.909	11.67	-183.3	5.85	—	—	.325	clear
1517	15L	6.48	.909	11.48	-184.9	5.85	—	—	.325	clear
1521	17L	6.49	.910	11.44	-186.0	5.85	—	—	.325	↓
1524	18L	6.49	.910	11.42	-176.9	5.85	—	—	.325	↓
			* D.O.	Probe	Not	Working				

SAMPLING

Date: 9/20/06
Time: 1541
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID =

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

8-5

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHL-8S **Date:** 9/21/06 **Time:**
Weather Conditions
PID NA (ppm) Condition good
Sample Team TB, DM

Well Stabilization Data

Well Depth (FT.) Datum BTOC
Static Water Level 7.96 (FT.) Diameter: 2"
Water Column (FT.) Purge Method: Low-Flow

Time Purging begins (T_o): 0811
Water Level at time T_o 7.96
Time Purging ends: (T_1) 0848
Water Level at time T_1: 9.95

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0837	10.5L	6.27	.062	9.94	-186.8	9.95	*	—	.4	clear
0844	13.5L	6.22	.062	9.99	-182.3	9.95	*	—	.4	↓
0848	15.0L	6.21	.062	9.95	-182.9	9.95	*	—	.4	↓
				* D.O. probe not working						

SAMPLING

Date: 9/21/06
Time: 0913
Field Filtering:
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B500005HL8SW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.l. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHL-8-D

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHL-8D **Date:** 9/21/06 **Time:**
Weather Conditions clear 60°F
PID NA (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth (FT.) Datum BTOPVCC
Static Water Level 7.78 (FT.) Diameter: 2"
Water Column (FT.) Purge Method: low-flow

Time Purging begins (T_o): 0831
Water Level at time T_o: 7.78
Time Purging ends: (T_1)
Water Level at time T_1

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0906	14L	6.06	.161	10.12	-272.7	8.05	*		0.4	Clear
0910	15.5L	6.06	.161	10.13	-271.1	8.05	*		.4	clear
0914	17.0L	6.05	.160	10.14	-266.8	8.05	*		.4	Clear
			*	D.O. probe	Not	working				

SAMPLING

Date: 9/21/06
Time: 0932
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B5000SHL8DW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHL-23

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts
Project Number: 284350.OM.02
Well ID: SHL-23 **Date:** 9/25/06
Time:
Weather Conditions clear 70°F
PID NA (ppm) **Condition** good
Sample Team TB / DZ

Well Stabilization Data

Well Depth ________ (FT.) Datum BTOPVC
Static Water Level 28.33 (FT.) Diameter: 4"
Water Column ________ (FT.) Purge Method: Low-Flow w/ Grundfos

Time Purging begins (T_0): 0928
Water Level at time T_0: 28.33
Time Purging ends: (T_1) 1008
Water Level at time T_1: 28.48

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0937	5L	6.54	.043	11.80	101.3	28.46	11.67	—	0.35	Clear
0941	8L	6.01	.036	12.10	167.4	28.48	11.67	—	↓	↓
0945	9.5	5.82	.035	12.48	185.7	28.48	11.61	—		↓
0950	11.5	5.73	.034	12.60	200.2	28.48	11.60	—		clear
0957	15.0L	5.64	.033	12.75	220.1	28.48	11.58	—		↓
1002	17.0L	5.59	.033	12.82	228.5	28.48	11.55	—		
1005	19.0L	5.58	.033	12.69	234.2	28.48	11.56	—	↓	↓
1008	19.0L	5.56	.033	12.70	238.3	28.43	11.54	—	.35 @	119 Htz

SAMPLING

Date: 9/25/06
Time: ~~1005~~ 1025 (TB)
Field Filtering:
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.l (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks:
Sample ID = BS 006 SHL23W
Sampl

LowFlowDataSheet.xlstemplate-low flow

SHL-21

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-21 Date: 9/25/06 Time: _____
Weather Conditions partly cloudy
PID WA (ppm) Condition good
Sample Team TOM JOE

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVLC
Static Water Level 47.81 (FT.) Diameter: 4"
Water Column _____ (FT.) Purge Method: low-flow / Grundfos

Time Purging begins (T_o): 1037
Water Level at time T_o: 47.81
Time Purging ends: (T_1) 1137
Water Level at time T_1: 45.48

Time	Volume Removed	pH +/- 0.1	Sp Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance	
1042	*3L	5.75	.080	11.49	208.4	45.85	2.73	—	.4	Clear	@ 150.60
1049	*5L	5.89	.079	12.84	205.9	45.85	5.10	—	.4	Clear	@ 150.60
1053	7L	5.91	.079	13.04	209.3	45.85	5.48	—	.4		
	ran out of gas			Pump back on @			1118	—	.4		
1127		5.99	.077	13.09	200.9	45.48	7.71	—	.35/.375/.4		@ 152.4 / 153 / 154.4
1130	11L	5.99	.078	13.60	201.9	45.48	7.48	—	.4		@ 154.4
1134		5.98	.077	13.78	205.4	45.48	7.21	—	.4		
1137	14L	5.97	.077	13.67	207.6	45.48	7.19	—	.4		

SAMPLING

Date: 9/25/06
Time: 1145
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B50005HL21W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B; Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

* Bucket not on level surface

PSP-1

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: PSP-1 Date: 9/12/06 Time: _____
Weather Conditions clear 60°F
PID N/A (ppm) Condition N/A
Sample Team TB/DE

Well Stabilization Data

Well Depth N/A (FT.) Datum ~~TOC~~ Grade
Static Water Level 1.16 (FT.) Diameter : NONE
Water Column N/A (FT.) Purge Method: NONE, Grab

Time Purging begins (T_o): _____
Water Level at time T_o: NA
Time Purging ends: (T_1) _____
Water Level at time T_1 _____

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0751	—	7.08	1,236	13.63	-184.6	1.16	1.92*	—	—	Slightly cloudy
				*	D.O. probe NOT working correctly					

SAMPLING

Date: 9/12/06
Time: 0900
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B50000PSP1(W)

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHP-01-36X

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHP-01-36X Date: 9/21/06 Time:
Weather Conditions clear 70°F
PID NA (ppm) Condition good
Sample Team TB/JDR

Well Stabilization Data

Well Depth _____ (FT.) Datum TOSC
Static Water Level _____ (FT.) Diameter: 1
Water Column _____ (FT.) Purge Method: low-flow

Time Purging begins (T_o): 1330
Water Level at time T_o:
Time Purging ends: (T_1) NA
Water Level at time T_1 _____

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1339	3.5L	6.75	.224	17.28	-44.8	Probe in well	.24	—	.45	clear
1343	5.5L	6.66	.224	17.28	-42.3	Fit	.21	—	.45	clear
1347	8.0L	6.63	.224	17.29	-41.6	in well	.20	—	.45	clear
1351	10.0L	6.61	.224	17.23	-41.7		.20	—	.45	clear

SAMPLING

Date: 9/21/06
Time: 1359
Field Filtering: ND
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B5SHP0136QX

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHP-01-37X

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHP-01-37X Date: 9/21/06 Time: _____
Weather Conditions Clear 70°F
PID N/A (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOSC
Static Water Level _____ (FT.) Diameter: 1"
Water Column _____ (FT.) Purge Method: low-flow

Time Purging begins (T_o): 1340
Water Level at time T_o: _____
Time Purging ends: (T_1) NA
Water Level at time T_1 _____

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1357	6.0L	6.79	.069	15.35	-70.7	constant	0.14	—	.35	clear
1401	7.5L	6.80	.069	15.33	-77.2	Probe in well	0.13	—	.35	clear
1409	9.0L	6.81	.069	15.31	-81.0		0.13	—	.35	clear
1408	10.0L	6.82	.069	15.29	-84.0		0.13	—	.35	clear

SAMPLING

Date: 9/21/06
Time: 1431
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B5SHP01 37X (W)

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1 gallon = 3.78 liters

SHP-01-38A

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: _____ Date: 9/21/06 Time: _____
Weather Conditions Clear 70°F
PID NA (ppm) Condition good
Sample Team TB IDR

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOSC
Static Water Level 4.24 (FT.) Diameter: 1"
Water Column _____ (FT.) Purge Method: low-flow

Time Purging begins (T_o): 1412
Water Level at time T_o: 4.24
Time Purging ends: (T_1) 1426
Water Level at time T_1: 4.24

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1412	4.5L					4.24			.5	clear
1417	7.0L	6.49	.382	12.93	-63.4	4.24	0.18	—	.5	clear
1421	9.0L	6.50	.382	12.91	-64.4	4.24	0.17	—	.5	↓
1426	11.0L	6.51	.381	12.90	-66.0	4.24	0.17	—	.5	↓

SAMPLING

Date: 9/21/06
Time: 1430
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BS SHP0138AW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHL - 15

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL - 15 Date: 9/25/06 Time:
Weather Conditions partly cloudy
PID NA (ppm) Condition good
Sample Team TA/DB

Well Stabilization Data

Well Depth _____ (FT.) Datum TOPVCC
Static Water Level 19.57 (FT.) Diameter :
Water Column _____ (FT.) Purge Method: Low-Flow

Time Purging begins (T_0): 1255
Water Level at time T_0: 19.57
Time Purging ends: (T_1) _____
Water Level at time T_1 _____

Time	Volume Removed	pH +/- 0.1	DP Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1304	4L	6.16	.193	12.76	21.0	19.69	0.27	—	0.325	clear
1308	5.5	6.07	.192	13.02	24.5	19.69	0.29	—	0.325	
1311		6.04	.190	13.22	25.0	19.69	0.36	—	.325	
1315	7.5	6.01	.189	13.13	27.2	19.69	0.39	—	.325	
1319	8.5	6.02	.187	13.10	30.1	19.69	0.40	—	.325	clear

SAMPLING

Date: 9/25/06
Time: 1330
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha Method of Shipment: Courier
Remarks:
Sample ID = BS000SHL15W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B
Alkalinity by 2320B, Chloride by 9251, Sulfate by
9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1 gallon = 3.78 liters

(Divider Page)

(3)

CTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL 3 Date: 12-8-06 Time: 0830
Weather Conditions Cold - 30° - Partly cloudy - windy
PID NA (ppm) Condition good
Sample Team CR / DR

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVCC
Static Water Level 30.03 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: low-flow / grundfos

Time Purging begins (T_o): 0830
Water Level at time T_o: 30.03
Time Purging ends: (T_1) 0903
Water Level at time T_1: ~~30.0~~ 30.1

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) % +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance ORP
0835		7.3	.018	11.14	199.7	30.03	~~5.22~~ 7.2			199.7
0840		7.32	.059	3.15	199.9		-7.13			199.9
0845		7.31	.059	3.74						
0850		7.08	.053	25.68	166.9		12.76			
0857		7.09	.049	19.55	158.8		14.39			
0903		7.08	.052	15.33	153.9	30.1	10.81			
12/13/06	1205 in situ	6.77	~~24.5~~ .0249	13.05	121	~~30.~~	~~89.9~~	9.53		

DO - need recal - readings unreliable due to pump setup

SAMPLING

Date: 12/8/06
Time: 0905
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = _____

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

(4) LTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: #SHL 4 **Date:** 12-8-06 **Time:** 1030
Weather Conditions 30°- cloudy - P. Cloudy
PID ______ (ppm) **Condition** Good
Sample Team CR/DR

.5L/m

Well Stabilization Data

Well Depth - (FT.) Datum BTOPVCC
Static Water Level ______ (FT.) Diameter : 2"
Water Column ______ (FT.) Purge Method: low-flo - Grundfos

Time Purging begins (T_o): 1030
Water Level at time T_o: 10.17
Time Purging ends: (T_1) 1120
Water Level at time T_1: 10.17

Time	Volume Removed	pH	Conductivity (mS/cm)	TEMP.(C)	Redox (mV)	Water level (Ft)	D.O. (mg/L)	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1105		+/- 0.1	+/- 3%	+/- 0.2 or 3%	+/- 10 mV	< 0.3 ft	+/- 10%			
1105		6.49	.167	10.12	118.1	10.17	NA			
1110		6.49	.165	10.12	114.4	10.17	/			
1115		6.49	.165	10.04	113.1	10.17	/			
1120		6.48	.164	10.02	112.3	10.17				
insitu 12-15-06 1230		5.62	.203	11.58	74	10.17		.40		

SAMPLING

Date: 12/8/06
Time: 1120
Field Filtering: ______
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID =

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHL-5

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-5 Date: 12-5-06 Time: 1400
Weather Conditions partly cloudy
PID NA (ppm) Condition good
Sample Team CR

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVC
Static Water Level 3.25 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: low-flow/per.

Time Purging begins (T_o): 1400
Water Level at time T_o: 3.25
Time Purging ends: (T_1) 1445
Water Level at time T_1: 3.30

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) % +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1415	4.5	6.57	.115	6.63	-29.5	3.30	29.85	—	.3	
1420	6.0	6.41	.113	6.60	-71.0	3.30	5.73	—		
1425	7.5	6.33	.110	6.83	-122.5	3.30	3.58	—	.3	
1430	9.0	6.31	.108	6.57	-135.0	3.30	3.15	—	.3	
1435	10.5	6.30	.108	7.18	-137.	3.30	2.66	—	.3	
1440	12.0	6.30	.108	7.24	-134.6	3.30	2.02	—		
1445	13.5	6.29	.108	7.31	-136.8	3.30	1.73	—	.3	

SAMPLING

Date: 12-5-06
Time: 1445
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B6000 SHL5W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (Inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

10

LTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHL 10 **Date:** 12-5-06 **Time:** 1355
Weather Conditions
PID (ppm) **Condition** good
Sample Team CR / CR

Well Stabilization Data

Well Depth (FT.) Datum BTOC PVC
Static Water Level (FT.) Diameter: 2"
Water Column (FT.) Purge Method: low-flow - groundfos

Time Purging begins (T_o): 1355
Water Level at time T_o: 1325 = 30.75
Time Purging ends: (T_1) 1510
Water Level at time T_1: 30.93

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) 2 or +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1450		6.44	0.041	11.90	162	30.93	11.05*		0.5	
1455	3GL	6.53	0.041	11.72	167	30.93	11.31*			
[illegible]		6.41	0.039	13.70	180		10.21			
1510		6.46	0.035	14.45	175	30.93	9.73		0.5	
				1515						

SAMPLING

Date: 12/5/06
Time: 1515
Field Filtering:
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID =

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

* Hit bottom of flow cell

LTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: 10C **Date:** 12-6-06 **Time:** 1650
Weather Conditions 20's [illegible]
PID _____ (ppm) **Condition** good
Sample Team [illegible]

Well Stabilization Data

Well Depth _____ (FT.) **Datum** B.T.O. PVC
Static Water Level _____ (FT.) **Diameter :** 4
Water Column _____ (FT.) **Purge Method:** Low-flow Bladder

Time Purging begins (T_0): 1055
Water Level at time T_0: 25.70
Time Purging ends: (T_1) 1145
Water Level at time T_1: 16.8

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1055		7.55	0.433	11.37	43.7	31.74	—		5	
1130		7.61	0.439	11.59	33.7	31.74	—			
1135	≈ 20L	7.64	0.443	11.70	26.5	31.74	—			
1140		7.66	0.445	11.90	20.2	31.76				
1145		7.66	0.444	12.05	16.8	31.76				
Insitu 1200	12/13/06	7.45	2.433	9.86	28		0.43			

SAMPLING

Date: 12/8/06
Time: 1145
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID =

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHL-11 LTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHL 11 **Date:** 12-8-06 **Time:** 1320
Weather Conditions _____
PID _____ (ppm) **Condition** Good
Sample Team DR + TB

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVC
Static Water Level _____ (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: low-flow-peri

Time Purging begins (T_o): 1325
Water Level at time T_o: 15.65
Time Purging ends: (T_1) 1426
Water Level at time T_1: 18.65

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) ? +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1408		6.32	605.5	10.07	-72	18.65	3.5			
1413		6.32	592.4	9.88	-73	18.65	3.4			
1418		6.36	589.6	9.45	-74	18.65	3.3			

SAMPLING

Date: 12/8/2006
Time: 1429
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = SHL20

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHL-19 LTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: [illegible] **Date:** 12-5-06 **Time:** 840
Weather Conditions _____
PID _____ (ppm) **Condition** good
Sample Team DR / CR

Well Stabilization Data

Well Depth _____ (FT.) **Datum** T TO PVC C
Static Water Level _____ (FT.) **Diameter :** 4"
Water Column _____ (FT.) **Purge Method:** low flow Peri

Time Purging begins (T_o): 840
Water Level at time T_o: 2[illegible]
Time Purging ends: (T_1) 1250
Water Level at time T_1: 2.73

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
950		6.43	.224	9.43	35.2	2.73	—			
955		6.43	.225	9.41	35.2	2.73				
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
12/8/06 1220	in situ	6.31	246.7 .246	10.91	2		0.29			

SAMPLING

Date: 12/8/06
Time: 1000
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID =

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.l. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

SHL-20

LTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-20 Date: 12/7/06 Time: 1320
Weather Conditions clear 40°F
PID NA (ppm) Condition good
Sample Team DRMB

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVC
Static Water Level 19.05 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: low-flow/peri.

Time Purging begins (T_0): 1325
Water Level at time T_0: 19.05
Time Purging ends: (T_1) 1435
Water Level at time T_1: 19.80

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1425	25L	6.50	.5342	4.07	-39	19.00	0.28	—	0.4	Clear
1430	27L	6.50	.5330	4.02	-38	19.00	0.29	—	0.4	↓
1435	29L	6.50	.5258	3.96	-38	19.00	0.28	—	0.4	↓
				1440						

SAMPLING

Date: 12/7/06
Time: 1440
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID =

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

22C LTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: ~~17-2701~~ SHM-93-22C **Date:** 12-12-06 **Time:** 0750
Weather Conditions Cloudy 40°
PID _____ (ppm) Condition good
Sample Team CB/JR

Well Stabilization Data

Well Depth ~ (FT.) Datum BTOPVCC
Static Water Level _____ (FT.) Diameter: 4"
Water Column _____ (FT.) Purge Method: low-flo-peri

Time Purging begins (T_o): ~~0705~~ 0755
Water Level at time T_o: 7.90
Time Purging ends: (T_1) 0830
Water Level at time T_1: 7.90

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) 2, +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0807		7.53	752.1	10.50	-142	7.90	3.6			
0812		7.51	750.1	9.87	-153	7.90	2.7			
0817		7.50	750.0	9.88	-157	7.90	2.9			
0822		7.50	751.0	9.86	-160	7.90	2.4			
0827		7.50	750.0	9.65	-162	7.90	2.5			

SAMPLING

Date: 12/8/06
Time: 0830
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = SHM9322C121206

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

(1)

31A

PMP + CHY

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-96-31A Date: 12-7-06 Time: 1420
Weather Conditions: cloudy 40°F
PID: NA (ppm) Condition: good
Sample Team: TB / DR

Well Stabilization Data

Well Depth ________ (FT.) Datum: BTOPVC
Static Water Level: 2.11 (FT.) Diameter: 2"
Water Column ________ (FT.) Purge Method: low-flow/peri

Time Purging begins (T_o): 1425
Water Level at time T_o: 2.11
Time Purging ends: (T_1) 1455
Water Level at time T_1: 2.24

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1440	6L	6.48	0.315	8.78	119.8	2.24	0.71	—	0.40	clear
1445	8L	6.44	0.315	8.84	119.5		0	—	0.40	clear
1450	10L	6.43	0.314	8.88	117.1	2.24	0	—	0.4	↓
1455	12L	6.43	0.311	8.90	115.9	2.24	0	—	0.4	↓
					→	recheck	@240,	reading 248.5		
Hydrolab →			SAMPLED	LABELLED	AT 1440					
		5.79	.161	9.09	50		0.17			

SAMPLING

Date: 12/7/06
Time: 1440
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID =

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

31B

PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-99-31B Date: 12-7-06 Time:
Weather Conditions clear 40°F
PID N/A (ppm) Condition good
Sample Team TB IDR

Well Stabilization Data

Well Depth (FT.) Datum BTOPVC
Static Water Level 3.19 (FT.) Diameter: 2"
Water Column (FT.) Purge Method: low flow / per.

