1998 ANNUAL REPORT

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

March 1999

PREPARED BY:

DEPARTMENT OF ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS

US Army Corps
of Engineers
New England District

SHEPLEY'S HILL LANDFILL
1998 ANNUAL REPORT

SHEPLEY'S HILL LANDFILL
DEVENS, MASSACHUSETTS

March 1999

SHEPLEY'S HILL LANDFILL 1998 ANNUAL REPORT

TABLE OF CONTENTS

Section	Title	Page
	EXECUTIVE SUMMARY	1
1.0	INTRODUCTION	3
2.0	LANDFILL CAP MAINTENANCE ACTIVITIES	4
3.0	LANDFILL CAP MONITORING ACTIVITIES	5
4.0	LANDFILL GAS MONITORING RESULTS	8
5.0	GROUNDWATER ELEVATIONS	9
6.0	GROUNDWATER SAMPLING	11
6.1	Preparation for Sampling	11
6.2	Sampling	11
6.3	Equipment Decontamination	12
7.0	LABORATORY TESTING	14
7.1	Analyses	14
7.2	Results	14
8.0	QUALITY CONTROL	21
8.1	Field Quality Control	21
8.2	Laboratory Quality Control	21
8.3	Data Evaluation	21
8.3.1	Data Evaluation for Samples Collected May 1998	22
8.3.2	Data Evaluation for Samples Collected November 1998	24
9.0	CORRECTIVE ACTION	29

SHEPLEY'S HILL LANDFILL ANNUAL REPORT

TABLE OF CONTENTS (Cont.)

TABLES

Table 5-1 Monitoring Wells and Elevations 10
Table 6-1 Monitoring Well Designation 13
Table 7-1 Groundwater Sample Analysis and Procedures 15
Table 7-2 Laboratory Results – May 1998 16
Table 7-3 Laboratory Results – November 1998 17
Table 7-4 Comparison of Historic Arsenic Results 20
Table 8-1 Sample Preperation and Analysis Methods 28

FIGURES

Figure 2-1 Shepley's Hill Landfill - Repairs
Figure 3-1 Shepley's Hill Landfill - Findings of Inspection Conducted 26 October 1998
Figure 4-1 Shepley's Hill Landfill - Groundwater Monitoring

APPENDICES

Appendix A Landfill Maintenance Checklist
Appendix B Landfill Gas Monitoring Form
Appendix C Groundwater Field Analysis Forms
Appendix D Chain of Custody Forms
Appendix E Quality Assurance Reports
Appendix F Groundwater Analytical Data
Appendix G References

EXECUTIVE SUMMARY

This annual report has been prepared to document the monitoring and maintenance activities conducted at the Shepley's Hill Landfill in Devens, Massachusetts as required by the Record of Decision (ROD) for areas of contamination 4, 5, and 18 (ABB-ES, Oct 1995). This report was developed by the U.S. Army Corps of Engineers (USCOE), New England District (NAE).

This report documents the results of the third year (1998) of the Long Term Monitoring and Maintenance conducted in accordance with the approved Long Term Monitoring and Maintenance Plan (SWEC, May 1996). Activities conducted as part of the Long Term Monitoring and Maintenance Plan include a yearly inspection of the landfill cover, yearly landfill gas vent monitoring, as well as semi-annual groundwater sampling. Post closure monitoring is required for a period of 30 years.

An annual landfill inspection was conducted and observations were made regarding vegetative cover, unwanted vegetation, erosion, settlement, and the condition of previously repaired areas. The cover surface is satisfactory with some minor areas of sparse vegetation and setttlement. Erosion, intermittent standing water, overgrown areas and wetlands plants were observed in isolated areas within drainage swales. There were no conditions observed which would jeopardize the integrity of the landfill cap. Combustible gas readings were collected from 18 gas vents on the landfill. None of the vents indicated positive readings for methane, carbon dioxide, or Percent Lower Explosive Limit.

The third year of long term groundwater sampling was performed on the 14 compliance point monitoring wells located adjacent to the landfill on the north and east. 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* (July 1996). Samples were analyzed for volatile organic compounds, inorganics, and general water quality parameters.