Time Purging begins (T_o): 1340
Water Level at time T_o 3.09
Time Purging ends: (T_1) 1424
Water Level at time T_1: 3.15

Time	Volume Removed	pH +/- 0.1	SP Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1348	3L	6.16	220.3	10.02	-30	3.15	0.41	—	0.4	clear
1353	5L	6.08	240.8	9.89	-25	3.15	0.35	—	0.4	
1358	7L	6.04	267.0	9.76	-22	3.15	0.30	—	0.4	
1402	9L	6.00	275.0	9.73	-22	3.15	0.30	—	0.4	clear
1405	10.5L	5.96	285.4	9.69	-21		0.27	—	0.4	clear
1408	11.5L	5.97	293.9	9.69	-20	3.15	0.27	—	0.4	
1412	13L	5.93	300.6	9.69	-19	3.15	0.27		0.4	
1418	14.5L	5.94	310.6	9.74	-18		0.20		0.4	

SAMPLING

Date: 12/7/06 **Analysis:** Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B
Time: ~~1350~~ 1415 Alkalinity by 2320B, Chloride by 9251, Sulfate by
Field Filtering: NO 9038, Nitrate by 4500, and Turbidity by 2130B
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BGSHM99 31BW

Diameter (inch)	Gallon / Foot	* delta w.l. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

1421	16L	5.93	313.6	9.74	-19	3.15	0.21		0.4
1424	17L	5.92	316.5	9.77	-18	3.15	0.19		0.4

3IC PMD + CH4

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: 36SHMW93IC **Date:** 12-7-06 **Time:** 1335
Weather Conditions Clear 45°F
PID N/A (ppm) **Condition** good
Sample Team TB/RD

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOC
Static Water Level 3.38 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: low flow pump

Time Purging begins (T_o): 1335
Water Level at time T_o: 3.38
Time Purging ends: (T_1) 1415
Water Level at time T_1: 3.54

Time	Volume Removed	pH +/- 0.1	Conductivity SP (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1345		6.88	1.932	9.42	13.7	3.54	1.35	----	0.4	clear
1350		6.88	1.939	9.40	11.2	3.54	1.30	—	0.4	
1354		6.89	1.934	9.42	9.4		0.78		0.4	
1400		6.88	1.934	9.43	7.8		0.60		0.4	
1405		6.89	1.934	9.46	6.3	3.54	0		0.4	
1410		6.89	1.933	9.44	5.6		0		0.4	
1415		6.89	1.932	9.46	4.9	3.54	0		0.4	
			SAMPLED AT 1410 (replicate)							

SAMPLING

Date: 12/7/06
Time: 1410
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = 36SHMW93ICW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

recheck w/ Flow probe D.O. = 0.41 mg/L
Redox = -65.2

32x PMP + CH4

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHLM-99-32x Date: 12-7-06 Time: 1435
Weather Conditions good clear 45°F
PID N/A (ppm) Condition good
Sample Team JB LDB

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVCC
Static Water Level 8.99 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: low-flow Peri

Time Purging begins (T_o): 1437
Water Level at time T_o: 8.99
Time Purging ends: (T_1) 1257
Water Level at time T_1: 9.03

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1243		6.28	1004	16.05	-68		0.24	—		clear
1250		6.30	1006	10.04	-72	9.03	0.25	—		clear
1253		6.30	1006	10.02	-73		0.24	—		clear
1256		6.31	1006	10.02	-74	9.03	0.24	—		clear

SAMPLING

Date: 12-7-06
Time: 1517
Field Filtering: no
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BG SHLM 99 32X (W)

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

39A

D.O. probe stop broke—checked later

DMP-well

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHMW-39A Date: 12-6-06 Time: 1300
Weather Conditions Cloudy
PID NA (ppm) Condition 30°F
Sample Team TB/DR

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVCC
Static Water Level 10.61 (FT.) Diameter: 2"
Water Column _____(FT.) Purge Method: low-flow/per.

Time Purging begins (T_o): 1305
Water Level at time T_o: 10.61
Time Purging ends: (T_1) 1410
Water Level at time T_1: 10.71

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1330		6.65	0.637	10.19	-19.7		0		0.40	
		6.67	0.638	10.17	-18.3		0*			
1355		6.67				10.71	*			
1405		6.68	0.638	9.99	-26.6	10.71				
1410		6.68	0.637	9.99	-26.4	10.71				
					Sample Lea @ 1410					
		recheck	for							
			D.O. field		-26.8		0.35			

SAMPLING

Date: 12/6/06
Time: 1410
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B6SHMW39AW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		

1gallon = 3.78 liters

39B PMP

390

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHMW39BW Date: 12-12-06 Time: 1310
Weather Conditions P. Cloudy ~45°
PID NA (ppm) Condition good
Sample Team DR/CR

Well Stabilization Data

Well Depth ~ (FT.) Datum TOC
Static Water Level _____ (FT.) Diameter: 2
Water Column ~ (FT.) Purge Method: Grundfos - low flow

Time Purging begins (T_o): 1315
Water Level at time T_o: 11.61
Time Purging ends: (T_1) 1353
Water Level at time T_1: 32.70

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) mS/cm +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) ~ +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1317		6.82	778.8	11.46	-58	11.61	11.2			
1322		6.82	910.0	11.54	-71	20.40	4.2		.3	
1333		6.85	799.6	13.14	-94	29.75	3.0			
1338		6.84	751.9	13.93	-100	30.50	2.8			
1343		6.87	806.1	13.65	-102	32.20	2.4			
1348		6.84	773.3	14.13	-106	32.75	2.4			
1353		6.89	811.8	13.47	-105	32.70	2.2		.3	

SAMPLING

Date: 12/12/06
Time: 1355
Field Filtering: ~
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B6 SHMW39BW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

40X PMP + CH4

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHM-0540X **Date:** 12-6-06 **Time:**
Weather Conditions clear cold
PID ND (ppm) Condition good
Sample Team JB JDR

Well Stabilization Data

Well Depth (FT.) Datum BTOPVCC
Static Water Level 13.21 (FT.) Diameter: 2"
Water Column (FT.) Purge Method: low-flow pump

Time Purging begins (T_o): 1325
Water Level at time T_o: 13.21
Time Purging ends: (T_1) 1435
Water Level at time T_1: 13.30

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1425	5.5 g	6.92	0.624	9.40	-5.3	13.36	*	—	0.4	clear
1431		6.93	0.624	9.40	-6.2	13.30	*	—		"
1434		6.93	0.625	9.38	-7.7	13.30	*	—	0.4	
		rechecked					0.68			

SAMPLING

Date: 12/6/06
Time: 1440
Field Filtering:
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BGSHM0540XW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Project Name Shepley's Hill Landfill
Job Number 284350.SC.01
Field Team [illegible]
Field Conditions [illegible]

Sampling Event LTMP/PMP 12/2006
Date 12-5-06
Page 3 of ____

Well/Sample Number SHM96 SC
Start Time 1450
Initial Depth to Water 4.56
Duplicate Number
Dupl. Time
Measure Point: Well TOC Steel Casing
Purge Method: Ded. Pump Other .3 L/m
Flow Cell: Y / N
Min. Purge Volume (gal)/(L)
Purge Rate (gpm)/(mLpm) 250 mL/m

Time	Vol. Purged gallons / liters	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv
1450		6.56	.927		5.69	9.69	-143.0
1455		6.57	.952		3.57	5.65	-130.9
1500		6.33	.761		2.79	4.81	-98.2
1505		6.39	.765		2.40	3.57	-59.3
1510		6.39	.763		1.96	3.07	-32.9
1515		6.39	.763		1.78	0.25	-31.6

Sample time = 1520
Combo Template

Remarks

Well/Sample Number SHM96 SB
Start Time 1510
Initial Depth to Water 5.75
Duplicate Number
Dupl. Time
Measure Point: Well TOC Steel Casing
Purge Method: Ded. Pump Other
Flow Cell: Y / N
Min. Purge Volume (gal)/(L)
Purge Rate (gpm)/(mLpm) .3 L/m

Time	Vol. Purged gallons / liters	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv
1520		6.05	.785		4.62	8.69	-91.6
1525		6.07	.745		3.61	5.58	-46.0
1530		6.07	.754		2.01	3.34	-82.3
1535		6.07	.749		1.63	3.42	-79.0
1540		6.07	.748		1.56	3.28	-77.4

Sample time = 1545
LTMP/PMP

Remarks

Project Name Shepley's Hill Landfill
Job Number 284350.SC.01
Field Team C. Rorp
Field Conditions 35°. overcast - calm

Sampling Event LTMP/PMP 12/2006
Date ~~12-5-06~~ 12-5-06
Page 1 of ___

Well/Sample Number SHL-8D
Start Time 0957
Initial Depth to Water 6.75
Duplicate Number B6006SHL8DW
Dupl. Time ___
Measure Point: Well TOC Steel Casing
Purge Method: Ded. Pump Other ___
Flow Cell: Y / N
Min. Purge Volume (gal)/(L) ___
Purge Rate (gpm)/(mLpm) 350 mL/m

Time	Vol. Purged gallons / liters	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen ~~mg/L~~ %	Temp. °C	Eh / ORP mv
1000		7.1	.196		92.1	8.6	124.9
1005		6.5	.190		92.1	8.76	142.9
1010		6.48	.190		90.0	8.75	141.9
1015		6.46	.189		90.0	8.65	139.9

Sample Time = 1015

Remarks ___

Well/Sample Number SHL-8S
Start Time 1000
Initial Depth to Water 7.39
Duplicate Number B6008SHL8SW
Dupl. Time ___
Measure Point: Well TOC Steel Casing
Purge Method: Ded. Pump Other ___
Flow Cell: Y / N
Min. Purge Volume (gal)/(L) ___
Purge Rate (gpm)/(mLpm) 200 mL/m

Time	Vol. Purged gallons / liters	pH	Conductivity mS/cm	Turbidity NTU	Diss. Oxygen mg/L	Temp. °C	Eh / ORP mv
1020		6.62	.097		2.38	8.24	127.3
1025		6.60	.095		1.49	8.34	133.7
1030		6.60	.094		1.43	8.36	135.8
1035		6.58	.088		1.97	8.41	137.9
1040		6.59	.088		1.80	8.42	138.9
1045		6.58	.087			8.42	140.0

Sample time = 1045

Remarks ___

DPM / LTMP well

* recalibrated @ 5+
240 Redox = 238.8 [redacted]
D.O. = 9.98 mg/L

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-9 Date: 12-6-06 Time: 845
Weather Conditions clear cold
PID — (ppm) Condition Cloudy 30°F
Sample Team DR & TB

Well Stabilization Data

Well Depth [illegible] (FT.) Datum BTOPVCC
Static Water Level ____ (FT.) Diameter: 2"
Water Column ____ (FT.) Purge Method: low-flow 1pm.

Time Purging begins (T_o): 845
Water Level at time T_o: 8.55
Time Purging ends: (T_1) 0920
Water Level at time T_1: 8.85

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0901		6.75	.232	9.64	92.7*	8.85	2.36*	—	0.45	Clear
0905		6.76	.232	9.66	92.7		0.91			
[illegible]	3gal	6.76	0.231	9.70	92.6	8.85	0.77			
0916		6.76	.231	9.67	91.0*		0.75			
0920		6.76	.231	9.68	89.9	8.85	0.68			
			SAMPLED	AT	0920					
re-measure *					*18.2 @ 1010					

SAMPLING

Date: 12-6-06
Time: 0920
Field Filtering: ____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID =

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

B60005HL9W

*Pumped @ higer rate (1.50 GPM @ Extraction wells on 12-5 & 12-6

LowFlowDataSheet.xlstemplate-low flow

collected MS/MSD

PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL 21 Date: 12-12-06 Time: 1050
Weather Conditions
PID (ppm) Condition good
Sample Team CR/DR

Well Stabilization Data

Well Depth (FT.) Datum BTOPVCC
Static Water Level (FT.) Diameter : 4"
Water Column (FT.) Purge Method: low-flo- peri

Time Purging begins (T_o): 1050
Water Level at time T_o: 14.15
Time Purging ends: (T_1) 1115
Water Level at time T_1: 14.15

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) µS/cm +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) % +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1055		5.84	76.8	11.45	194	14.15	74.5			
1100		5.81	75.5	12.65	195	14.15	78.5			
1105		5.79	74.8	12.87	198	14.15	78.2			
1110		5.73	74.9	13.31	201	14.15	74.0			

SAMPLING

Date: / / **Analysis:** Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B
Time: 1115 Alkalinity by 2320B, Chloride by 9251, Sulfate by
Field Filtering: 9038, Nitrate by 4500, and Turbidity by 2130B
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B6000SHL21W

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHL 23 **Date:** 12-12-06 **Time:** 0910
Weather Conditions /
PID / (ppm) **Condition** good
Sample Team CR/DR

SHL 23W

Well Stabilization Data

Well Depth / (FT.) **Datum** BTC PVC C
Static Water Level _____ (FT.) **Diameter:** 4"
Water Column / (FT.) **Purge Method:** low-flo- Grundfos

Time Purging begins (T_o): 0910
Water Level at time T_o: 26.65
Time Purging ends: (T_1) 0945
Water Level at time T_1: 26.71 ↑

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) mS/cm? +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) ? +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0915		7.62	30.4	7.63	93	26.65	99.5			
0920		7.13	26.8	11.93	160	26.65	98.0			
0925		6.88	27.3	12.85	190	26.68	97.8			
0930		6.66	26.8	13.25	207	26.69	97.3			
0935		6.63	27.1	13.37	209	26.71	97.5			

SAMPLING

Date: 12/12/06
Time: 0940
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B60005HL23W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

LTMP

80D / PMP well - combo

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.om.02
Well ID: SHL-22 Date: 12-6-06 Time: 0845
Weather Conditions cloudy 30°F
PID N/A (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVC
Static Water Level ~~7.93~~ 6.98 (FT.) Diameter: 4"
Water Column _____ (FT.) Purge Method: low-flow / Peri

Time Purging begins (T_0): 0846
Water Level at time T_0: 6.98
Time Purging ends. (T_1) 0958
Water Level at time T_1: 6.98

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0938	—	—	—	—	—	6.98	—	—	0.3	
0942		6.91	0.757	9.26	51.9	6.98	1.48	—	0.3	— clear
0946		6.92	0.757	9.27	49.3		1.25	—	0.3	
0949		6.92	0.758	~~9.9~~ 9.22	48.6	6.98	0.89	—	0.3	clear
0958	958	6.92	0.756	9.29	47.6	6.98	0.70 *	—		
	AFTER SAMPLING									

SAMPLING

Date: 12/6/06
Time: 1001
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K via SW-846/ 6010B
Alkalinity via SW-846/2320B, Chloride via SW-846/9251
and Turbidity via SW-846/2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

BG 000SHL22W * EW was pumping higher

LowFlowDataSheet.xlstemplate-low flow

* DO did not stabilize

LTMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHMW622B Date: 12-6-06 Time: 1015
Weather Conditions Cloudy 30°F
PID N/A (ppm) Condition good
Sample Team TB/DN

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVCC
Static Water Level 6.51 (FT.) Diameter : 2"
Water Column _____ (FT.) Purge Method: low-flow pump

Time Purging begins (T_o): 1015
Water Level at time T_o: 6.15
Time Purging ends: (T_1) 1051
Water Level at time T_1: 6.18

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1040	3L	6.92	0.764	9.36	-20.1	6.18 ~~6.03~~	0.08	—	0.40	
1045	12L	6.92	0.762	9.43	-22.0	6.18	0.10	—	0.4	
1050	14L	6.91	0.761	9.46	-22.6	6.18	0.10	—	0.4	

SAMPLING

Date: 12/6/06
Time: 1110
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = ~~B6SHMW622B~~

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B
Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

~~Also collected MS/MSD & DUP~~ (B6 DEC06 DUP-1)
TB

LowFlowDataSheet.xlstemplate-low flow

* rechecked w/ 240 mV auto cal solution reads 227.2 so OK

411A

RMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHM-05-411A **Date:** 12-6-06 **Time:**
Weather Conditions cloudy 30°F
PID NA (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth (FT.) Datum BTOPVC
Static Water Level 9.48 (FT.) Diameter: 2"
Water Column (FT.) Purge Method: low-flow/peri.

Time Purging begins (T_0): 1210
Water Level at time T_0: 9.43
Time Purging ends: (T_1) 1250
Water Level at time T_1: 9.51

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1235		6.65	0.156	9.60	77.2	9.51	0.23	—	0.40	clear
1239		6.58	0.142	9.61	97.4	9.51	0.27	—	0.40	clear
1244		6.54	0.140	9.62	104.4	9.51	0.19	—	0.40	—
1247		6.54	0.139	9.56	103.7	9.51	0.20	—	0.40	clear
1250		6.53	0.139	9.56	102.5	9.51	0.21			
1501		6.74	0.219	9.76	36.2	9.51	—	—	0.4	
1505		6.68	0.164	9.78	65.3	9.51				
1510		6.58	0.146	9.76	91.3	9.51				

1445B

SAMPLING

Date: 12/6/06
Time: 1250
Field Filtering: No
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BG SHM0541AW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

41B PNP *Pumping EW = ± 50 GPM on 12/5 & 12/6 (NORMALLY 25 GPM)

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: SHM-05-41B **Date:** 12-6-06 **Time:** 1200
Weather Conditions Cloudy
PID NA (ppm) **Condition** good
Sample Team TB/DR

Well Stabilization Data

Well Depth — (FT.) Datum 3TOPVC
Static Water Level 9.31 (FT.) Diameter : 2"
Water Column — (FT.) Purge Method: low flow peri

Time Purging begins (T_o): 1203
Water Level at time T_o: 9.31
Time Purging ends: (T_1) 1228
Water Level at time T_1: 9.31

Time	Volume Removed	pH + / - 0.1	Sp Conductivity (mS/cm) + / - 3%	TEMP.(C) + / - 0.2 or 3%	Redox (mV) + / - 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) + / - 10%	Turbidity (NTU) <5 NTU preferred and + / - 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1216		6.60	0.753	9.49	3.6	9.31	1.24	—	0.45	clear
1220		6.60	0.754	9.51	5.0		1.16	—	0.45	clear
1224		6.60	0.755	9.48	6.7	9.31	1.07	—	0.45	clear
1228		6.60	0.754	9.56	6.5	9.31	1.09	—	0.45	"
1448 1445		6.60	0.740	9.54	21.6		—	—	0.3	
1448		6.61	0.747	9.60	19.3	9.31	—		0.3	
1453		6.61	0.751	9.59	19.4	9.31	—			
1456		6.61	0.751	9.61	19.9	9.31	—			

SAMPLING

Date: 12/6/06
Time: ~~1300~~ 1230
Field Filtering:
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks:
Sample ID = ID = B6SHM0541BW

4:20 4:52

41C PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-05-41C Date: 12-6-06 Time: 1230
Weather Conditions cloudy
PID NA (ppm) Condition good
Sample Team TB/DR

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVCC
Static Water Level 9.52 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: low-flow (peri

Time Purging begins (T_o): 1238
Water Level at time T_o: 9.52
Time Purging ends: (T_1) 1312
Water Level at time T_1: 9.69

Time	Volume Removed	pH +/- 0.1	Conductivity Sp (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1300		7.28	0.768	9.70	-43.6	9.69	.06	—	0.45	
1306		7.30	0.769	9.70	-46.6	9.69	0.06	—	0.45	clear
1309		7.30	0.770	9.64	-45.0	9.69	0.06	—		↓
1312		7.30	0.770	9.57	-47.5	9.69	0.06	—	0.45	↓
1538 1520		7.18	0.701	9.75	-3.9	9.69	—	—	0.48	
1540		7.20	0.773	9.75	-44.5	9.69	—	—	—	

SAMPLING

Date: 12/6/06
Time: 1315
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B
Remarks:
Sample ID = B6SHM0541CW

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

PMP + CH4

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-05-42A Date: 12-7-16 Time: 1200
Weather Conditions clear 45°F
PID N/A (ppm) Condition good
Sample Team JB/DR

Well Stabilization Data

Well Depth — (FT.) Datum BTOP/CC
Static Water Level 3.81 (FT.) Diameter: 2"
Water Column — (FT.) Purge Method: low-flow pump

Time Purging begins (T_0): 1200
Water Level at time T_0: 3.81
Time Purging ends: (T_1) 1225
Water Level at time T_1: 3.92

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1210		6.41	0.160	9.34	196.2	3.90	4.63		0.4	
1215		6.39	0.138	9.26	205.9	3.92	4.63			
1220		6.38	0.135	9.15	213.8	3.92	4.63			
1225		6.38	0.134	9.10	217.1	3.92	4.62			
				SAMPLER IN AT			1230			
				KOLLER IN AT				3.87		

SAMPLING

Date: 12/7/16
Time: 1230
Field Filtering: —
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BG SHM05 42AW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Deep PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHM-05-42B Date: 12-7-06 Time: 1155
Weather Conditions Clear 45°F
PID NA (ppm) Condition Good
Sample Team TB/DR

Well Stabilization Data

Well Depth / (FT.) Datum BTOPVCC
Static Water Level 3.70 (FT.) Diameter: 1"
Water Column / (FT.) Purge Method: low-flow-peri

Time Purging begins (T_o): 1155
Water Level at time T_o: 3.70
Time Purging ends: (T_f) 1221
Water Level at time T_f: 3.84

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1210	6L	6.22	1020	10.25	-74	3.84	0.81	—	0.4	clear
1214	7.5	6.26	1019	9.74	-75		0.44	—	0.4	clear
1217	9.0	6.27	1020	9.67	-76	3.84	0.41	—	0.4	↓
1221	10.5	6.28	1021	9.59	-77	3.84	0.43	—	0.4	↓

SAMPLING

Date: 12/7/06 **Analysis:** Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B
Time: 1241 Alkalinity by 2320B, Chloride by 9251, Sulfate by
Field Filtering: yes 9038, Nitrate by 4500, and Turbidity by 2130B
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B6 SHM0542B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

DTW Before = 3.70 DTW (after w/ transducer back in) = 3.79

NSP1

PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts **Project Number:** 284350.OM.02
Well ID: NS P1 **Date:** 12-12-06 **Time:** 1420
Weather Conditions
PID (ppm) Condition
Sample Team DR/CR

Well Stabilization Data

Well Depth (FT.) Datum BTOC
Static Water Level (FT.) Diameter :
Water Column (FT.) Purge Method: low flo - peri

Time Purging begins (T_o): 1428
Water Level at time T_o: 2320
Time Purging ends: (T_1) 1455
Water Level at time T_1: 23.85 → 23.30

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) mS/cm +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) % +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1435		6.72	616.9	10.24	-64	23.84	11.3			
1440		6.63	678.6	10.12	-71	23.84	5.1		.3	
1445		6.67	707.1	10.02	-74	23.90	5.0			
1450		6.70	711.9	9.98	-74	23.85	4.6			
1455		6.70	719.9	9.86	-71	23.85	4.7			

SAMPLING

Date: 1/1
Time: 1455
Field Filtering:
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B60000 NSP1 W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

NSP2

PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: NSP2 Date: 12-12-06 Time: 1420
Weather Conditions _____
PID _____ (ppm) Condition good
Sample Team DR/CR

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOSC
Static Water Level _____ (FT.) Diameter: 1
Water Column _____ (FT.) Purge Method: _____

Time Purging begins (T_o): 1425 1430
Water Level at time T_o: 23.71
Time Purging ends: (T_1) 1510
Water Level at time T_1: 23.80 23.70

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1430						23.72			.25	
1500		6.25	1331	10.75	-58	23.85	2.9			
1505		6.24	1326	11.08	-63	23.80	2.8			
1510		6.23	1332	11.15	-66	23.80	2.6			

SAMPLING

Date: 12/12/06
Time: 1510
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B60660/NSP2W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

PMP

Field Data Sheets for Low Flow Ground Water Sampling

SHP-93-10D

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: ~~SHL-10D~~ Date: 12/13/2k Time: 0930
Weather Conditions
PID (ppm) Condition good
Sample Team CR/DR

Well Stabilization Data

Well Depth (FT.) Datum BTOPVCC
Static Water Level (FT.) Diameter: 4"
Water Column (FT.) Purge Method: Low-Flo- Grundfos

Time Purging begins (T_o): 0936
Water Level at time T_o: 29.98
Time Purging ends: (T_1) 0930
Water Level at time T_1: 36.70

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
0941		11.31	0.486	10.76	-14	31.46	3.62		03	
0946		11.39	0.475	13.29	-26	33.95	1.10			
0951		11.41	0.469	13.63	-29	35.55	1.05			
0955		11.44	0.464	13.70	-33	36.70	1.00			well purged to dry
		Sampled 1155								

SAMPLING

Date: 1/1 **Analysis:** Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B
Time: 1155 Alkalinity by 2320B, Chloride by 9251, Sulfate by
Field Filtering: 9038, Nitrate by 4500, and Turbidity by 2130B
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B65HP9310DW

36.55

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-15 Date: 12-7-06 Time: 1000
Weather Conditions Clear, 40's
PID NA (ppm) Condition Good
Sample Team TB/JDR

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPOCC
Static Water Level 17.61 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: low flow pump

Time Purging begins (T_o): 1000
Water Level at time T_o: 17.61
Time Purging ends: (T_1) 1035
Water Level at time T_1: 17.61

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1010		6.24	0.483	13.29	96.8	17.61	2.71		0.45	
1015		6.24	0.488	13.29	95.2	17.61	2.64			
1020		6.24	0.483	13.31	93.5	17.61	2.33			
1025	3 g	6.24	0.482	13.23	92.9		1.69			
1030		6.24	0.481	13.17	92.1	17.61	1.04			
1035	4 g	6.24	0.482	13.14	91.8	17.61	0.99			
				SAMPLED AT 1045						

SAMPLING

Date: 12/7/06
Time: 1045
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BG0008SHL15W

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (Inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHL-13 Date: 12-5-06 Time: 1110
Weather Conditions cloudy
PID NA (ppm) Condition good
Sample Team CR

Well Stabilization Data

Well Depth _____ (FT.) Datum BTOPVCC
Static Water Level 6.45 (FT.) Diameter: 2"
Water Column _____ (FT.) Purge Method: low-flow pump

Time Purging begins (T_o): 1110
Water Level at time T_o: 6.45
Time Purging ends: (T_1) 1145
Water Level at time T_1: 6.45

Time	Volume Removed (L)	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1130	6	6.47	.290	9.63	120.8	6.45	—	—	.3	
1140	9	6.69	.292	9.50	121.5	6.45	—	—	↓	
1145	11	6.60	.281	9.60	121.1	6.46	—	—	↓	

SAMPLING

Date: 12/5/06
Time: 1150
Field Filtering: NO
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Remarks:
Sample ID = B6000 SHL13W

PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHP-01-36X Date: 12-13-06 Time: 1045
Weather Conditions
PID (ppm) Condition good
Sample Team DF/CR

Well Stabilization Data

Well Depth ~ (FT.) Datum TOC
Static Water Level (FT.) Diameter: 1"
Water Column ~ (FT.) Purge Method: Low-flow - peri

Time Purging begins (T_o): 1047
Water Level at time T_o: 7.98
Time Purging ends: (T_1) 1120
Water Level at time T_1: 8.01

Time	Volume Removed	pH +/- 0.1	Conductivity (mS/cm) +/- 3%	TEMP.(C) +/- 0.2 or 3%	Redox (mV) +/- 10 mV	Water level (Ft) < 0.3 ft	D.O. (mg/L) % +/- 10%	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
1110		6.67	193.6	10.89	-44	7.98	2.4			
1115		6.67	194.5	10.78	-45	8.00	2.4			
1120		6.64	193.5	10.82	-47	8.01	2.3			
			Sample @	1120						

SAMPLING

Date: 12/13/06
Time: 1120
Field Filtering: ~
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B65HP0136XW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9036, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHP-01-37X Date: 12/13/06 Time: 1020
Weather Conditions _____
PID NA (ppm) Condition good
Sample Team DR - CR

Well Stabilization Data

Well Depth _____ (FT.) Datum TOC
Static Water Level _____ (FT.) Diameter: 1"
Water Column _____ (FT.) Purge Method: peristaltic - low-flow

Time Purging begins (T_o): 10:16
Water Level at time T_o: 6.30
Time Purging ends: (T_1) 1100
Water Level at time T_1: 6.7

Time	Volume Removed	pH	Conductivity (mS/cm)	TEMP.(C)	Redox (mV)	Water level (Ft)	D.O. (mg/L) %	Turbidity (NTU) <5 NTU preferred and +/- 10% > 1 NTU	Purge rate (Lpm) 0.3 to 0.5LPM	Appearance
		+/- 0.1	+/- 3%	+/- 0.2 or 3%	+/- 10 mV	< 0.3 ft	+/- 10%			
~~1028~~		~~7.11~~	~~313.3~~	~~9.91~~	~~-73~~	~~4.3~~	~~2.9~~			CR
1050		6.79	200.0	10.14	-53	6.75	2.4			
1055		6.79	200.7	10.12	-54	6.75	2.4			
1100		6.75	201.5	10.18	-61	6.70	2.3			
				Sample @ 1100						

SAMPLING

Date: 12/13/06
Time: ~~10~~ 1100
Field Filtering: _____
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = BG SHP01 37XW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.l. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

PMP

Field Data Sheets for Low Flow Ground Water Sampling

Project Name: Shepley Hill Landfill, Devens, Massachusetts Project Number: 284350.OM.02
Well ID: SHP-01-38A Date: 12-13-06 Time: 1010
Weather Conditions
PID N/A (ppm) Condition good
Sample Team CR, JR

Well Stabilization Data

Well Depth ___ (FT.) Datum TOC
Static Water Level ___ (FT.) Diameter: 1"
Water Column ___ (FT.) Purge Method: Peri - low-flow

Time Purging begins (T_o): 1010
Water Level at time T_o: 4.50
Time Purging ends: (T_1) 1040
Water Level at time T_1: 4.35

Time	Volume Removed	pH	Conductivity (mS/cm)	TEMP.(C)	Redox (mV)	Water level (Ft)	D.O. (mg/L) %	Turbidity (NTU)	Purge rate (Lpm)	Appearance
		+/- 0.1	+/- 3%	+/- 0.2 or 3%	+/- 10 mV	< 0.3 ft	+/- 10%	<5 NTU preferred and +/- 10% > 1 NTU	0.3 to 0.5LPM	
1030		7.11	313.3	9.91	-73	4.3	2.9			
1035		6.90	310.0	9.92	-72	4.4	2.8			
1040		6.81	309.0	9.99	-72	4.35	2.9			
			SAMPLED @ 1040							

SAMPLING

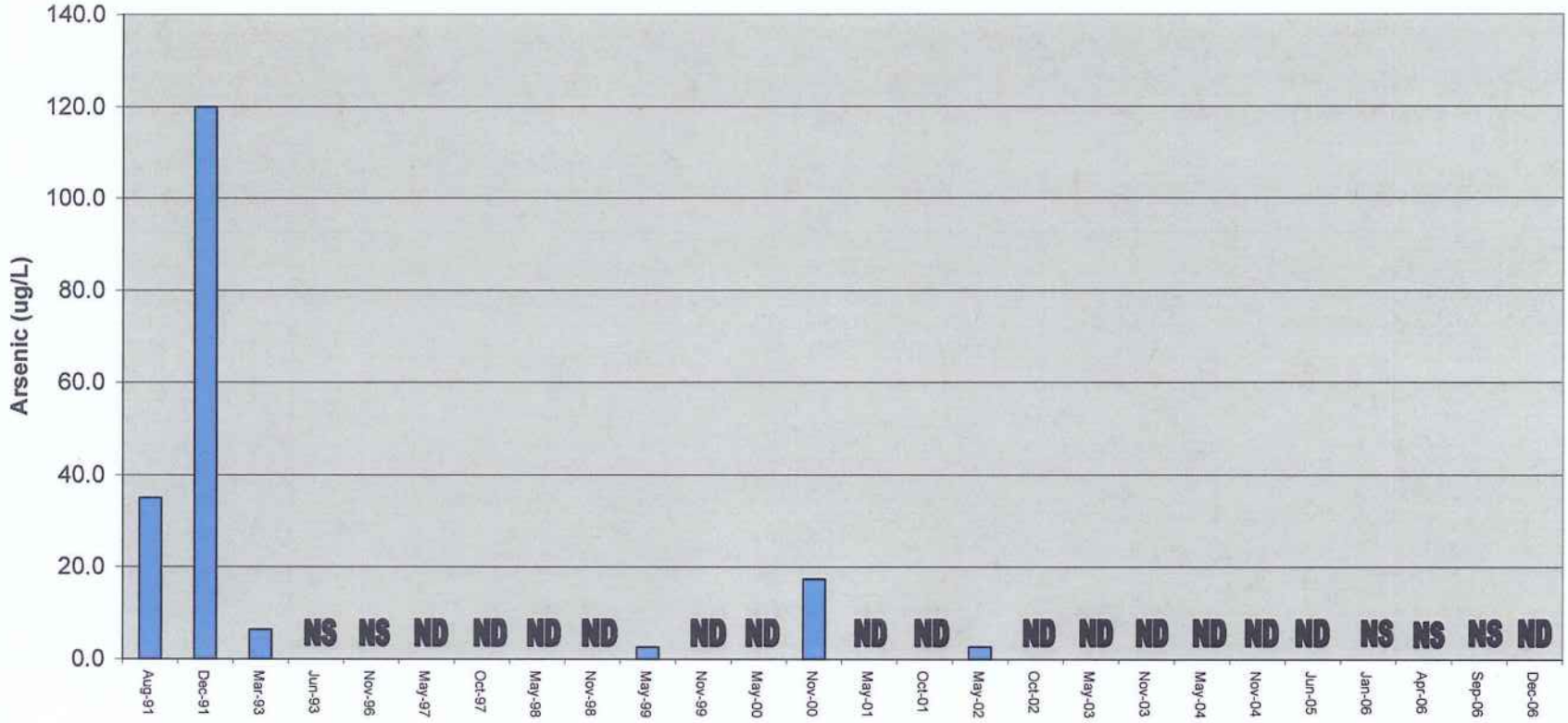
Date: 12/13/06
Time: 1040
Field Filtering: ___
Sampling Methodology: Low Flow Sampling
Laboratory: Alpha **Method of Shipment:** Courier
Remarks:
Sample ID = B6 SHP0138AW

Analysis: Total As, Fe, Mn, Mg, Ca, Na, K by SW-846/ 6010B Alkalinity by 2320B, Chloride by 9251, Sulfate by 9038, Nitrate by 4500, and Turbidity by 2130B

Diameter (inch)	Gallon / Foot	* delta w.t. (ft)	= volume lost (gallons)
1	0.040		
1.5	0.091		
2	0.163		
			1gallon = 3.78 liters

Appendix D
Comparison of Arsenic Results

SHL-3


Arsenic (ug/L)
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
NS
ND
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
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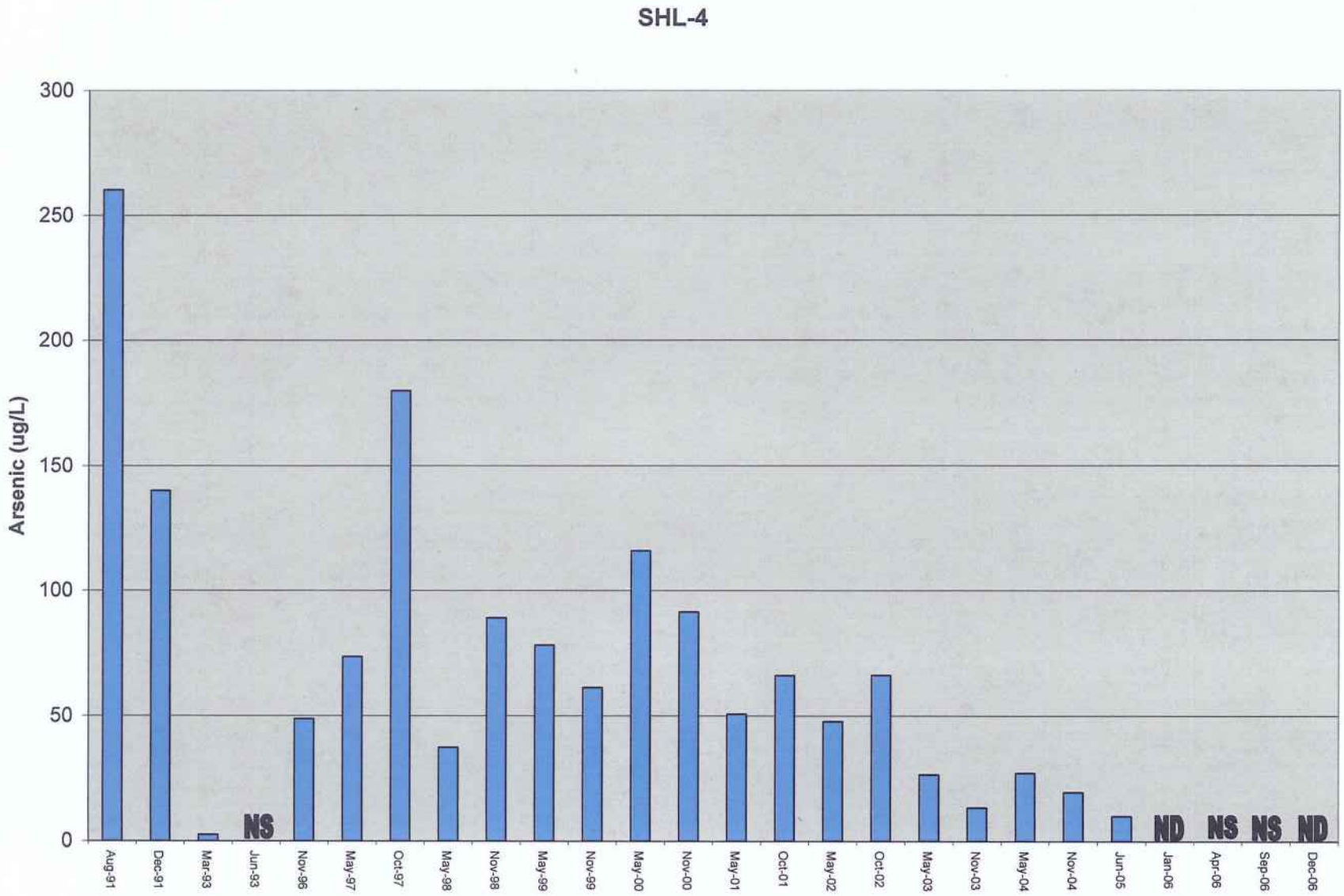
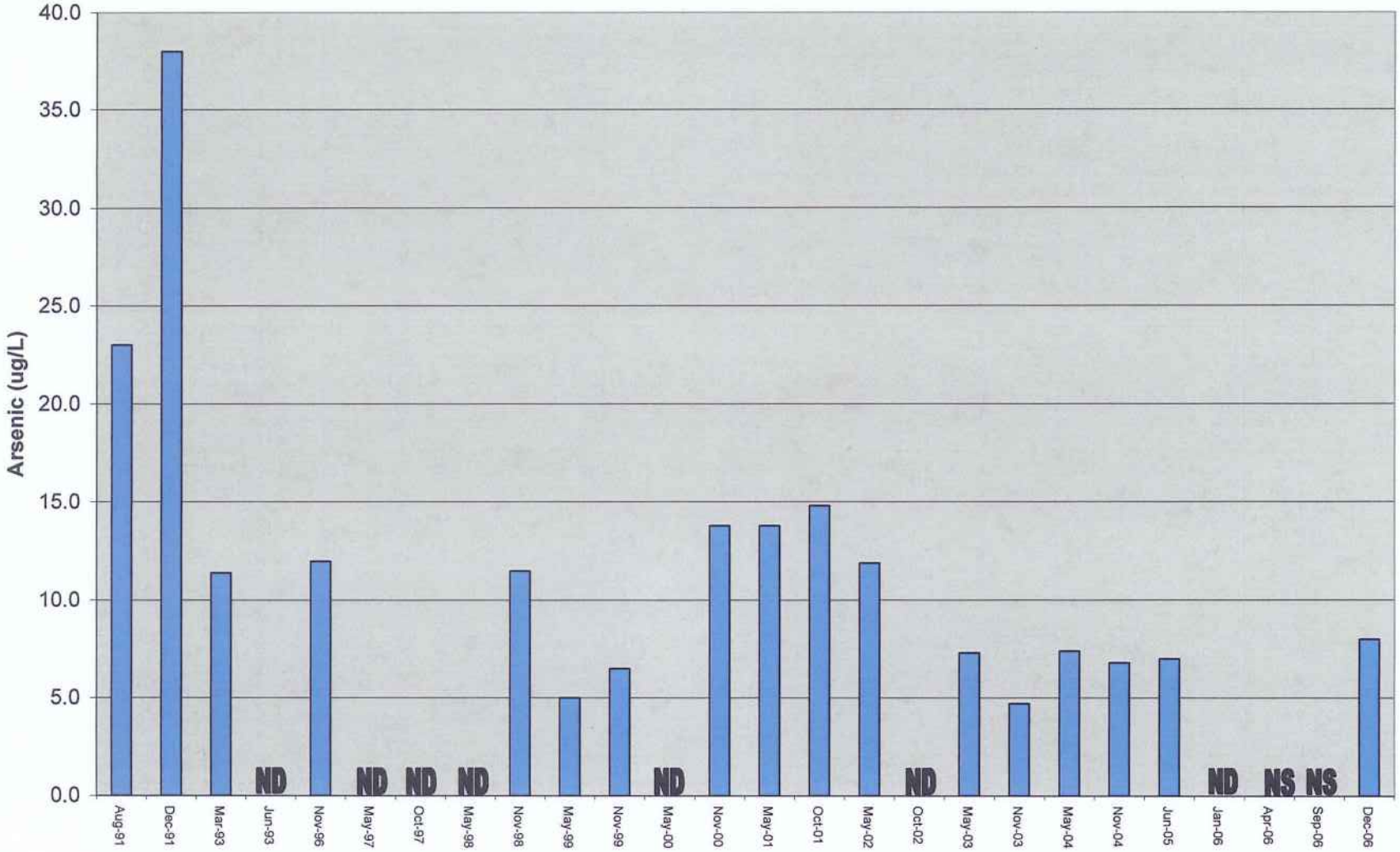
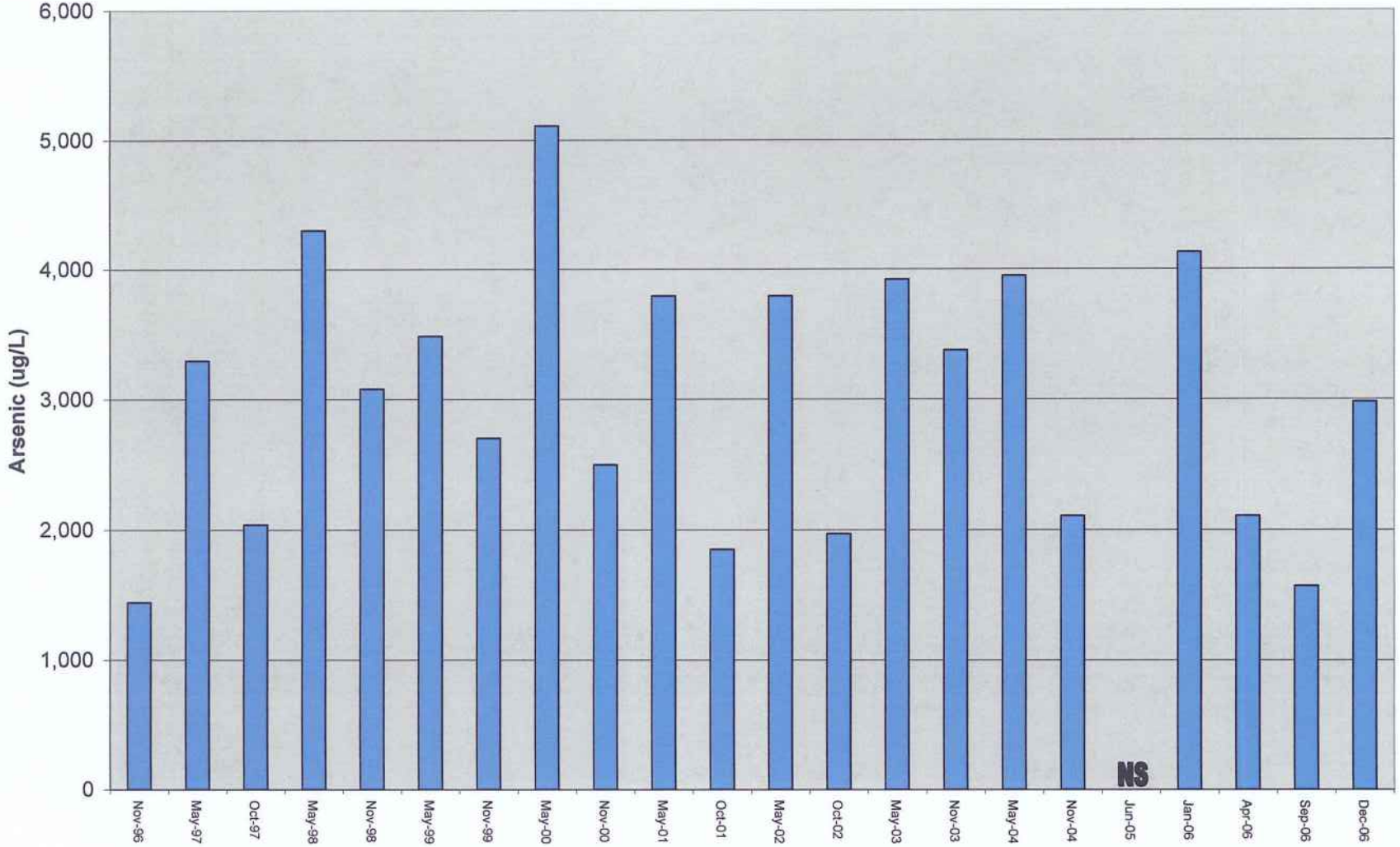
Nov-04
Jun-05
Jan-06
Apr-06
Sep-06
Dec-06