In accordance with the Record of Decision, the effectiveness of Alternative SHL-2 is determined by evaluating groundwater sampling results from two groups of monitoring wells. Wells are designated as either Group 1 or Group 2 wells. Group 1 wells are wells where all chemical of concern concentrations have historically met or been below cleanup levels established in the Record of Decision. Group 2 wells are wells where chemical of concern concentrations have exceeded cleanup levels. In the Long Term Monitoing and Maintenance Plan, all existing wells were designated as Group 2 wells and the three new wells that were installed in 1996 were to be designated after the first round of sampling. During the first five year site review (August 1998) six monitoring wells (SHL-3, SHL-5, SHL-9, SHL-22, SHL-93-10C, and SHL-93-22C) achieved cleanup levels for all chemicals of concern and were reclassified as Group 1 wells. All other wells, including the three new wells, are classified as Group 2 wells. Monitoring will continue to assure that cleanup levels are maintained over time in Group 1 wells. Well designations will be reviewed again during the second five year review.

Of the chemicals of concern established in the Record of Decision, only those chemicals which present carcinogenic risk were considered trigger chemicals in the Long Term Monitoring and Maintenance Plan. The trigger chemicals are arsenic, dichlorobenzenes, and 1,2-dichloroethane. Therefore, the evaluation of effectiveness of Alternative SHL-2 is based on the reduction of carcinogenic risk rather than reduction of chemical concentrations as a measure of progress toward attainment of cleanup goals. This approach prevents a situation in which failure to attain a concentration reduction goal for a minor contributor to risk

(i.e. 1,2-dichloroethane) overshadows the achievement of a 50 percent reduction of concentration of a higher carcinogenic risk (arsenic). Risk reduction was evaluated during the first five year review in August 1998. However, for the annual reports the contaminant concentrations will be referenced against the cleanup levels as a benchmark. It should be noted that the majority of the risk present at Shepley's Hill Landfill is due to arsenic in the groundwater.

Arsenic was the only trigger chemical detected above cleanup levels during the 1998 sampling events. Analytical results from the 1998 groundwater sampling rounds (Tables 7-2 and 7-3) have indicated the presence of arsenic above the cleanup level in wells SHM-96-5B, SHM-96-22B, SHM-93-22C, SHL-11, SHL-20, SHL-19 and SHL-4. The 1998 monitoring year results were compared to previous years data. A comparison of arsenic concentrations during the 1998 period with historical data indicates that there was a general decrease in arsenic concentrations except for well SHM-96-5B.

The first five-year review to assess the protectiveness of the selected remedial action for Shepley's Hill Landfill was completed in 1998, in accordance with the Record of Decision. The review concluded that reductions of contaminant concentrations and corresponding risk satisfied the evaluation criteria at most, but not all, historical groundwater monitoring wells. However, data from monitoring well SHM-96-5B, at the north end of the landfill, showed arsenic concentrations up to two orders of magnitude greater than historical values in other wells. Therefore, supplemental groundwater investigations are being performed by the Army to assess whether arsenic contamination exists beyond the Devens Reserve Forces Training Area boundary, and to characterize its nature and location. In accordance with the *Final Work Plan, Supplemental Groundwater Investigation at Shepley's Hill Landfill, Devens Reserve Forces Training Area, Devens, Massachusetts* (HLA, February 1999) the work includes; a hydrogeologic assessment of groundwater recharge potential along the western edge of the landfill; characterization of groundwater flow and quality immediately north of Shepley's Hill Landfill; updating and refining the groundwater model for Shepley's Hill Landfill; and analyzing rock samples for naturally occurring arsenic.

Based on recommendations made from the 1996 and 1997 inspections, several landfill maintenance activities were performed during 1998 to properly maintain the landfill cap. The maintenance activities included repair of perimeter drainage swales, erosion control measures, filling rodent holes, regrading roads on and around the landfill, and mowing of the vegetative cover and drainage swales.

The 1998 landfill inspection identified additional corrective actions required to maintain the landfill cap. These include: placement of topsoil and reseeding of depressed areas; unwanted vegetation clearing; replacement and regrading catch basins and the repair of the perimeter fence. Corrective actions for landfill cap maintenance will be conducted within the next year. Overall the landfill is in fair condition and is functioning adequately.