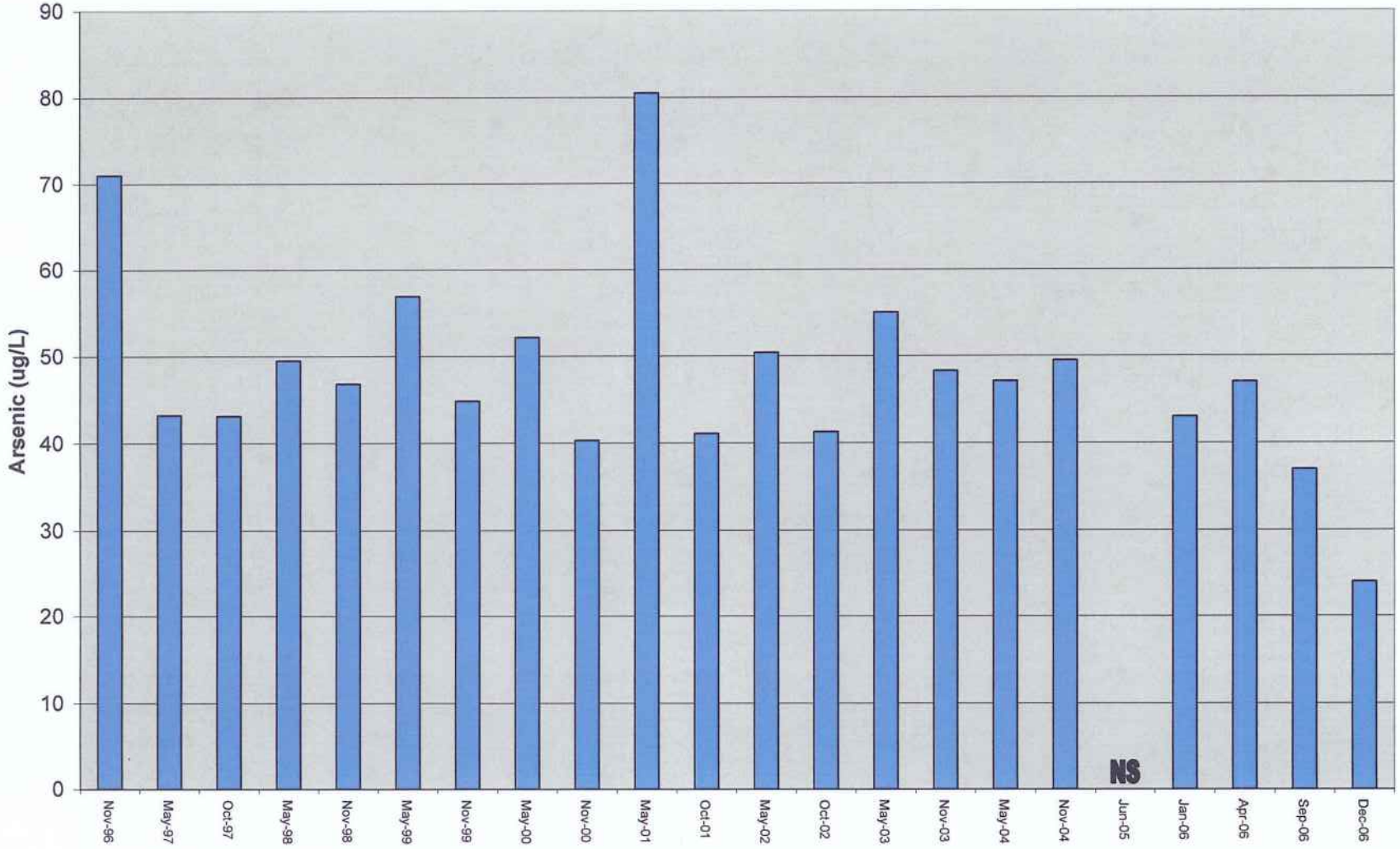

SHL-4
Arsenic (ug/L)
300
250
200
150
100
50
0
NS
ND
NS
NS
ND
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Sep-06
Dec-06

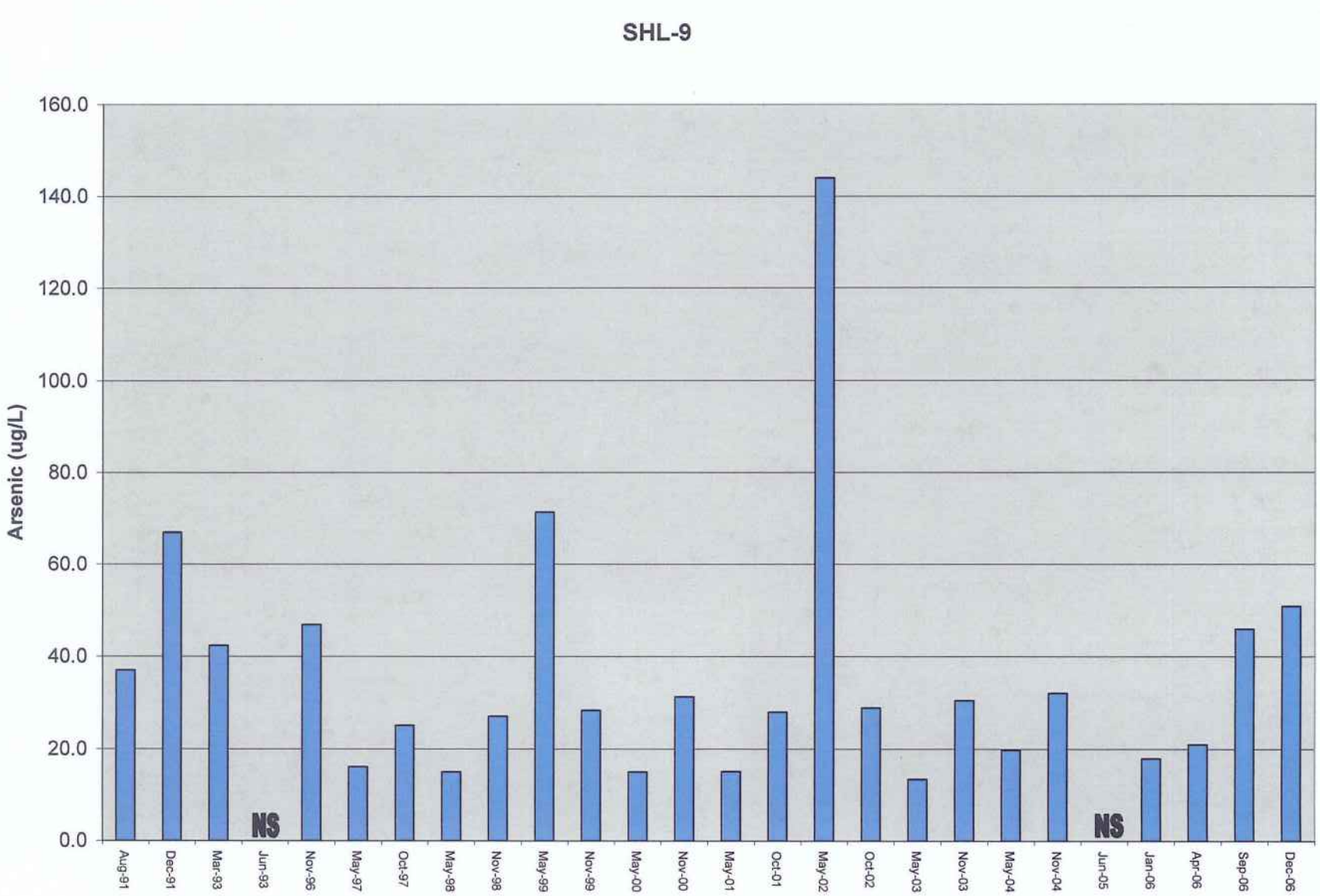
SHL-5

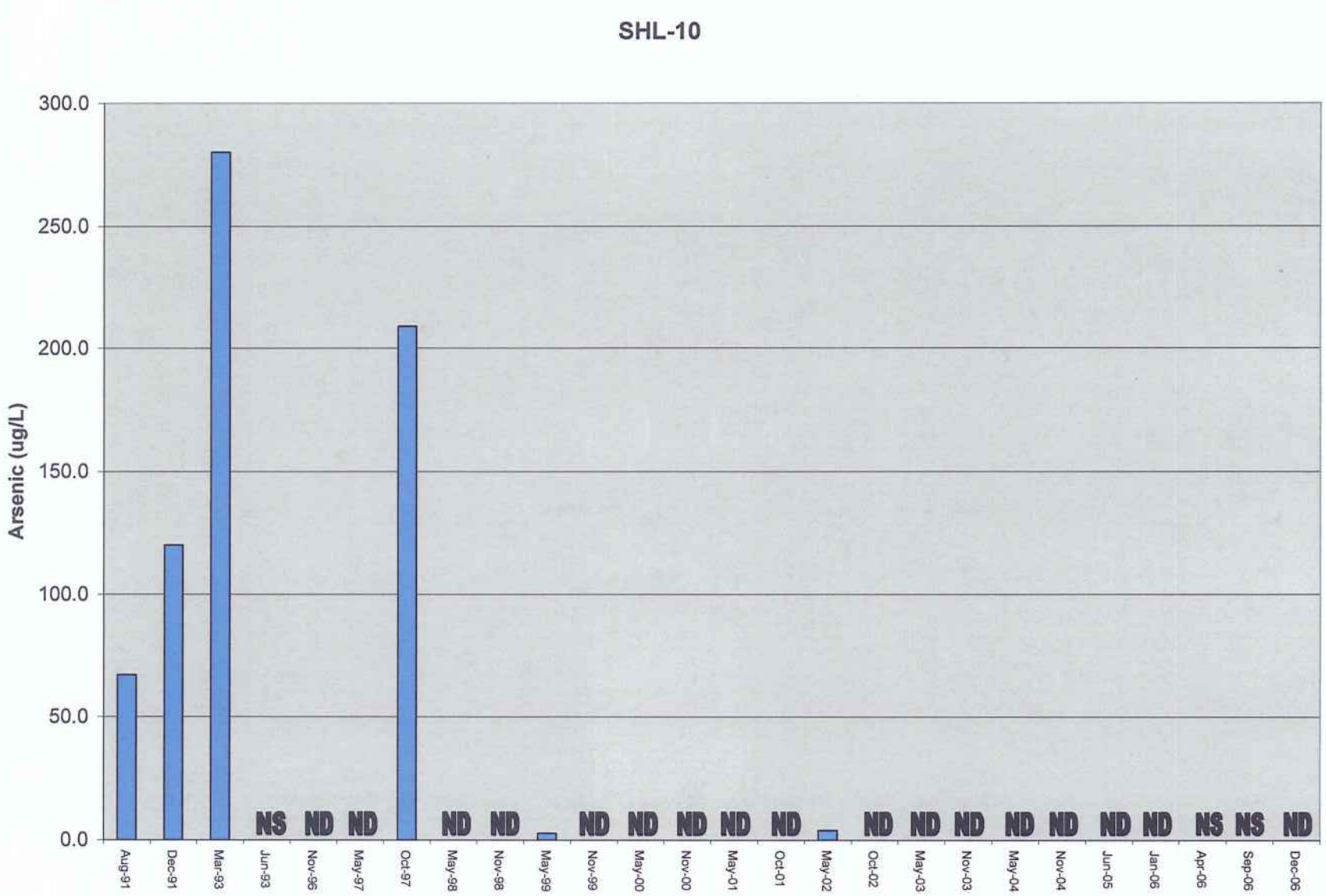

Arsenic (ug/L)
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
ND
ND
ND
ND
ND
ND
NS
NS
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Sep-06
Dec-06


SHL-96-5B
Arsenic (ug/L)
6,000
5,000
4,000
3,000
2,000
1,000
0
NS
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Sep-06
Dec-06

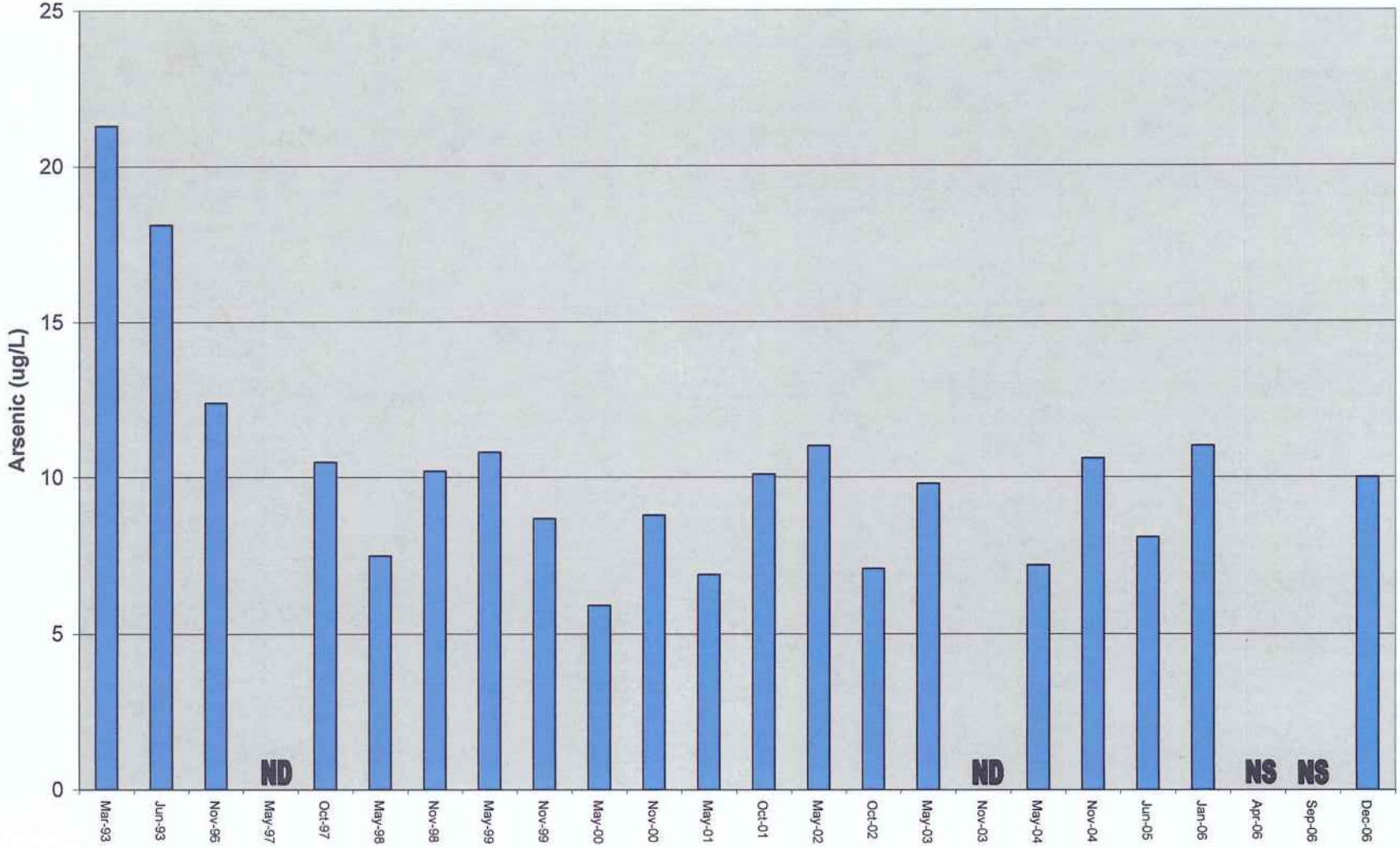
SHL-96-5C


Arsenic (ug/L)
90
80
70
60
50
40
30
20
10
0
NS
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Sep-06
Dec-06


SHL-9
Arsenic (ug/L)
160.0
140.0
120.0
100.0
80.0
60.0
40.0
20.0
0.0
NS
NS
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Sep-06
Dec-06


SHL-10
Arsenic (ug/L)
300.0
250.0
200.0
150.0
100.0
50.0
0.0
NS
ND
ND
ND
ND
ND
ND
ND
ND
ND
ND
ND
ND
ND
ND
ND
ND
ND
ND
ND
ND
ND
ND
NS
NS
ND
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Sep-06
Dec-06

SHM-93-10C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20
15
10
5
0
ND
ND
NS
NS
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
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Nov-03
May-04
Nov-04
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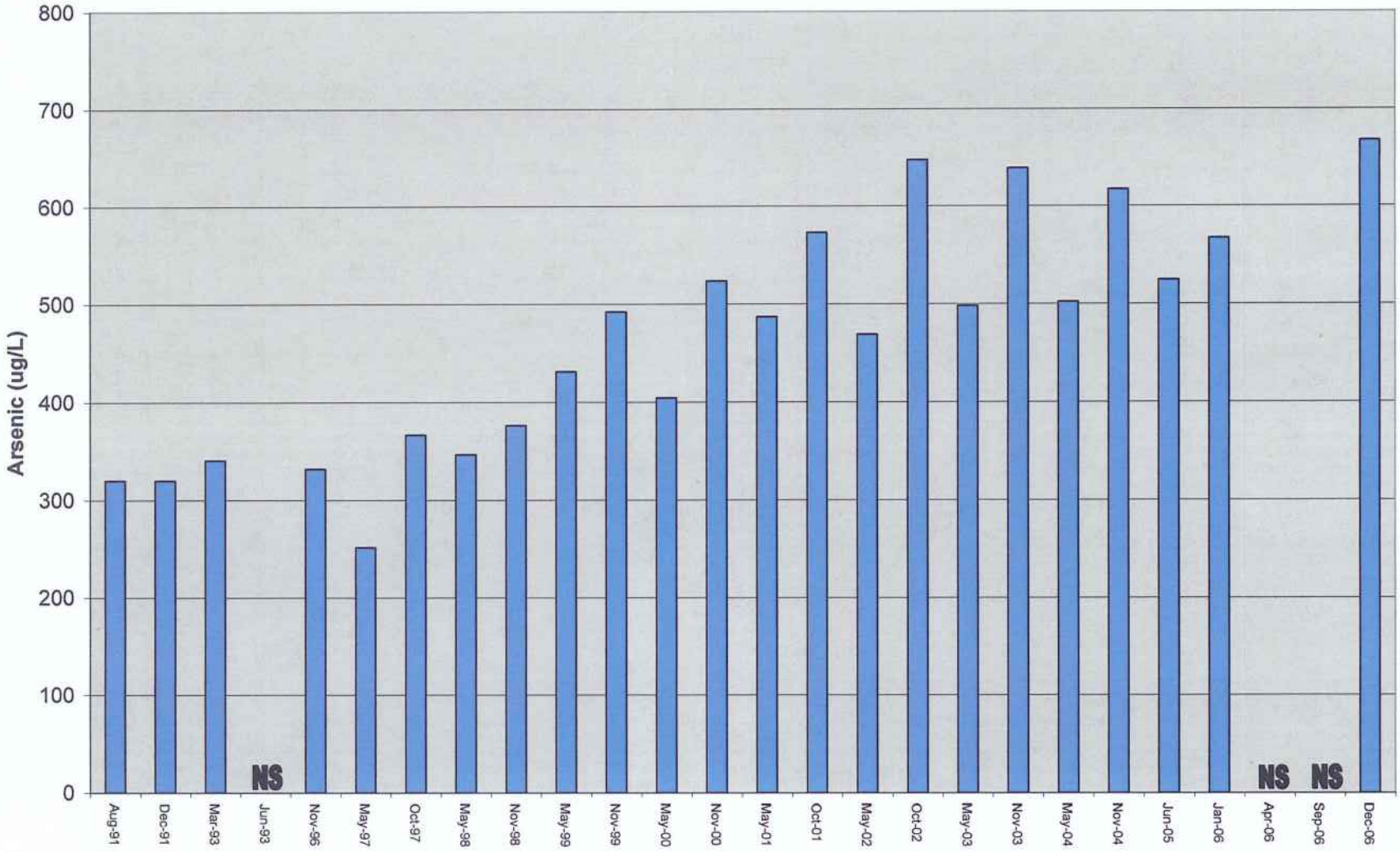
Jan-06
Apr-06
Sep-06
Dec-06


SHL-11
Arsenic (ug/L)
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700
600
500
400
300
200
100
0
NS
NS
NS
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
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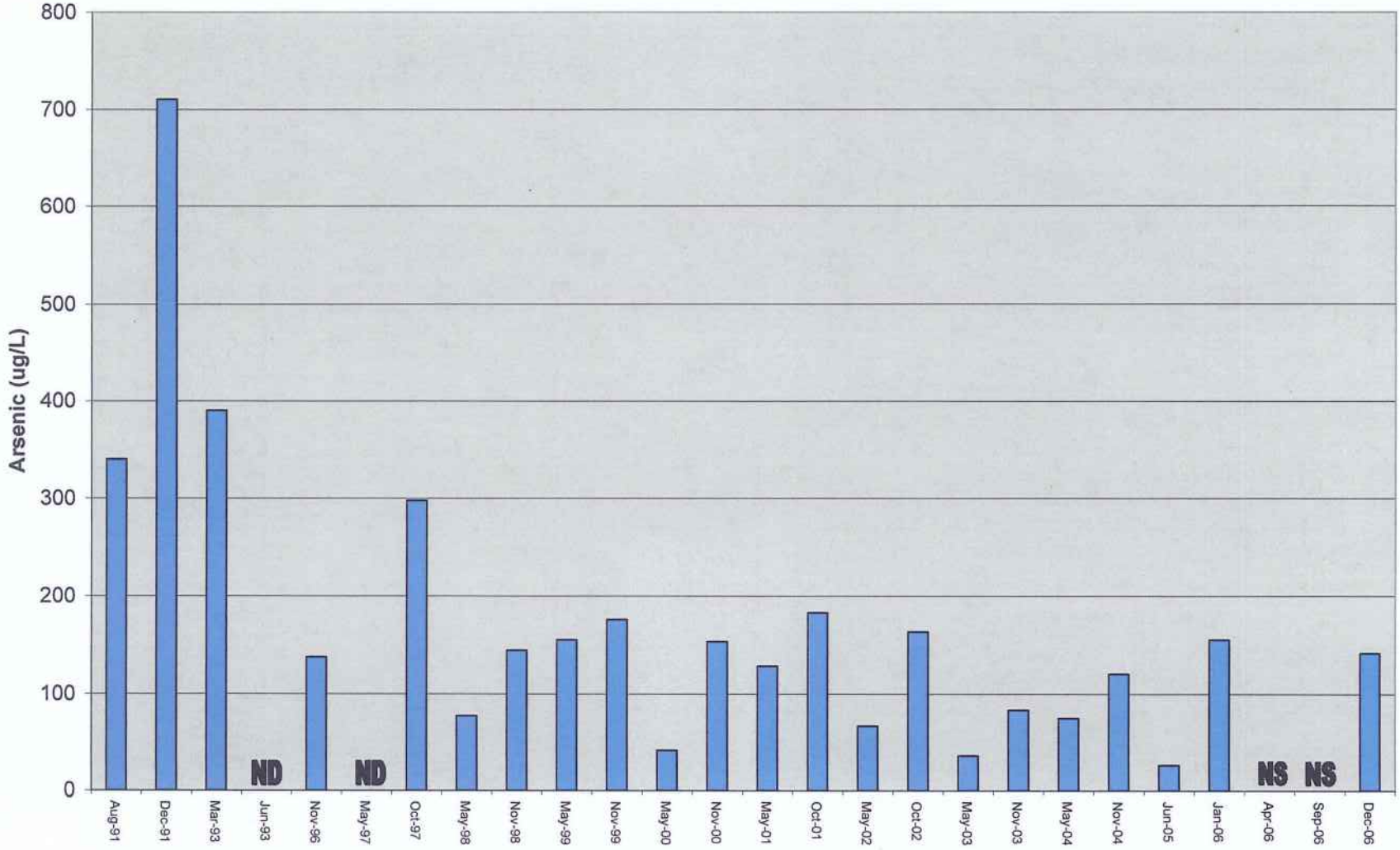
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Sep-06
Dec-06


SHL-19
Arsenic (ug/L)
800
700
600
500
400
300
200
100
0
ND
ND
NS
NS
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
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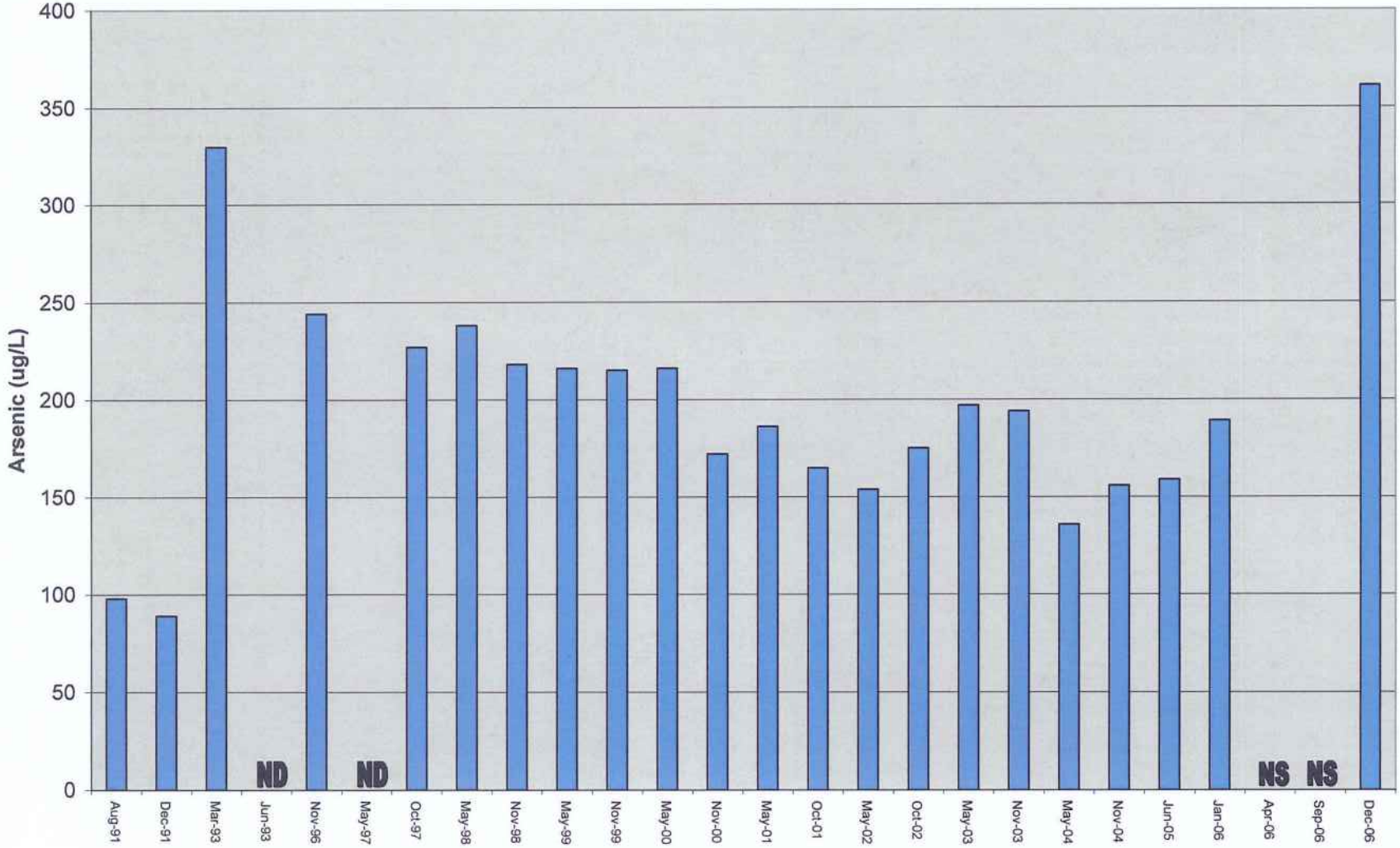
Nov-04
Jun-05
Jan-06
Apr-06
Sep-06
Dec-06


SHL-20
Arsenic (ug/L)
400
350
300
250
200
150
100
50
0
ND
ND
NS
NS
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
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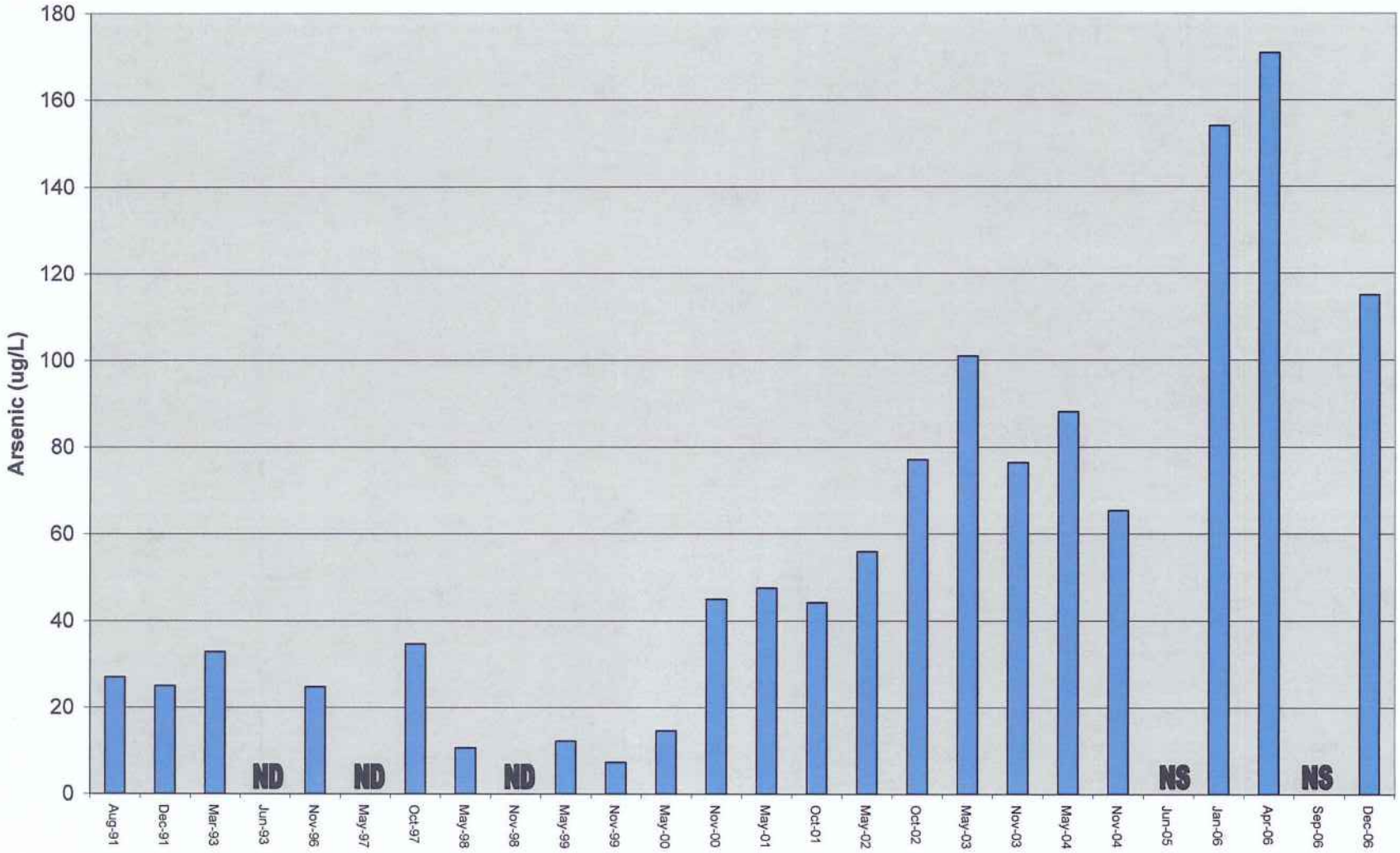
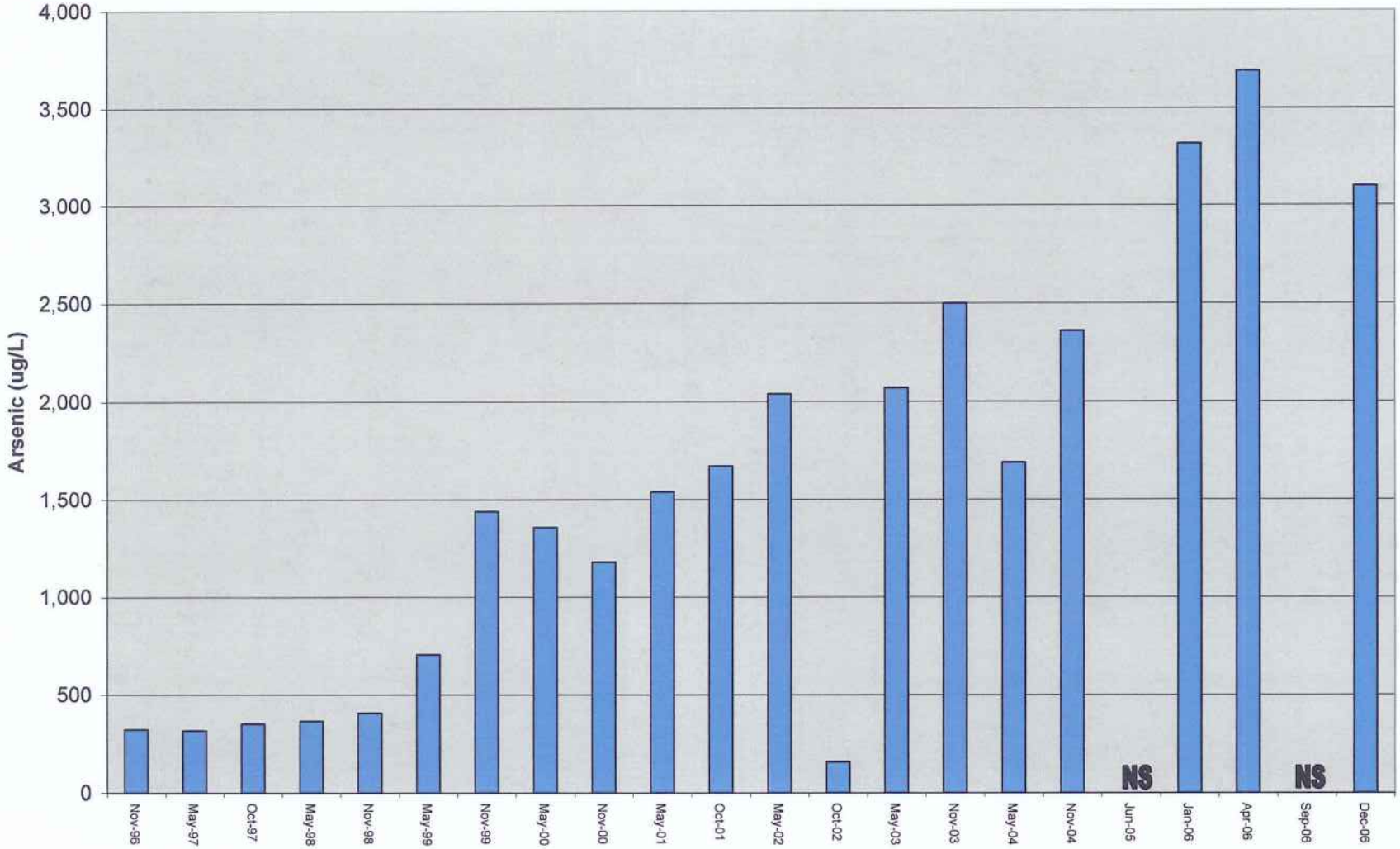
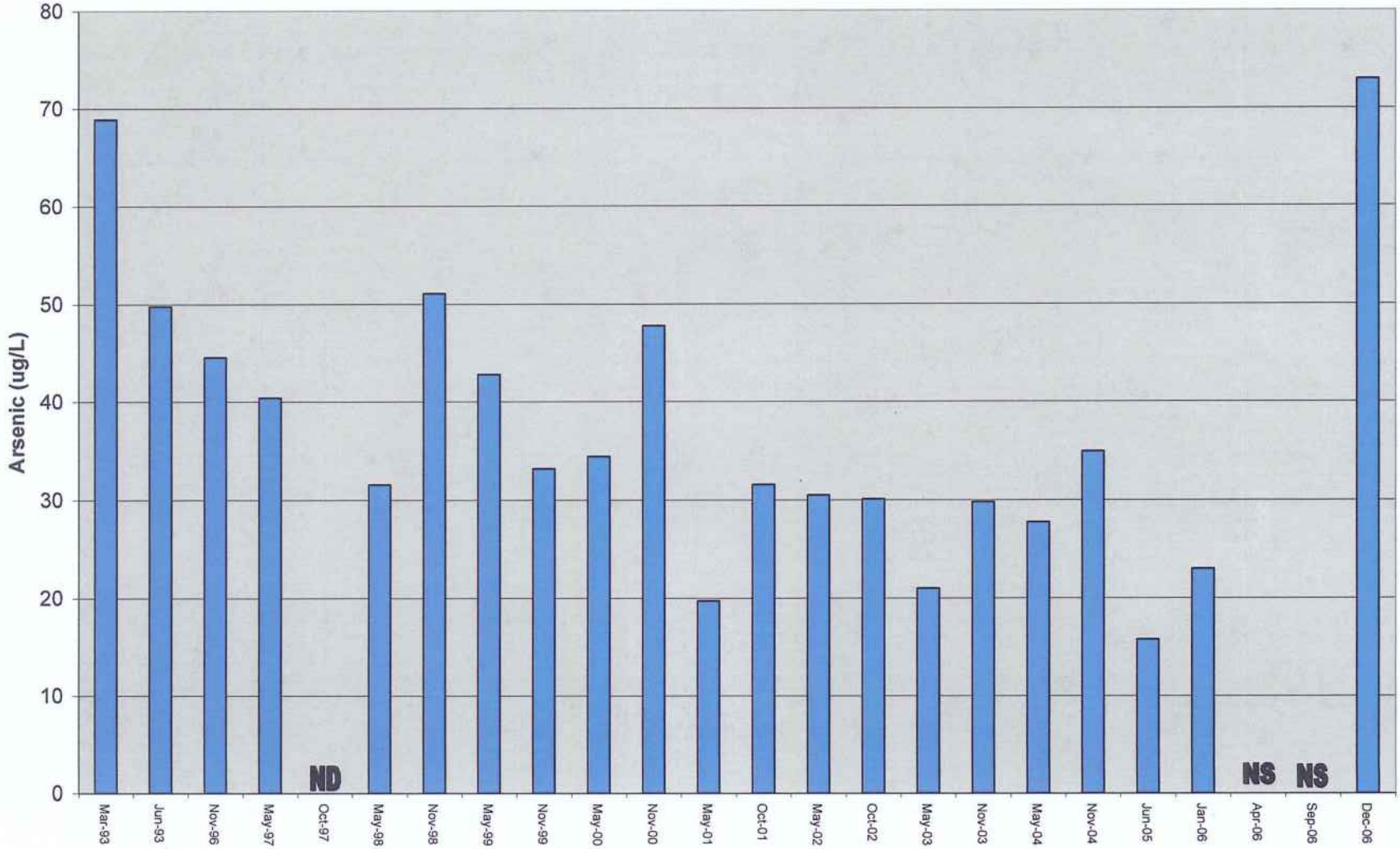
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Sep-06
Dec-06


SHL-22
Arsenic (ug/L)
180
160
140
120
100
80
60
40
20
0
ND
ND
ND
NS
NS
Aug-91
Dec-91
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Sep-06
Dec-06

SHM-96-22B


Arsenic (ug/L)
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
NS
NS
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Sep-06
Dec-06

SHM-96-22C


Arsenic (ug/L)
80
70
60
50
40
30
20
10
0
ND
NS
NS
Mar-93
Jun-93
Nov-96
May-97
Oct-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Oct-01
May-02
Oct-02
May-03
Nov-03
May-04
Nov-04
Jun-05
Jan-06
Apr-06
Sep-06
Dec-06

Appendix E
Data Quality Evaluation and Chemical Quality Analysis Reports

Fort Devens
2006 March, April, and September PMP Shepley's Hill Sampling
Data Quality Evaluation Report

Introduction

The objective of this Data Quality Evaluation (DQE) report is to assess the data quality of analytical results for water samples collected for Fort Devens during the 2006 March, April, and September Performance Monitoring Program (PMP) Shepley's Hill sampling event. Individual method requirements, guidelines from the USEPA Contract Laboratory National Functional Guidelines for Inorganic Data Review, July 2002 (NFG) were used in this assessment.

This report is intended as a general data quality assessment designed to summarize data issues.