The next round of groundwater sampling will be conducted in May 1999.

1.0 INTRODUCTION

This annual report has been prepared to document the monitoring and maintenance procedures conducted at the Shepley's Hill Landfill in Devens, Massachusetts based on the Record of Decision (ROD) (ABB-ES Oct 1995) for Shepley's Hill Landfill Areas of Contamination 4, 5, and 18. This report was developed by the U.S. Army Corps of Engineers (USCOE), New England District (NAE).

The Long Term Monitoring and Maintenance Plan (LTMMP) (SWEC, May 1996) for Shepley's Hill Landfill outlines the landfill closure monitoring and maintenance procedures. These procedures include a semi-annual groundwater sampling program to monitor contaminants, and an annual visual inspection and gas emission monitoring of the landfill cap. This report documents the third year of the long term monitoring. The first two years of monitoring were conducted by SWEC. The 1998 monitoring was conducted by NAE. Post closure monitoring is required for a period of 30 years.

2.0 LANDFILL CAP MAINTENANCE ACTIVITIES

The Record of Decision for the Shepley's Hill Landfill required monitoring and maintenance of the landfill cap based on observations made during the annual inspections. Based on recommendations made from the 1996 and 1997 inspections, improvements and repairs were performed during 1998 to properly maintain the cap. Periodic mowing was also performed on the landfill vegetative cover and drainage swales each year. The cap maintenance activities included repair of perimeter drainage swales, erosion control measures, filling rodent holes and regrading roads on and around the landfill. Landfill Cap improvements were conducted during the fall of 1998, by Roy F. Weston, Inc., under contract to the Army. Specific improvements were made as described below and as identified on Figure 2-1.

- Repaired erosion in the drainage swale to the northwest of gas vent #1, regrade, rip-rap, revegetate. Approximately 800 LF of drainage swale area was regraded to about 15 feet width (side slopes and bottom swale included). Filter fabric was placed on regraded areas and 6"-10" rip-rap was placed on top of the filter fabric to a depth of 12"-15".

- Restored entire access road. Approximately 1 mile of roadway was upgraded by placing 6 inches of ¾" crushed stone with up to 3 inches of graded base stone on top for an average width of 10 feet. Existing tire ruts were leveled and regraded.

- Installed new rip-rap adjacent to the previously repaired area east of Vent No. 8. Erosion downstream of rip-rap area was backfilled and regraded with stone dust. Additional filter fabric was placed and 6"-10" stone rip rap extended over the filter fabric.

- Installed new rip-rap curb in the drainage ditch which leads to Plow Shop Pond. The last 200 feet at the downstream end of the drainage swale showed severe erosion on the southern bank which separated the stormwater drainage swale and the landfill drainage swale. This bank was reconstructed and compacted, topsoiled and erosion control mats were placed on the bank.

- Regraded and reseeded area adjacent to (west of) Plow Shop Pond drainage ditch. Approximately 800 LF of drainage swale in the sandy area was regraded. Flow direction was controlled by reshaping the curve to prevent supercritical flows which caused erosion of the sandy banks. Three trees were relocated outside the boundary of the landfill. Filter fabric was placed along the entire length of the drainage swale on the bottom and 1'-2' of either sideslope. 6"-10" stone rip rap was placed to a depth of 12"-15" over the fabric and 6" of the side slopes.

- Revegetated selected areas of the cap to enhance vegetative growth.

- Removed overgrown vegetation and accumulated debris and sand in drainage swales.

- Filled animal borrows at various locations on the cap.

- Mowed the landfill vegetative cover material and drainage swales.

3.0 LANDFILL CAP MONITORING ACTIVITIES

The Shepley's Hill Landfill at Devens, Massachusetts was inspected, and monitoring activities were performed, on 26 October 1998 by personnel from the U.S. Army Corps of Engineers, New England District (NAE). Features of the landfill 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 condition of the various features. Appendix A of this report contains the Landfill Maintenance Checklist which summarizes the findings of this inspection. All observations are also presented on Figure 3-1. A narrative of the findings of this inspection follows. Descriptions of observations begin at the northern extremity of the landfill and continue in a counter-clockwise direction.

- In the northwest extremity of the landfill cap, between gas vent #1 and #3, there is an eroded gully leading to the west drainage swale. It is about one to two feet wide and 15 feet long. The placement of topsoil and seed in the gully should be sufficient to repair this area.

- In the vicinity of gas vent #1, there is an oval-shaped area of erosion, about five by ten feet. The placement of topsoil and seed in the eroded area should be sufficient to repair this area.

- In the existing settled area between gas vents #3 and #4, 6 to 12 inches of standing water was observed and wetland species are becoming established. Woody species are just starting to grow on the periphery of this settled area. During a dry period, the settled area should be cleared and mowed to eliminate woody species and to slow the encroachment of wetland species. If the area does not dry out sufficiently to allow mowing, then hand clearing should be performed.

- On the west side between gas vent #3 and #6 there is a small area of settlement, about 15 feet by 15 feet, with about three inches of standing water. There is no erosion in this settled area, and upland vegetation types are still growing well. This area should be monitored for further settlement and wetland encroachment. No action is required at this time.

- On the west side near gas vent #9, a shallow sloped area is undergoing mild erosion. Vegetation is not well established and minor erosion is forming shallow gullies. The placement of topsoil and seed, with a surface treatment of broadcast hay or straw, should be sufficient to repair this area and stop the erosion process.

- Catch Basin #2 near the Cooke Street entrance to the site has a broken surface grate. A large piece of the corner of the grate is missing. This surface grate should be replaced.

- Catch Basin #3 near the Cooke Street entrance to the site is not set at grade. Soil excavation in this area has left the rim of the grate about six to eight inches higher than the surrounding ground. This rim of this catch basin should be lowered to the surrounding grade.

- Catch basin #7 near the southwest corner of the site is substantially overgrown by the adjacent vegetation and will soon be completely overgrown and hidden from view. The catch basin is partially filled with many small pieces of PVC pipe. This catch basin should be cleared of encroaching vegetation and the PVC pipe pieces should be removed.

- The concrete headwall drainage structure at the terminus of the catch basin and underground conduit system on the south side is overgrown with vegetation, including some larger woody species, and is silting in. The grade of the channel bottom is uneven and standing water is present. Wetland species are becoming established as well. The structure and channel immediately downstream should be cleared, accumulated sediment should be removed, and the channel should be regraded as required to properly drain. The channel should then be reseeded or riprap should be placed, depending on water velocities.

- Most of the drainage swale on the south side is being invaded by woody species. There are also intermittent zones of standing water indicating a lack of proper channel slope and drainage. The south side drainage swale should be cleared of woody vegetation and regraded as needed to properly drain all areas of standing water. Depending on water velocities, the channel should then be reseeded or riprap should be placed.

- Approximately midway along the south drainage swale, on the outside channel side slope, there is an area about 10 feet by 15 feet which lacks vegetation. It is just beginning to show signs of erosion. This area should be reseeded, with hay or straw placed on the surface, to prevent further erosion.

- In the east side drainage swale, in the vicinity of gas vent #13 and continuing downstream to the new rock-lined channel, the drainage swale is heavily overgrown with woody vegetation and wetland 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 channel into a pond. This reach of the drainage swale should be cleared of the obstruction, all vegetation and accumulated silt and sand, and regraded to drain properly. Seeding, or riprap placement, should follow, depending on water velocities.

- In the vicinity of the new rock channel on the east side, there are large areas with very sparse or no vegetation. The soil in these bare areas is mostly sand. During the fall of 1998, hydroseeding of some of these barren areas was performed, but at the time of the site inspection very little germination had occurred. This area should be closely watched to see if adequate vegetation can become established in the sandy soils. Some evidence of natural revegetation can be seen, but there are still many areas vulnerable to erosion. Erosion in these areas would directly contribute to the sand delta that has accumulated in Plow Shop Pond. No action is recommended at this time, but if the hydroseeded areas do not vegetate, the application of topsoil and seed next season may be necessary.