Analytical Data

This DQE report covers 62 normal (N) and 4 field duplicate (FD) environmental samples. These samples were reported under 7 sample delivery groups. Samples were collected between March 15, and September 25, 2006 and delivered to the laboratory the same day as collection. Alpha Analytical Laboratories (APHW) in Westborough, Massachusetts performed the analyses. Selected samples were analyzed for the following analytes/methods:

Table 1
Analytical Parameters

Parameter	Method	Laboratory
Total Alkalinity	E310.1	APHW
pH		APHW
Chloride	SW9251, E300.0	APHW
Nitrogen, Nitrate	A4500, E300.0	APHW
Sulfate	E300.0	APHW
Biochemical Oxygen Demand (BOD), 5-day	E405.1	APHW
Oil & Grease	E1664A	APHW
Total Suspended Solids	E160.2	APHW
Total Cyanide	E335.2	APHW
Turbidity	A2130B	APHW
Methylene Chloride	SW8260B	APHW
1,1-Dichloroethane	SW8260B	APHW
Chloroform	SW8260B	APHW
Carbon Tetrachloride	SW8260B	APHW
1,2-Dichloropropane	SW8260B	APHW

Table 1
Analytical Parameters

Parameter	Method	Laboratory
Dibromochloromethane	SW8260B	APHW
1,1,2-Trichloroethane	SW8260B	APHW
Tetrachloroethene	SW8260B	APHW
Chlorobenzene	SW8260B	APHW
Trichlorofluoromethane	SW8260B	APHW
1,2-Dichloroethane	SW8260B	APHW
1,1,1-Trichloroethane	SW8260B	APHW
Bromodichloromethane	SW8260B	APHW
trans-1,3-Dichloropropene	SW8260B	APHW
cis-1,3-Dichloropropene	SW8260B	APHW
Bromoform	SW8260B	APHW
1,1,2,2-Tetrachloroethane	SW8260B	APHW
Benzene	SW8260B	APHW
Toluene	SW8260B	APHW
Ethylbenzene	SW8260B	APHW
Chloromethane	SW8260B	APHW
Bromomethane	SW8260B	APHW
Vinyl Chloride	SW8260B	APHW
Chloroethane	SW8260B	APHW
1,1-Dichloroethene	SW8260B	APHW
trans-1,2-Dichloroethene	SW8260B	APHW
Trichloroethene	SW8260B	APHW
1,2-Dichlorobenzene	SW8260B	APHW
1,3-Dichlorobenzene	SW8260B	APHW
1,4-Dichlorobenzene	SW8260B	APHW
Methyl tert butyl ether	SW8260B	APHW
m,p-Xylene	SW8260B	APHW
o-Xylene	SW8260B	APHW
cis-1,2-Dichloroethene	SW8260B	APHW
Dibromomethane	SW8260B	APHW
1,2,3-Trichloropropane	SW8260B	APHW
Styrene	SW8260B	APHW
Dichlorodifluoromethane	SW8260B	APHW
1,1-Dichloropropene	SW8260B	APHW
Bromochloromethane	SW8260B	APHW
2,2-Dichloropropane	SW8260B	APHW

Table 1
Analytical Parameters

Parameter	Method	Laboratory
1,2-Dibromoethane	SW8260B	APHW
1,3-Dichloropropane	SW8260B	APHW
1,1,1,2-Tetrachloroethane	SW8260B	APHW
Bromobenzene	SW8260B	APHW
n-Butylbenzene	SW8260B	APHW
sec-Butylbenzene	SW8260B	APHW
tert-Butylbenzene	SW8260B	APHW
o-Chlorotoluene	SW8260B	APHW
p-Chlorotoluene	SW8260B	APHW
1,2-Dibromo-3-chloropropane	SW8260B	APHW
Hexachlorobutadiene	SW8260B	APHW
Isopropylbenzene	SW8260B	APHW
p-Isopropyltoluene	SW8260B	APHW
Naphthalene	SW8260B	APHW
n-Propylbenzene	SW8260B	APHW
1,2,3-Trichlorobenzene	SW8260B	APHW
1,2,4-Trichlorobenzene	SW8260B	APHW
1,3,5-Trimethylbenzene	SW8260B	APHW
1,2,4-Trimethylbenzene	SW8260B	APHW
Total Aluminum	SW6010B	APHW
Total Arsenic	SW6010B	APHW
Total Antimony	SW6010B	APHW
Total Barium	SW6010B	APHW
Total Beryllium	SW6010B	APHW
Total Cadmium	SW6010B	APHW
Total Calcium	SW6010B	APHW
Total Chromium	SW6010B	APHW
Total Copper	SW6010B	APHW
Total Iron	SW6010B	APHW
Total Lead	SW6010B	APHW
Total Magnesium	SW6010B	APHW
Total Manganese	SW6010B	APHW
Total Mercury	SW6010B	APHW
Total Nickel	SW6010B	APHW
Total Potassium	SW6010B	APHW
Total Selenium	SW6010B	APHW

Table 1
Analytical Parameters

Parameter	Method	Laboratory
Total Silver	SW6010B	APHW
Total Sodium	SW6010B	APHW
Total Thallium	SW6010B	APHW
Total Zinc	SW6010B	APHW

The assessment of data includes a review of: (1) the Chain-of-Custody (CoC) documentation; (2) holding time compliance; (3) the required quality control (QC) samples at the specified frequencies; (4) flagging for method blanks; (5) laboratory control spiking samples (LCS); (6) analytical spike data; (7) matrix spike/matrix spike duplicate (MS/MSD) samples; and (8) flagging for equipment blank.

Data flags were assigned according to the NFG. Multiple flags are routinely applied to specific sample method/matrix/analyte combinations, but there will be only one final flag. A final flag is applied to the data and is the most conservative of the applied validation flags. The final flag also includes matrix and blank sample impacts.

The data flags are those listed in the NFG and are defined below:

- J = Analyte is present but the reported value may not be accurate or precise (estimated).
- R = The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.
- U = Analyte was not detected at the specified detection limit.
- UJ = Analyte was not detected and the specified detection limit may not be accurate or precise (estimated).

Findings

The overall summaries of the data validation findings are contained in the following sections:

Holding Times

All holding-time criteria were met.

Method Blanks

Method blanks were analyzed at the required frequency and were free of contamination.

Equipment Blank

An equipment blank was collected and analyzed at the required frequency. Turbidity and Chloride were detected in the equipment blank. These target analytes were detected in the associated samples so "J" flags were applied.

Trip Blank

Trip blanks were collected and analyzed at the required frequency. No target analytes were detected in the trip blanks so all acceptance criteria were met.

Field Duplicates

FDs were collected and analyzed at the required frequency. The relative percent differences (RPD) between the N and FD results exceeded the acceptance criteria for Turbidity for B5000SHL22W. The RPD exceedance is most likely indicative of analytical imprecision caused by the magnification of errors near the limit of detection. The detected results were "J" flagged.

Laboratory Control Samples

Laboratory control sample/laboratory control sample duplicates were analyzed as required. All accuracy and precision criteria were met.

Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike/matrix spike duplicates (MS/SD) were analyzed as required. All accuracy and precision criteria were met.

Chain of Custody

Methods outlined on the CoC were performed by the lab using the equivalent Standard Method. No other discrepancies were noted.

Completeness

Out of approximately 880 points, there were no data points rejected due to QC exceedances, no data points were qualified as non-detect due to blank exceedances, and 13 data points were qualified as estimated due to QC exceedances. These numbers indicate that the overall completeness goals for the project were met and that the quality of the analytical program and laboratory is sufficient to meet the project data quality objectives.

Overall Assessment

The final activity in the data quality evaluation is an assessment of whether the data meets the data quality objectives. The goal of this assessment is to demonstrate that a sufficient number of representative samples were collected and the resulting analytical data can be used to support the decisionmaking process. The precision, accuracy, representativeness, completeness and comparability are addressed in the NFG. The following summary highlights the data evaluation findings for the above-defined events:

1. The completeness objectives were met for all method/analyte combinations.
2. There were no results qualified because of low-level blank contamination.
3. The precision and accuracy of the data, as measured by laboratory QC indicators, suggest that the NFG goals have been met.

Table 1 – Validation Flags

FieldID	Method	Analyte	Final Result	Final Flag	Reason
B5000SHL22W	A2130B	Turbidity	1.4	J	FD>RPD
DUP02092106	A2130B	Turbidity	0.92	J	FD>RPD
B3SH0539BW	A2130B	Turbidity	880	J	FD>RPD
B3000DUP2W	A2130B	Turbidity	1400	J	FD>RPD
B300SHL8SW	A2130B	Turbidity	1.2	J	FD>RPD
B3000DUP1W	A2130B	Turbidity	0.78	J	FD>RPD
B5SHM0539BW	A2130B	Turbidity	530	J	EB>MDL
B5SHM0539BW	SW9251	Chloride	46	J	EB>MDL
B5000SHL23W	A2130B	Turbidity	5.3	J	EB>MDL
B5000SHL23W	SW9251	Chloride	2.0	J	EB>MDL
B5000SHL21W	A2130B	Turbidity	0.85	J	EB>MDL
B5000SHL21W	SW9251	Chloride	2.0	J	EB>MDL
B500SHL10DW	A2130B	Turbidity	60	J	EB>MDL
B500SHL10DW	SW9251	Chloride	21	J	EB>MDL
B50000SHL15W	A2130B	Turbidity	0.78	J	EB>MDL
B50000SHL15W	SW9251	Chloride	7.1	J	EB>MDL
B50000N5P2W	A2130B	Turbidity	94	J	EB>MDL
B50000N5P2W	SW9251	Chloride	18	J	EB>MDL
B50000N5P1W	A2130B	Turbidity	37	J	EB>MDL
B50000N5P1W	SW9251	Chloride	17	J	EB>MDL

FD>RPD = Field duplicate relative percent difference greater than upper control limit
EB>MDL = Equipment blank detected above the method detection limit
J = Analyte is present but the reported value may not be accurate or precise (estimated).

Fort Devens
2006 June LTM/PMP Shepley's Hill Sampling
Data Quality Evaluation Report

Introduction

The objective of this Data Quality Evaluation (DQE) report is to assess the data quality of analytical results for water samples collected for Fort Devens during the 2006 June Long-Term Monitoring Program/Performance Monitoring Program (LTM/PMP) Shepley's Hill sampling event. Individual method requirements, guidelines from the USEPA Contract Laboratory National Functional Guidelines for Inorganic Data Review, July 2002 (NFG) were used in this assessment.

This report is intended as a general data quality assessment designed to summarize data issues.

Analytical Data

This DQE report covers 47 normal (N) and 4 field duplicate (FD) environmental samples. These samples were reported under 7 sample delivery groups. Samples were collected between June 6, and June 13, 2006 and delivered to the laboratory the same day as collection. Alpha Analytical Laboratories (APHW) in Westborough, Massachusetts performed the analyses. Selected samples were analyzed for the following analytes/methods:

Table 1
Analytical Parameters

Parameter	Method	Laboratory
Total Alkalinity	E310.1	APHW
Chloride	SW9251, E300.0	APHW
Nitrogen, Nitrate	A4500, E300.0	APHW
Sulfate	E300.0	APHW
Chemical Oxygen Demand	E410.4	APHW
Biochemical Oxygen Demand (BOD), 5-day	E405.1	APHW
Total Organic Carbon	SW9060	APHW
Total Suspended Solids	E160.2	APHW
Total Cyanide	E335.2	APHW
Hardness	A2340B	APHW
Turbidity	A2130B	APHW
Methylene Chloride	SW8260B	APHW
1,1-Dichloroethane	SW8260B	APHW
Chloroform	SW8260B	APHW
Carbon Tetrachloride	SW8260B	APHW
1,2-Dichloropropane	SW8260B	APHW

Table 1
Analytical Parameters

Parameter	Method	Laboratory
Dibromochloromethane	SW8260B	APHW
1,1,2-Trichloroethane	SW8260B	APHW
Tetrachloroethene	SW8260B	APHW
Chlorobenzene	SW8260B	APHW
Trichlorofluoromethane	SW8260B	APHW
1,2-Dichloroethane	SW8260B	APHW
1,1,1-Trichloroethane	SW8260B	APHW
Bromodichloromethane	SW8260B	APHW
trans-1,3-Dichloropropene	SW8260B	APHW
cis-1,3-Dichloropropene	SW8260B	APHW
Bromoform	SW8260B	APHW
1,1,2,2-Tetrachloroethane	SW8260B	APHW
Benzene	SW8260B	APHW
Toluene	SW8260B	APHW
Ethylbenzene	SW8260B	APHW
Chloromethane	SW8260B	APHW
Bromomethane	SW8260B	APHW
Vinyl Chloride	SW8260B	APHW
Chloroethane	SW8260B	APHW
1,1-Dichloroethene	SW8260B	APHW
trans-1,2-Dichloroethene	SW8260B	APHW
Trichloroethene	SW8260B	APHW
1,2-Dichlorobenzene	SW8260B	APHW
1,3-Dichlorobenzene	SW8260B	APHW
1,4-Dichlorobenzene	SW8260B	APHW
Methyl tert butyl ether	SW8260B	APHW
m,p-Xylene	SW8260B	APHW
o-Xylene	SW8260B	APHW
cis-1,2-Dichloroethene	SW8260B	APHW
Dibromomethane	SW8260B	APHW
1,2,3-Trichloropropane	SW8260B	APHW
Styrene	SW8260B	APHW
Dichlorodifluoromethane	SW8260B	APHW
Acetone	SW8260B	APHW
Carbon disulfide	SW8260B	APHW
2-Butanone	SW8260B	APHW

Table 1
Analytical Parameters

Parameter	Method	Laboratory
4-Methyl-2-pentanone	SW8260B	APHW
2-Hexanone	SW8260B	APHW
Bromochloromethane	SW8260B	APHW
Tetrahydrafuran	SW8260B	APHW
2,2-Dichloropropane	SW8260B	APHW
1,2-Dibromoethane	SW8260B	APHW
1,3-Dichloropropane	SW8260B	APHW
1,1,1,2-Tetrachloroethane	SW8260B	APHW
Bromobenzene	SW8260B	APHW
n-Butylbenzene	SW8260B	APHW
sec-Butylbenzene	SW8260B	APHW
tert-Butylbenzene	SW8260B	APHW
o-Chlorotoluene	SW8260B	APHW
p-Chlorotoluene	SW8260B	APHW
1,2-Dibromo-3-chloropropane	SW8260B	APHW
Hexachlorobutadiene	SW8260B	APHW
Isopropylbenzene	SW8260B	APHW
p-Isopropyltoluene	SW8260B	APHW
Naphthalene	SW8260B	APHW
n-Propylbenzene	SW8260B	APHW
1,2,3-Trichlorobenzene	SW8260B	APHW
1,2,4-Trichlorobenzene	SW8260B	APHW
1,3,5-Trimethylbenzene	SW8260B	APHW
1,2,4-Trimethylbenzene	SW8260B	APHW
Ethyl ether	SW8260B	APHW
Isopropyl ether	SW8260B	APHW
Ethyl-tert-butyl-ether	SW8260B	APHW
Tertiary-Amyl Methyl Ether	SW8260B	APHW
1,4-Dioxane	SW8260B	APHW
Total Aluminum	SW6010B	APHW
Total Arsenic	SW6010B	APHW
Total Barium	SW6010B	APHW
Total Cadmium	SW6010B	APHW
Total Calcium	SW6010B	APHW
Total Chromium	SW6010B	APHW
Total Copper	SW6010B	APHW

Table 1
Analytical Parameters

Parameter	Method	Laboratory
Total Iron	SW6010B	APHW
Total Lead	SW6010B	APHW
Total Magnesium	SW6010B	APHW
Total Manganese	SW6010B	APHW
Total Mercury	SW6010B	APHW
Total Nickel	SW6010B	APHW
Total Potassium	SW6010B	APHW
Total Selenium	SW6010B	APHW
Total Silver	SW6010B	APHW
Total Sodium	SW6010B	APHW
Total Zinc	SW6010B	APHW

The assessment of data includes a review of: (1) the Chain-of-Custody (CoC) documentation; (2) holding time compliance; (3) the required quality control (QC) samples at the specified frequencies; (4) flagging for method blanks; (5) laboratory control spiking samples (LCS); (6) analytical spike data; (7) matrix spike/matrix spike duplicate (MS/MSD) samples; and (8) flagging for equipment blank.

Data flags were assigned according to the NFG. Multiple flags are routinely applied to specific sample method/matrix/analyte combinations, but there will be only one final flag. A final flag is applied to the data and is the most conservative of the applied validation flags. The final flag also includes matrix and blank sample impacts.

The data flags are those listed in the NFG and are defined below:

- J = Analyte is present but the reported value may not be accurate or precise (estimated).
- R = The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.
- U = Analyte was not detected at the specified detection limit.
- UJ = Analyte was not detected and the specified detection limit may not be accurate or precise (estimated).

Findings

The overall summaries of the data validation findings are contained in the following sections:

Holding Times

All holding-time criteria were met.

Method Blanks

Method blanks were analyzed at the required frequency and were free of contamination.

Equipment Blank

An equipment blank was collected and analyzed at the required frequency. Chloroform was detected in the equipment blank. None of these target analytes were detected in any of the samples so no flags were applied.

Trip Blank

Trip blanks were collected and analyzed at the required frequency. Acetone was detected in the trip blank. None of these target analytes were detected in any of the samples so no flags were applied.

Field Duplicates

FDs were collected and analyzed at the required frequency. The relative percent differences (RPD) between the N and FD results met the acceptance criteria.

Laboratory Control Samples

Laboratory control sample/laboratory control sample duplicates were analyzed as required. Dichlorodifluoromethane, 2-Hexanone, and Chloromethane were below the laboratory control limit and their associated samples were non-detects so an "R" flag was applied. All other accuracy and precision criteria were met.

Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike/matrix spike duplicates (MS/SD) were analyzed as required. Isopropylbenzene and Total potassium did not meet MS/SD acceptance criteria. The associated result was non-detect so no flags were applied. Total iron did not meet MS/SD acceptance criteria. The associated sample concentration was greater than four times the spike concentrations so no flags were required per the NFG. All other accuracy and precision criteria were met.

Chain of Custody

Methods outlined on the CoC were performed by the lab using the equivalent Standard Method. No other discrepancies were noted.

Completeness

Out of approximately 3970 points, there were 8 data points rejected due to QC exceedances, no data points were qualified as non-detect due to blank exceedances, and no data points were qualified as estimated due to QC exceedances. These numbers indicate that the overall completeness goals for the project were met and that the quality of the analytical program and laboratory is sufficient to meet the project data quality objectives.

Overall Assessment

The final activity in the data quality evaluation is an assessment of whether the data meets the data quality objectives. The goal of this assessment is to demonstrate that a sufficient number of

representative samples were collected and the resulting analytical data can be used to support the decisionmaking process. The precision, accuracy, representativeness, completeness and comparability are addressed in the NFG. The following summary highlights the data evaluation findings for the above-defined events:

1. The completeness objectives were met for all method/analyte combinations.
2. There were no results qualified because of low-level blank contamination.
3. The precision and accuracy of the data, as measured by laboratory QC indicators, suggest that the NFG goals have been met.

Table 1 - Validation Flags

FieldID	Method	Analyte	Final Result	Final Flag	Reason
060806SHL5	SW8260B	Chloroform	ND	None	EB>MDL
B40SHM965BW	SW8260B	Chloroform	ND	None	EB>MDL
B40SHM965CW	SW8260B	Chloroform	ND	None	EB>MDL
061306SHL10	SW8260B	Isopropylbenzene	ND	None	MS>UCL
B40SHM965CW	SW8260B	Dichlorodifluoromethane	ND	R	LCS<LCL
B40SHM965CW	SW8260B	Dichlorodifluoromethane	ND	R	LCSD<LCL
B40SHM965BW	SW8260B	Dichlorodifluoromethane	ND	R	LCS<LCL
B40SHM965BW	SW8260B	Dichlorodifluoromethane	ND	R	LCSD<LCL
060806SHL5	SW8260B	Dichlorodifluoromethane	ND	R	LCS<LCL
060806SHL5	SW8260B	Dichlorodifluoromethane	ND	R	LCSD<LCL
060606SHL20	SW8260B	Acetone	ND	None	TB>MDL
060606SHL11	SW8260B	Acetone	ND	None	TB>MDL
060606SHL4	SW8260B	2-Hexanone	ND	R	LCS<LCL
060606SHL19	SW8260B	2-Hexanone	ND	R	LCS<LCL
B40000PSP1W	SW6010B	Total Potassium	ND	None	SD>UCL
B40000PSP1W	SW6010B	Total Potassium	ND	None	MS>UCL
B4000SHL22W	SW8260B	Chloromethane	ND	R	LCS<LCL
B4000SHL22W	SW8260B	Chloromethane	ND	R	LCSD<LCL
B4SHM9622BW	SW8260B	Chloromethane	ND	R	LCS<LCL
B4SHM9622BW	SW8260B	Chloromethane	ND	R	LCSD<LCL
B40000SHL9W	SW8260B	Chloromethane	ND	R	LCS<LCL
B40000SHL9W	SW8260B	Chloromethane	ND	R	LCSD<LCL

EB>MDL = Equipment blank greater than method detection limit.
TB>MDL = Trip blank greater than method detection limit.
MS>UCL = Matrix spike recovery greater than upper control limit
SD>UCL = Matrix spike duplicate recovery greater than upper control limit
LCS<LCL = Laboratory control spike recovery less than lower control limit
LCSD<LCL = Laboratory control spike duplicate recovery less than lower control limit
None = A database flag with no QC implications. A flag is not applied
R = Rejected data

Fort Devens
2006 December LTM/PMP Shepley's Hill Sampling Data Quality Evaluation Report

Introduction

The objective of this Data Quality Evaluation (DQE) report is to assess the data quality of analytical results for water samples collected for Fort Devens during the 2006 December Long-Term Monitoring Program/Performance Monitoring Program (LTM/PMP) Shepley's Hill sampling event. Individual method requirements, guidelines from the USEPA Contract Laboratory National Functional Guidelines for Inorganic Data Review, July 2002 (NFG) were used in this assessment.

This report is intended as a general data quality assessment designed to summarize data issues.

Analytical Data

This DQE report covers 54 normal (N) and 3 field duplicate (FD) environmental samples. These samples were reported under 11 sample delivery groups. Samples were collected between December 5, and December 13, 2006 and delivered to the laboratory the same day as collection. Alpha Analytical Laboratories (APHW) in Westborough, Massachusetts performed the analyses. Selected samples were analyzed for the following analytes/methods:

Table 1
Analytical Parameters

Parameter	Method	Laboratory
Total Alkalinity	E310.1	APHW
Alkalinity, Carbonate	E310.1	APHW
Methane		APHW
Ethane		APHW
Ethene		APHW
pH		APHW
Chloride	SW9251, E300.0	APHW
Total Residual Chlorine		APHW
Nitrogen, Nitrate	A4500, E300.0	APHW
Sulfate	E300.0	APHW
Chemical Oxygen Demand	E410.4	APHW
Biochemical Oxygen Demand (BOD), 5-day	E405.1	APHW
Total Organic Carbon	SW9060	APHW
Total Suspended Solids	E160.2	APHW
Total Dissolved Solids	E160.1	APHW
Total Cyanide	E335.2	APHW

Table 1
Analytical Parameters

Parameter	Method	Laboratory
Hardness	A2340B	APHW
Turbidity	A2130B	APHW
Methylene Chloride	SW8260B	APHW
1,1-Dichloroethane	SW8260B	APHW
Chloroform	SW8260B	APHW
Carbon Tetrachloride	SW8260B	APHW
1,2-Dichloropropane	SW8260B	APHW
Dibromochloromethane	SW8260B	APHW
1,1,2-Trichloroethane	SW8260B	APHW
Tetrachloroethene	SW8260B	APHW
Chlorobenzene	SW8260B	APHW
Trichlorofluoromethane	SW8260B	APHW
1,2-Dichloroethane	SW8260B	APHW
1,1,1-Trichloroethane	SW8260B	APHW
Bromodichloromethane	SW8260B	APHW
trans-1,3-Dichloropropene	SW8260B	APHW
cis-1,3-Dichloropropene	SW8260B	APHW
Bromoform	SW8260B	APHW
1,1,2,2-Tetrachloroethane	SW8260B	APHW
Benzene	SW8260B	APHW
Toluene	SW8260B	APHW
Ethylbenzene	SW8260B	APHW
Chloromethane	SW8260B	APHW
Bromomethane	SW8260B	APHW
Vinyl Chloride	SW8260B	APHW
Chloroethane	SW8260B	APHW
1,1-Dichloroethene	SW8260B	APHW
trans-1,2-Dichloroethene	SW8260B	APHW
Trichloroethene	SW8260B	APHW
1,2-Dichlorobenzene	SW8260B	APHW
1,3-Dichlorobenzene	SW8260B	APHW
1,4-Dichlorobenzene	SW8260B	APHW
Methyl tert butyl ether	SW8260B	APHW
m,p-Xylene	SW8260B	APHW
o-Xylene	SW8260B	APHW
cis-1,2-Dichloroethene	SW8260B	APHW

Table 1
Analytical Parameters

Parameter	Method	Laboratory
Dibromomethane	SW8260B	APHW
1,2,3-Trichloropropane	SW8260B	APHW
Styrene	SW8260B	APHW
Dichlorodifluoromethane	SW8260B	APHW
1,1-Dichloropropene	SW8260B	APHW
Bromochloromethane	SW8260B	APHW
2,2-Dichloropropane	SW8260B	APHW
1,2-Dibromoethane	SW8260B	APHW
1,3-Dichloropropane	SW8260B	APHW
1,1,1,2-Tetrachloroethane	SW8260B	APHW
Bromobenzene	SW8260B	APHW
n-Butylbenzene	SW8260B	APHW
sec-Butylbenzene	SW8260B	APHW
tert-Butylbenzene	SW8260B	APHW
o-Chlorotoluene	SW8260B	APHW
p-Chlorotoluene	SW8260B	APHW
1,2-Dibromo-3-chloropropane	SW8260B	APHW
Hexachlorobutadiene	SW8260B	APHW
Isopropylbenzene	SW8260B	APHW
p-Isopropyltoluene	SW8260B	APHW
Naphthalene	SW8260B	APHW
n-Propylbenzene	SW8260B	APHW
1,2,3-Trichlorobenzene	SW8260B	APHW
1,2,4-Trichlorobenzene	SW8260B	APHW
1,3,5-Trimethylbenzene	SW8260B	APHW
1,2,4-Trimethylbenzene	SW8260B	APHW
Monochloroacetic Acid	SW6251B	APHW
Monobromoacetic Acid	SW6251B	APHW
Dichloroacetic Acid	SW6251B	APHW
Trichloroacetic Acid	SW6251B	APHW
Dibromoacetic Acid	SW6251B	APHW
Bromochloroacetic Acid	SW6251B	APHW
Total Aluminum	SW6010B	APHW
Total Arsenic	SW6010B	APHW
Total Barium	SW6010B	APHW
Total Cadmium	SW6010B	APHW

Table 1
Analytical Parameters

Parameter	Method	Laboratory
Total Calcium	SW6010B	APHW
Total Chromium	SW6010B	APHW
Total Copper	SW6010B	APHW
Total Iron	SW6010B	APHW
Total Lead	SW6010B	APHW
Total Magnesium	SW6010B	APHW
Total Manganese	SW6010B	APHW
Total Nickel	SW6010B	APHW
Total Potassium	SW6010B	APHW
Total Selenium	SW6010B	APHW
Total Silver	SW6010B	APHW
Total Sodium	SW6010B	APHW
Total Zinc	SW6010B	APHW

The assessment of data includes a review of: (1) the Chain-of-Custody (CoC) documentation; (2) holding time compliance; (3) the required quality control (QC) samples at the specified frequencies; (4) flagging for method blanks; (5) laboratory control spiking samples (LCS); (6) analytical spike data; (7) matrix spike/matrix spike duplicate (MS/MSD) samples; and (8) flagging for equipment blank.

Data flags were assigned according to the NFG. Multiple flags are routinely applied to specific sample method/matrix/analyte combinations, but there will be only one final flag. A final flag is applied to the data and is the most conservative of the applied validation flags. The final flag also includes matrix and blank sample impacts.

The data flags are those listed in the NFG and are defined below:

- J = Analyte is present but the reported value may not be accurate or precise (estimated).
- R = The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria.
- U = Analyte was not detected at the specified detection limit.
- UJ = Analyte was not detected and the specified detection limit may not be accurate or precise (estimated).

Findings

The overall summaries of the data validation findings are contained in the following sections:

Holding Times

All holding-time criteria were met.

Method Blanks

Method blanks were analyzed at the required frequency and were free of contamination.

Equipment Blank

An equipment blank was collected and analyzed at the required frequency. No target analytes were detected in the equipment blanks so all acceptance criteria were met.

Trip Blank

Trip blanks were collected and analyzed at the required frequency. No target analytes were detected in the trip blanks so all acceptance criteria were met.

Field Duplicates

FDs were collected and analyzed at the required frequency. The relative percent differences (RPD) between the N and FD results met the acceptance criteria.

Laboratory Control Samples

Laboratory control sample/laboratory control sample duplicates were analyzed as required. Dichlorodifluoromethane was above the laboratory control limit but all samples were non-detects and no flagging is required per the NFG. Hexachlorobutadiene was above the RPD limit but all samples were non-detects and no flagging is required per the NFG. Bromomethane, 2,2-Dichloropropane, and BOD were below the laboratory control limit and their associated samples were non-detects so an "R" flag was applied. All other accuracy and precision criteria were met.

Matrix Spike/Matrix Spike Duplicate Samples

Matrix spike/matrix spike duplicates (MS/SD) were analyzed as required. Hexachlorobutadiene, Total cyanide, and Acetone did not meet MS/SD acceptance criteria. The associated results were non-detect so no flags were applied. Total iron did not meet MS/SD acceptance criteria for sample B6000SHL15W. The sample concentration was greater than four times the spike concentrations for total iron so no flags were required per the NFG.

Chain of Custody

Methods outlined on the CoC were performed by the lab using the equivalent Standard Method. No other discrepancies were noted.

Completeness

Out of approximately 2340 points, there were 18 points rejected due to QC exceedances, no data points were qualified as non-detect due to blank exceedances, and two data points were qualified as estimated due to QC exceedances. These numbers indicate that the overall completeness goals for the project were met and that the quality of the analytical program and laboratory is sufficient to meet the project data quality objectives.

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Overall Assessment

The final activity in the data quality evaluation is an assessment of whether the data meets the data quality objectives. The goal of this assessment is to demonstrate that a sufficient number of representative samples were collected and the resulting analytical data can be used to support the decisionmaking process. The precision, accuracy, representativeness, completeness and comparability are addressed in the NFG. The following summary highlights the data evaluation findings for the above-defined events:

1. The completeness objectives were met for all method/analyte combinations.
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3. The precision and accuracy of the data, as measured by laboratory QC indicators, suggest that the NFG goals have been met.

Table 1 – Validation Flags

FieldID	Method	Analyte	Final Result	Final Flag	Reason
120506SHL5	SW8260B	Bromomethane	ND	R	LCS<LCL
120506SHL5	SW8260B	Bromomethane	ND	R	LCSD<LCL
SHL3 120806	SW8260B	Bromomethane	ND	R	LCSD<LCL
SHL19 120806	SW8260B	Bromomethane	ND	R	LCSD<LCL
SHL4 120806	SW8260B	Bromomethane	ND	R	LCSD<LCL
SHL11 120806	SW8260B	Bromomethane	ND	None	LCS>UCL
SHL11 120806	SW8260B	Bromomethane	ND	None	LCSD>UCL
SHL20 120806	SW8260B	Bromomethane	ND	None	LCS>UCL
SHL20 120806	SW8260B	Bromomethane	ND	None	LCSD>UCL
SHL10 120806	SW8260B	Bromomethane	ND	None	LCS>UCL
SHL10 120806	SW8260B	Bromomethane	ND	None	LCSD>UCL
SHM931C 120806	SW8260B	Bromomethane	ND	R	LCS<LCL
SHM931C 120806	SW8260B	Bromomethane	ND	R	LCSD<LCL
SHM931C 120806	SW8260B	2,2-Dichloropropane	ND	R	LCS<LCL
SHM931C 120806	SW8260B	2,2-Dichloropropane	ND	R	LCSD<LCL
B60SHM965CW	SW8260B	Bromomethane	ND	R	LCS<LCL
B60SHM965CW	SW8260B	Bromomethane	ND	R	LCSD<LCL
B60SHM965BW	SW8260B	Bromomethane	ND	R	LCS<LCL
B60SHM965BW	SW8260B	Bromomethane	ND	R	LCSD<LCL
B60000SHL9W	SW8260B	Bromomethane	ND	R	LCS<LCL
B60000SHL9W	SW8260B	Bromomethane	ND	R	LCSD<LCL
B6SHM9622BW	SW8260B	Bromomethane	ND	R	LCS<LCL
B6SHM9622BW	SW8260B	Bromomethane	ND	R	LCSD<LCL
B60000SH22W	SW8260B	Bromomethane	ND	R	LCS<LCL
B60000SH22W	SW8260B	Bromomethane	ND	R	LCSD<LCL
B6DEC06DUPW	SW8260B	Bromomethane	ND	R	LCS<LCL
B6DEC06DUPW	SW8260B	Bromomethane	ND	R	LCSD<LCL
B6000EQGW	SW8260B	Hexachlorobutadiene	ND	None	LCSRPD>UCL
B6000EQPW	SW8260B	Hexachlorobutadiene	ND	None	LCSRPD>UCL
SHL10 120806	E405.1	BOD, 5-day	ND	R	LCS<LCL
120506SHL5	E405.1	BOD, 5-day	ND	R	LCS<LCL
B60SHM965CW	E405.1	BOD, 5-day	3.2	J	LCS<LCL
B60SHM965BW	E405.1	BOD, 5-day	ND	R	LCS<LCL
B60000SHL9W	E405.1	BOD, 5-day	ND	R	LCS<LCL
B6SHM9622BW	E405.1	BOD, 5-day	4.2	J	LCS<LCL
B60000SH22W	E405.1	BOD, 5-day	ND	R	LCS<LCL
B6DEC06DUPW	E405.1	BOD, 5-day	ND	R	LCS<LCL
SHM-93-22-C121206C121206	SW8260B	Hexachlorobutadiene	ND	None	MSRPD>UCL
B6000SHL15W	SW6010B	Total iron	18	None	SD>UCL
B6000SHL9W	SW8260B	Acetone	ND	None	SD>UCL
B6000SHL9W	SW8260B	Total Potassium	ND	None	MS>UCL
B6000SHL9W	SW8260B	Total Potassium	ND	None	SD>UCL
B6000SHL9W	SW8260B	Total Mercury	ND	None	MS>UCL
B6000EQGW	E335.2	Total Cyanide	ND	None	MS>UCL

MSRPD>UCL = Matrix spike relative percent difference greater than upper control limit
MS>UCL = Matrix spike recovery greater than upper control limit
SD>UCL = Matrix spike duplicate recovery greater than upper control limit
LCS<LCL = Laboratory control spike recovery less than lower control limit
LCSD<LCL = Laboratory control spike duplicate recovery less than lower control limit
LCS>UCL = Laboratory control spike recovery greater than upper control limit
LCSD>UCL = Laboratory control spike duplicate recovery greater than upper control limit
LCSRPD>UCL = Laboratory spike relative percent difference greater than upper control limit
None = A database flag with no QC implications. A flag is not applied
R = Rejected data
J = Analyte is present but the reported value may not be accurate or precise (estimated).

Appendix F
Response to Comments

Response to EPA Comments
(Letter to Mr. Robert Simeone, BRAC Environmental Coordinator, dated August 10, 2007

EPA Comments on
Draft 2006 Annual Report
Shepley's Hill Landfill
Long Term Monitoring & Maintenance
Devens, Massachusetts
May 2007

EPA has reviewed the document titled, "2006 Annual Report, Shepley's Hill Landfill, Long Term Monitoring & Maintenance", dated May 2007, as prepared by CH2M Hill on behalf of the Army. The 2006 Annual Report documents results of long-term monitoring and maintenance activities for Shepley's Hill Landfill, which were conducted in 2006. As stated in the Executive Summary, this document discusses results from an optimized and comprehensive strategy that incorporates elements of both the former Long Term Monitoring and Maintenance Plan (LTMMP) for SHL and the Performance Monitoring Plan (PMP) for the Contingency Remedy. Results are presented for the annual landfill cap inspection, methane/ethane sampling (in gas vents and as dissolved gases in selected monitoring wells) and groundwater monitoring.

Trigger chemicals, identified in the LTMMP as those presenting carcinogenic risk, are: arsenic, 1,2-dichlorobenzene, 1,4-dichlorobenzene, and 1,2-dichloroethane. Of these, only arsenic (As) was detected above the cleanup level during the 2006 monitoring. Other contaminants of concern (COCs) that are not contributors to carcinogenic risk but were detected above their cleanup levels in the 2006 sampling are iron (Fe), manganese (Mn), and sodium (Na).

No major change in arsenic concentrations in downgradient wells has been observed yet. Continued long-term monitoring will be needed to evaluate the effectiveness of the groundwater treatment plant. The recently implemented increase in the extraction rate from 25 to 50 gpm may accelerate changes downgradient. Continued monitoring will be critical to identify hydrologic perturbations, e.g. unacceptable drawdown at downgradient wetland locations, if they occur.

Note that the Revised LTMMP (May 2007) eliminated the Group 1 and Group 2 well designation and risk reduction criteria established in the ROD for evaluating the effectiveness of the cap, since that criteria was to trigger the implementation of the contingency remedy, which is now in operation. The Revised LTMMP indicated that the BCT would work together during 2007 to identify appropriate remedy evaluation criteria to assess the effectiveness of the groundwater treatment system and that the 2007 Annual Report would provide a proposal for the new remedy evaluation criteria. EPA looks forward to working with the Army and MassDEP to meet this goal and suggests that a BCT Technical Meeting on this issue be scheduled in the Fall to address this matter.

Army Response: *Comment noted.*

EPA's comments on the Draft 2006 Annual Report are attached. If you have any questions, please feel free to contact me at (617) 918-1754. Thanks.

Response to EPA Comments
(Letter to Mr. Robert Simeone, BRAC Environmental Coordinator, dated August 10, 2007

Specific Comments:

1. Page v, Executive Summary: The 2nd paragraph discussion on the 2006 annual landfill inspection refers to a 2005 inspection report. Please revise the reference to the report for the 2006 inspection report and refer the reader to the landfill inspection checklist in Appendix A.

Army Response: *The report reference is correct relating to cap system and drainage system issues identified in 2005 Annual Report. The intent was to provide context against which repairs made in 2006 are presented. The text has been modified to provide clarification and a reference to the checklist for the 2006 inspection, included in Appendix A, has been added.*

2. Page vi, Executive Summary: The last paragraph on page vi discusses historic levels of arsenic in groundwater at SHL and states that "[T]he highest concentration observed historically at any well has been 5110 ug/L at well SHM-96-5B in May 2000." For comparison, it should be noted that the highest arsenic concentration observed anywhere within the SHL system was 5970 ug/L at piezometer N5-P1 (6/8/2006). An unfiltered sample from N5-P1 reported a value of 6080 ug/L (5800 in the filtered sample) during the November 1999 Supplemental Groundwater Investigation (Harding ESE, 2003). Also, other wells reporting elevated arsenic include: SHP-99-29X, 4380 ug/L in a filtered sample (11/1999); EW-04, 5910 ug/L (8/18/2005); SHM-05-40X, 4070 ug/L (12/2006); and SHM-05-41B, 2730 ug/L (9/2006). Please note that the latter two are beyond the toe of the landfill.

   While EPA acknowledges the distinction between monitoring wells and piezometers or extraction wells, it is important to consider all occurrences of elevated arsenic, at all depths and at all locations within the SHL network, when proposing any conceptual model(s) for the system. The paragraph at the bottom of page vi continues at the top of page vii with the statement that monitoring wells SHM-96-22B and SHM-95-5B "…exhibit the highest arsenic levels measured at the site, one to two orders of magnitude above levels measured at other compliance wells…" This information is then used to support the interpretation that these two wells intercept "…the most reducing (impacted) zone moving north from the landfill." At this time, the links between reducing conditions in the overburden aquifer, elevated arsenic, and landfill-related impacts to groundwater have not been clearly established.

Army Response: *The statements in the ES relate to compliance monitoring wells that have been monitored for many years under the LTMMP. They are not intended to relate to the highest historical occurrence at any location near SHL. The text has been changed to provide clarification. It is acknowledged that N5-P1, within the landfill, has had higher arsenic levels, during the SGI and recent monitoring. Samples from EW-04 have been higher, as well. These and the other referenced wells are not compliance wells under the LTMMP program, in place at the time. The statement at the end of the paragraph relating to SHM-96-22C and SHM-95-5B is simply that arsenic levels are "one to two orders of magnitude above levels measured at the other compliance wells and are interpreted to be completed in the most reducing (impacted) zone moving north from the landfill." The next sentence then goes on to state simply that "The Contingency Remedy extraction wells are completed in this zone upgradient adjacent to the landfill." These statements are not incorrect and will remain unchanged. The intent of these*

statements was simply to provide some information about where the extraction well-field has been located relative to downgradient compliance wells that have been monitored north of the capped landfill area for many years.

3. Page vii, Executive Summary: The first complete paragraph on this page discusses trends in arsenic concentrations in monitoring wells SHM-96-22B and SHM-95-5B and suggests that these trends are "…consistent with the operation of the extraction wells…" The text acknowledges that insufficient time has elapsed to relate these trends to the extraction system with any certainty. However, it should be noted that even though the arsenic concentrations at SHM-96-22B declined somewhat between April and December 2006, the overall trend over ten years of monitoring is a general increase in arsenic in this particular monitoring well. Arsenic at SHM-95-5B peaked at 5110 ug/L in May 2000, before the installation of the extraction system, and has since shown an overall decline, with marked seasonal variations. Arsenic concentrations are generally higher in the spring sampling events than in the fall.

Army Response: *Agreed, comment noted. The referenced sentence reads "[t]hese reductions are consistent with the operation of the extraction wells; however, it is too early in the operation of these wells to identify whether the trends are related to operation of the system." The statement identifies that although reductions were observed during the time frame in which the extraction system has been operating, it is too early to attribute these changes to the system.*

4. Page 1, Section 1.0: In the last sentence in the 2nd paragraph of this section, please change "…reducing the standard from 50 ppm to 10 ppm" to "…50 ppb to 10 ppb."

Army Response: *Correction made.*

5. Page 2, Section 1.1: The 2nd paragraph provides an estimate of 1.3×10^6 cubic yards of waste, of which approximately 25% lies below the water table. Please give a citation for the source of this information (both the waste volume and fraction below the water table).

Army Response: *The Final Feasibility Study, Shepley's Hill Landfill Operable Unit, Fort Devens Feasibility Study for Group 1A Sites (ABB-ES, 1995a), Record of Decision (USAEC, 1995), and the Revised Supplemental Groundwater Investigation (Harding ESE, 2003) all refer to a landfill volume estimate of 1.3×10^6 cubic yards. The text has been modified to reference (ABB-ES, 1995a). The reference to 25 percent of the volume being below the watertable has been deleted.*

6. Page 3, Section 1.2 and Page 29, section 8.1: The 4th paragraph on page 3, the discussion on the Five-Year Reviews (FYRs), needs to be revised. The text states that the 2nd FYR was the 2005 FYR and that this FYR concluded that the contingency remedy should be implemented. The 2nd FYR for SHL was the 2000 FYR which required that the Army reevaluate alternative SHL-9. The decision to implement the contingency remedy followed the 2000 FYR, and the 2005 FYR, the 3rd FYR for SHL, deferred the protectiveness statement for SHL and required start-up and performance monitoring of the system and completion on the CSA/CAAA. The 1st bullet in Section 8.1 indicates that the 2000 FYR concluded that the incremental reduction

is risk was not achieved and that the agencies decided to implement Alternative SHL-9. Please clarify. Was the decision to implement the contingency remedy made in the 2000 FYR or later?

Army Response: *The five year reviews, including the first SHL FYR (SWET, 1998) and the subsequent two comprehensive FYRs (HLA, 2000 and Nobis, 2005) for all of Devens and inclusive of SHL are referenced in Section 1.3. The Section 1.2 Paragraph has been modified to clarify that neither the second nor the last FYRs completed by HLA (2000) and Nobis (2005) reclassified Group 2 monitoring wells. In addition, this paragraph has been modified to clarify that the 2000 FYR recommended that the Army reevaluate the Contingency Remedy and that a decision to implement the Contingency Remedy was made at a later date. The Section 8.1 bullet has been simplified to simply state "The Contingency Remedy groundwater extraction and treatment systems began long-term operations in March 2006.*

7. Page 5-7, Section 2.2 and Page 31, Section 8.2: Section 2.2 lists a number of bulleted items which identify recommendations from the 2006 landfill cap inspection. Page 7 implies that resolution of a number of these items will be deferred to the Supplemental Groundwater Investigation and Landfill Cap Assessment. The last 3 bullets in Section 8.2 attempt to address how the items listed in Section 2.2 will be reconciled. However, so that the status of the follow-up action for each of the issues listed in Section 2.2 is clear to the reader, please number them and identify in Section 8.2 specifically which items have already been addressed, are scheduled for repair, or are being deferred to the Landfill Cap Assessment.

Army Response: *The recommendations for maintenance work will be addressed in a SOW expected to be completed and implemented in FY08.*

8. Page 8, Section 3.1: According to the text, a key objective addressed by the annual gas survey is to verify that landfill methane generation is declining as expected. What is the basis for the statement in the 4th paragraph, "[I]n general, landfill gas production is continuing to decline"? Please provide some demonstration (graphical presentation, statistical trend analysis, or other) that this is indeed the case. Methane levels in several gas vents (GV 1, 2, 3, 5, 6, 7, 9, and 10) appear to have increased steadily over the past several years. Please provide support for the statement that, overall, methane concentrations are declining.

Army Response: *The statement has been modified with the following text addition:*

"In general, landfill gas production is low, typical of landfills that have been closed for many years. Landfill gas monitoring has been conducted since the 1998 Annual Report (USAEC, 1999). Review of these data and other data collected annually since 1998 indicate variability in production between vents from year to year. This is likely associated with changing soil moisture and atmospheric pressures from monitoring event to event and non-uniform response across the landfill to these changes. However, in a general sense the data indicate that production is greatest, to the south in the Phase III and IV areas that were the last active areas, being capped and closed between 1989 and 1992. By comparison, many wells to the north have had low methane readings throughout the nine years of monitoring. Gas production for the

landfill, as a whole, is low by comparison to active or recently closed municipal landfills. For active or recently closed landfills, high landfill gas flux rates result in measurable high concentrations of landfill gas near vent pipe openings under ambient conditions, prior to capping and purging. This is not the case with Shepley's Hill where ambient readings were non-detect in 2006 following capping and prior to full purging, indicative of generally low flux rates. The historic data from the perimeter gas monitoring wells on the north indicate no history of detectable methane which further suggests gas production is low by comparison with recently closed or active municipal landfills."

9. Page 10, Section 3.2: Typo? Please replace "Samples from the temporary…" with "Soil" (if the text was intended to read "Soil gas samples…").

Army Response: *Edit made to read "Samples from the temporary gas probes..."*

10. Page 12, Section 4.1: The 1st paragraph in this section notes that Table 4-2 provides specifications for the LTMMP/PMP wells, including elevations of the screened intervals. There are numerous discrepancies between the screen lengths shown in this table and those in Table 3-1, Data Analysis Plan (AMEC, 2007). Please verify the accuracy of the screen elevations in Table 4-2.

Army Response: *Table 4-2 screen elevations were derived, to the maximum extent possible, from original well completion logs and ground survey. Table 4-2 has been reviewed and re-checked against published logs and other information and is mostly correct with a few edits. A minor change has been made to SHL-10C, in which an error was detected in the calculated screen elevation. SH-96-22B screen depth has been corrected to 82.0 to 92.0 feet bgs as indicated in the original log.*

Screen elevation is a calculated value from well screen depths and the ground surface elevations provided in the original logs. If ground surface elevation was not presented on particular paper logs then the surface elevations obtained by Meridian Associates in 2005 were utilized. For a number of wells, installed in the 1999-2001 timeframe logs were not available. For these a text table in Section 2.6 of the Supplemental Groundwater Investigation (Harding ESE, 2003) was used to obtain screen depths. These depths were then used to calculate screen elevations, using Meridian (2005) survey data for ground surface since the SGI table did not present ground surface elevations. The "geologic designation" column in the table is consistent with Table 2-5 in the SGI. Well locations that are highlighted by an asterisk, are those for which well completion logs could not be located; however, approximate screened-interval depths were derived from other sources (e.g. cross-sectional depictions in the SGI). These depths were then converted to elevations.

Information for a few shallow overburden/WT wells and one deep bedrock well were left blank since well construction information could not be located. In addition, a number of the N-series piezometers were left blank since logs, cross-sections, or tabular summaries for them were not available in the SGI; however, Table 2-5 of the SGI does indicate the general horizons in which they are completed. For these piezometers, some depth information is available on field

sampling forms in the appendices of the SGI; however, it was not used since it is unclear how the information was generated. The table footnotes have been updated to clarify the sources of the information used in development of the table.

11. Page 12, Section 4.1: Table 4-3 shows that water levels were recorded at the staff gauge in Plow Shop Pond. However, Figures 4-1 and 4-2 do not display these critical data. Please show the surface water levels on the maps, so that the reader can easily compare adjacent groundwater levels, locate the hinge line, etc.

Army Response: *Readings added.*

12. Page 15, Section 4.2.3: The 2nd sentence in this section states that selected groundwater samples from the December 2006 round were analyzed for methane and ethane. Please include here, in the table of parameters and methods on this page, and/or in Table 4-4, the method that was used for the dissolved methane/ethane analyses.

Army Response: *The method utilizes a GC. The laboratory references the following procedure: Analysis of Dissolved Methane, Ethane & Ethylene in Groundwater by a Standard Gas Chromatographic Technique, Kampbell & Vandegrift, EPA-OK, Journal of Chrom, Vol 36, May 1998 & Technical Guidance for the Natural Attenuation Indicators, EPA-NE, July 2001. The text table has been modified to provide this method reference.*

13. Page 16, Section 4.3: The text indicates that Figure 4-3 shows arsenic results from the LTMMP wells (for June and December 2006). Please consider developing a comparable figure for the PMP wells (for which the locations are shown on Fig. 4-3 but results are not), in order to see spatial relations of results. Also, please note that Figure 4-3 is out of order (it precedes the "Figures" section in the document).

Army Response: *The LTMMP compliance monitoring depicted in Figure 4-3 provides considerable coverage relating to arsenic monitoring. The PMP data have been depicted elsewhere and are presented general locational format in summary tables. During 2006, a transition year with operation of the new system and development of a Revised LTMMP, PMP data were added to the standard LTMMP annual report to aid transition. Future annual reports, under the Revised LTMMP program, will provide depictions of the spatial coverage relating to full network being monitored for arsenic with the combined cap and extraction system remedy.*

14. Page 17, Section 4.3.1: In the 4th paragraph in this section, it is stated that arsenic concentrations in SHM-96-5B have "…generally decreased since having a near all-time high result of 4110 ug/L in January 2006." It should be noted, as is stated in the Executive Summary, page vi, that the maximum arsenic observed at this well was 5110 ug/L in May 2000; subsequently, the overall trend has been decreasing. However, it is premature to attribute this 'general pattern' to a response of the flow field and redox chemistry to the operation of the nearby extraction wells.

Army Response: *The Army agrees with the conclusion. The text the first sentence has been modified and new second sentence added as follows for clarification:*

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"The arsenic concentration at SHM-96-22B has generally increased in the past year when compared to previous years while SHL-96-5B has generally decreased since having an all-time high result of 5,110 µg/L in May, 2000. However, in January 2006, SHL-96-5B appears to have trended up briefly to 4130 ug/L before returning to lower levels, typical of recent years, later in 2006 (refer to Table 4-9)."

15. Page 19, Section 4.3.4: According to the last paragraph in this section, methane concentrations in downgradient wells range from <1 to 7910 ug/L, and it is suggested that dissolved methane/ethane is also associated with the reducing conditions that give rise to Fe, Mn, and As (through reductive dissolution). Please reconcile these statements regarding methanogenesis at depth with statements elsewhere in the report (e.g., Page 8, Section 3.1) asserting that the landfill is mature and that landfill-generated gas flux rates are low.

Army Response: *The association of the highest levels of dissolved methane with the most reducing conditions observed at SHL and the presence of dissolved Fe, As, and Mn is clear. Statements about maturity of the landfill and gas generation are relative statements. Methanogenesis may occur beneath mature landfills as it does beneath young active or recently closed landfills, just not to the same degree. There is no inconsistency here. However, beneath active or recently closed landfills it would be expected to be more pervasive with greater flux of methane gas through the vadose zone and greater partitioning and flux of dissolved methane in groundwater. Generally aerobic glacial sand and gravel aquifers where methanogenis is not generally the pervasive biodegradative pathway may have zones or areas where redox conditions are sufficiently negative such that methanogens dominate. Wetlands are a natural example where enough organic matter is often available that biological activity drives redox conditions to a sufficiently reductive condition in which methanogens dominate.*

16. Page 20, Section 5.1: In the 3rd paragraph, activities that were conducted prior to startup of the extraction system are discussed. It is apparent that considerable testing, sampling, and adjustments of the system were required in order to evaluate the appropriate coagulant dosage needed to achieve the goal of 10 ug/L arsenic under pumping at 25 gpm. Will the same approach be used to verify the appropriate coagulant dosage under pumping conditions at 50 gpm? Please expand this discussion to include steps that will be followed when the pumping rate is increased.

Army Response: *Dosage is set and is maintained as flow is increased or decreased. In other words, coagulant additions are flow paced (automatically adjusted with flow), maintaining a constant dosage, independent of pumping rate.*

17. Page 22, Section 5.2: In the 4th paragraph in this section, the presence of gaseous methane in the plant influent tank is attributed to exsolution from groundwater as it equilibrates with atmospheric pressure. The methane/ethane levels in the groundwater are "…fairly typical for groundwater having high TOC levels and…undergoing active methanogenesis." Please provide, if possible, data and/or references that support this statement. Also, please see related Specific Comment 15, above, regarding an apparent contradiction between 'active methanogenesis at depth' and statements suggesting that the landfill is mature and gas

production rates are declining. Is it possible that other carbon sources are contributing to methane production at depth?

Army Response: *It is possible other carbon sources could be contributing to methanogenesis in the sand and gravel glacial aquifer. This could be researched or studied in upgradient areas near Shepley's Hill; however, it is expected that the dominant source of TOC at SHL relates to the landfill. DoD and EPA have developed a wealth of monitored natural attenuation literature that provide TOC data associated with dissolved methane as a natural attenuation parameter. Some of there reference were provided previously with the responses to comments on the "Methane Memo."*

18. Page 25, Section 6.0: The 1st bullet on this page states that a remedial response objective is to "[p]rotect potential residential receptors from exposure to contaminated groundwater migrating from the landfill having chemicals in excess of MCLs". It is noted that proper operation of the groundwater extraction system has the potential to meet this objective in a strict sense, to the extent that 100% capture of the groundwater flux through the SHL catchment would prevent *all* groundwater from "migrating from the landfill." However, it still remains to be seen whether or not the arrest of the advective mass flux of arsenic at the north end of the landfill will have a significant effect on downgradient water quality. Continued monitoring of the downgradient domain is critical to this determination over the long term.

Army Response: *Comment noted.*

19. Page 25, Section 6.0: The 2nd bullet on this page states that one of the remedial response objectives (RO) is to "[p]revent contaminated groundwater from contributing to the contamination of Plow Shop Pond sediments in excess of human health and ecological risk-based concentrations." It is noted that the groundwater LTM program can only address this RO to the extent that it can provide a limited assessment of the groundwater flow pattern (e.g., region of discharge to the pond) and the As concentrations of that discharge. However, the groundwater LTM program does not test whether or not As continues to accumulate in sediment. This will need to be addressed by the AOC 72 RI/FS.

Army Response: *Comment noted.*

20. Page 26, Section 6.0: The 2nd complete paragraph on this page indicates that Army may conduct further evaluation of the wellfield hydraulics in order to develop data to compare with model predictions for a pumping rate of 50 gpm. Note that evaluation of wellfield hydraulics at the increased pumping rate of 50 gpm and comparison of that data to model predictions will be critical to the evaluation of the effectiveness of the remedy.

Army Response: *Comment noted.*

21. Page 28, Section 7.0 and Table 4-7: The explanation for the apparent switch in reported results from SHM-05-42A and SHM-05-42B is appreciated. Upon closer scrutiny of the data presented in Table 4-7, it appears that some other results are inconsistent with historical

concentrations and possibly also due to errors arising from switching bottles during sampling or analysis, or in data entry. Please check and verify the following:

- SHP-37X: Chloride for the December 2006 sample is reported as 36000 ug/L, while the previous 3 rounds reported Cl at 1900, 1000 U, and 2700 ug/L. Similarly, Na is given as 18000 ug/L while the previous 3 rounds are 2200, 2400, and 3200 ug/L. Is it possible that the December results belong to another well, e.g. SHP-36X (Cl in the December round is 35000 ug/L, Na is 21000 ug/L)?

Army Response: *The December results have been checked for SHP-37X. They are believed to be correct. Although they deviate from the earlier 2006 results for Na and Cl they are similar, in terms of magnitude, to results from the other shallow wellpoints SHP-36X and SHP-01-38A and monitoring well SHL-13 which are all shallow overburden groundwater sampling points located near PSP. These in turn are generally consistent with the PSP-01 (pond sample). This may be indicative of pond-water dominated flux to groundwater at the 37X location established in December 2006 (screen depth 1 to 6 feet below grade). This may be related to changes in overall hydrologic conditions related to ongoing pumping and PSP hydrologic conditions in December or simply may be a more typical result for this area believed to be downgradient of the pond. These locations are scheduled to be monitored for the same analytes as part of the Revised LTMMP. These data in conjunction with other data collected by EPA in this area of the pond will be important in further defining pond groundwater interactions.*

- SHP-35X: In a previous spreadsheet, Cl for the September 2006 sampling was reported as 4200 ug/L; in Table 4-7 (this report), Cl for this round is now 42000. Please check and verify the correct value.

Army Response: *The 42,000 result is correct. The earlier data summaries were draft and had not yet been validated or QA/QC'd.*

- N5-P1: Cl for the December sampling is reported as 8600 ug/L; previous rounds reported Cl at 20000, 16000, and 17000 J ug/L. Nitrogen (nitrate) for the December sampling is reported at 22000 ug/L, while the previous results are 160, 100 U, and 100 U ug/L. Sulfate for the December sampling is given as 100 U, while previous results are 10000 U, 10000U, and 8400 ug/L. Is the Cl number (8600 ug/L) possibly the December sulfate concentration and the nitrate value in the table is really for Cl? Also, is the sulfate value of 100 U actually the nitrate result? Please check values for all of these parameters and edit where appropriate.
- N5-P2: Chloride for the December round is given as 1000 U ug/L, when the previous 3 rounds reported values of 19000, 20000, and 18000 ug/L. Nitrate in the December sample is reported as 18000 ug/L, compared to previous results of 190, 140, and 100 U ug/L. Also, sulfate in December is 100 U; this reporting limit for sulfate appears only in the December results for N5-P1 and N5-P2, as it is 1000 U ug/L in all other December 2006 samples. Is the December sulfate value possibly 1000 U (in the Cl row), nitrate is 100 U (sulfate row), and the nitrate value is really Cl? Please check and edit if necessary.

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- SHL-21: The December 2006 Cl value is 9400 ug/L (compared to two previous results, 1000 U and 2000 U); nitrate in December is 2500 ug/L (compared to 100 U in each of two previous rounds); and sulfate is 100 U (compared to 10000 U and 9500 ug/L previously). It seems possible that the December Cl value is sulfate, the nitrate value is Cl, and the sulfate value is actually nitrate. Please check and edit if necessary.

Army Response: *The data are correct, however, the December Chloride, Nitrogen (nitrate), and Sulfate results were out of order during the merging process due to a change in reporting sequence in the EDD's. Most of these were caught except for SHL-10D, SHL-21, N5-P1, and N5-P-2. The summary table listing has been corrected.*

Also note that in Table 4-7 the labels "methane" and "ethane" for the rows containing the dissolved gas results should be reversed.

Army Response: *This has been corrected.*

References:

AMEC Earth and Environmental, Inc., 2007, *Scope of Work: Supplemental Groundwater and Landfill Cap Assessment for Long-Term Monitoring and Maintenance – Data Analysis Plan. Shepley's Hill Landfill, Devens Massachusetts*. February 2007.

Harding ESE, 2003, *Revised Draft Shepley's Hill Landfill Supplemental Groundwater Investigation, Devens Reserve Forces Training Area, Devens, Massachusetts*. May 2003.

Response to DEP Comments
(Letter dated August 6, 2007)

[DEP Letter to Mr. Robert Simeone, BRAC Environmental Coordinator, dated August 6, 2007]

RE: 2006 Annual Report, Shepley's Hill Landfill, Long Term Monitoring and Maintenance (2006 AR), Devens, Massachusetts, May 2007

Dear Mr. Simeone:

The Massachusetts Department of Environmental Protection (MassDEP) has reviewed the above submittal prepared by CH2M Hill, contractors for the Army's Shepley's Hill Landfill Contingency Remedy, per the DSMOA for Devens. ROD Contingency Remedy is fully op[era]tional since March 2006. Since then, more than six million gallons of groundwater has been pumped, and about 300 pounds of arsenic has been removed. With Performance Monitoring Plan, in conjunction with Long Term Monitoring and Maintenance Plan, a total of 39 monitoring wells were sampled quarterly or semiannually. Mass DEP is providing the following comments:

1. MassDEP had the following comments during the review of Revised Long Term Monitoring and Maintenance Plan for Shepley's Hill Landfill:

    i. MassDEP received the methane sampling data conducted in the fall of 2006 on January 16, 2007 and additional information about recently installed landfill gas monitoring probes at southern perimeter of Shepley's Hill Landfill (SHL) on February 2, 2007, both through emails. An additional teleconference was held on February 8, 2007 with USEPA, MassDEP, Army, Army Corps of Engineer and their consultant. During the teleconference the Army agreed: 1) quarterly monitoring of dissolved methane at the subset of groundwater monitoring wells and 2) further assessment of methane generation across the site. MassDEP would like to discuss the details of those proposals at the next BCT meeting.

Army Response: *As indicated in the RTC on the 2005 AR, a detailed response to follow-up comments on the 2005 AR regarding issue of methane monitoring (both landfill gas monitoring and monitoring of dissolved methane in groundwater will be provided in a separate Army response letter. Again in response to previous comments on the 2005 AR and again here, the Army did not commit to performing quarterly monitoring of dissolved methane. The Army did state in the referenced telecon that additional characterization of dissolved methane would be performed under the supplemental groundwater monitoring work plan in order to confirm the methane in groundwater sampling data collected to date. This data indicated that levels of dissolved methane in groundwater in the area of Scully Road do not pose a safety risk based on both the concentrations detected in groundwater and on the methane gas monitoring data collected in this area. The data also indicated that the methane concentrations in groundwater are attenuating in the down-gradient direction. These data and interpretations are provided in the 2006 Annual Report and also in responses to comments on the "Methane Memo."*

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The additional "off-site" groundwater characterization effort committed will include analyses for dissolved methane in order to confirm these conditions and the Army will work with the MADEP and USEPA in selecting the appropriate locations for this analysis.

ii. In addition, MassDEP has reviewed the newly installed landfill gas monitoring probes information and requests the Army look into the construction of the probes. In particular, the construction details do not coincide with the Annual Reports' (1999, 2001, 2003 & 2004) recommendations of installing gas monitoring probes along the southern property line. The specifications indicated:

> ' The probes should be installed in clusters with screens installed at deep, mid-depth and shallow intervals. The deep screen should extend to just above the saturated zone. The top of shallow screen should be installed at app. 3 to 5 feet below ground surface'.

The specifications in these Annual Reports are consistent with MA Landfill Technical Guidance Manual, May 1997 under Chapter 4 of Part I, Environmental Monitoring Program, E. Landfill Gas Monitoring Requirements, 3. Landfill Gas Measuring Devices, read as:

> In most situations landfill gas probes are not acceptable as the perm*anent monitoring devices for the site. This is because they cannot typically be installed to depths to monitor the full unsaturated depth of soils or extend to the maximum depth of waste placement.*

The gas probes installed in December 2005 had only 1-ft screen and were generally screened about 3 to 5 feet below ground surface. MassDEP believes the probes do not provide adequate monitoring for the fully unsaturated soil column and will need to be supplemented.

The Army has agreed that a comprehensive evaluation about the landfill gas issues will be conducted. MassDEP would welcome the opportunity to share this information since additional groundwater investigation is already underway.

Army Response: *The Army will address this issue in separate correspondence*

2. Furthermore, on page 8 of the 2006 AR, the report indicated that *landfill gas production is continuing to decline.* MassDEP requests further explanation. Especially MassDEP interpreted *very little detected landfill,* before purging, and increased percent LEL at several gas vents including GV-I, GV-7, GV-9, GV-11 and GV-14, may potentially imply the landfill gas not properly vented. Also, on page 9 of the report, it is stated that, *if the gas vents are functioning properly and are*

adequately spaced, off-gas migration of landfill gases is controlled. MassDEP has been requesting a further investigation of whether *the gas vents are functioning properly and are adequately spaced.* Please address.

Army Response: *The passive vent system has been designed and installed in accordance to EPA guidance and accepted practice used for capping and closure of landfills. Many landfills have been closed in this manner. The passive venting systems are actually very simple designs involving no mechanical valves or other components that would fail over a 30 year post closure period. It would be helpful to the Army to understand what mechanism of failure DEP is suggesting may have occurred in this system.*

Variability in gas data spatially and temporally across the landfill is not unexpected for landfills and is likely due to subtle changes in atmospheric pressure between and during monitoring events, as well as spatial changes in soil moisture, etc.

3. As concentration of 10 ppb at PSP 01 may suggest groundwater monitoring at SHP-05-47A, B should be included.

Army Response: *PSP-01 is a pond water sample location. SHP-05-47A,B is shallow drive point location downstream of the dam intended to evaluate hydraulics. Sufficient groundwater sampling points near the pond are available and being sampled under the Revised LTMMP for arsenic and may be used to evaluate pond water arsenic contributions to groundwater.*

4. Arsenic concentrations at the some Nearfield wells, including SHL-20, SHL-22, SHM-96-22B and SHM-96-22C, have significantly increased during the year of 2006. Further evaluation and sampling may be beneficial before the pumping rate of 50 gpm is implemented.

Army Response: *The results for 2006 do not show significant increases at the locations mentioned. The sampling program planned under the Revised LTMMP is designed to support pumping at a cumulative rate of either 25 or 50 gpm. The BCT agreed to increase the pumping rate at the July 19th meeting.*

5. In addition, the hydraulic monitoring network, as specified in Table 1 of the Performance Monitoring Plan, Shepley's Hill Landfill Groundwater Extraction, Treatment and Discharge Contingency Remedy, should be conducted while the pumping rate of 50 gpm is implemented. Also Mass DEP is concerned with any potential drawdown of Nonacoicus Brook at these higher pumping rates and requests staff gauges in NB be monitored for any potential impact from increased pumping.

Army Response: *The hydraulic monitoring network currently in place will be utilized to evaluate pumping at 50 gpm*