- The access roads on the site are in good condition. Work was performed on these roads in the Fall of 1998 to upgrade the surface. There are no problems on access roads which warrant repair at this time.

- Portions of the perimeter chain-link security fence is in poor condition. Fence sections and gates are missing and unrestricted access to the site is available at several locations. Some evidence of off-road vehicles (ATV's, dirt bikes, etc.) using the turfed cap area was seen. The security fence should be repaired, with all missing fence sections, including gates, replaced or repaired.

- The gas vents are in good condition. All screens and pipes are in functional condition and no repairs are required at this time. Many of the vents have animal burrows adjacent to them which should be eliminated. The location of the burrows is noted on the gas vent monitoring result table which is in Section 4.0 Landfill Gas Monitoring Results.

A summary of Corrective Action measures for the Landfill Cap are included in Section 9.0

4.0 LANDFILL GAS MONITORING RESULTS

The purpose of the landfill gas monitoring program is to establish long-term trends with regard to gas production and venting. A combustible gas survey was performed to determine whether methane, hydrogen sulfide, or volatile organic compounds have accumulated in the subsurface of the landfill site.

The third annual landfill gas sampling was conducted on October 26, 1998. The weather at the time of sampling was sunny, with temperatures in the 40's to 50's (F) and the barometric pressure was 30.2 inches of mercury. Gas samples were field analyzed for the following parameters using the listed equipment:

Parameter	Equipment
Total Volatile Organic Compounds (VOC)	HNu Photoionization Detector (PID)
Percent Oxygen	Industrial Scientific TMX 412 Combustible Gas Indicator (CGI)
Hydrogen Sulfide (ppm)	CGI
Percent Lower Explosive Limit (LEL)	CGI
Carbon Monoxide (ppm)	CGI
Percent Carbon Dioxide	Landtec GA-90 landfill gas monitor
Percent Methane	Landtec GA-90 landfill gas monitor

The CGI and the Landtec GA-90 were both calibrated in the shop by U.S. Environmental. The PID was calibrated in the field to 251 ppm isobutylene.

Samples were collected by holding the monitoring equipment below the outlet of the vent with approximately four feet of intake hose inserted through the bird screen down into the vent. The pump in the gas monitoring equipment was then turned on and readings were obtained of the air in the vicinity of the tip of the intake hose, well inside the gas vent. Results were recorded on the Landfill Gas Monitoring form (Appendix B). The locations of the gas vents are depicted in Figure 4-1. In the previous gas sampling rounds, prior to gas sampling, two vent volumes were purged from the soil gas vents using an exhaust fan. Samples were then collected by holding the monitoring equipment in the exhaust stream of the fan. This gas sampling event provided readings representative of average, everyday conditions inside the vent, whereas prior years sampling events drew air from deeper within the gas vent system, which may not be representative of average conditions closer to the vent outlets. The different approaches used may explain the variability of the results obtained during this sampling event as compared to those of prior years.

Combustible gas readings were collected from 18 gas vents on the landfill. None of the vents indicated positive readings for methane, carbon dioxide, or Percent Lower Explosive Limit (LEL). Oxygen levels at the vents ranged from 21.0% to 21.6%.

No odors were noticed at any of the vent locations.

5.0 GROUNDWATER ELEVATIONS

Groundwater elevations were collected from each well during groundwater sampling activities. The depth to groundwater was subtracted from the elevation of the reference point to determine the elevation of the groundwater at each location. Table 5-1 lists the water level elevations for each well for each sampling round. During each sampling event, groundwater elevations were recorded on the first day of sampling for all wells scheduled to be sampled. Locations of monitoring wells are shown in Figure 4-1. Groundwater levels measured during November 1998 were consistently lower than those measured in May 1998, which most likely reflects the seasonal differences. Except for a few anomalies, the mean difference is roughly 2 feet.

In addition to these semi-annual groundwater measurements, regular groundwater measurements of all Shepley's Hill Landfill wells have been conducted by ABB-ES and Harding Lawson Associates (HLA) since 1992. During the first 5-year review (SWEC, August 1998), groundwater elevations were re-evaluated to identify hydraulic gradients and to confirm changes due to the construction of the landfill cap. It was determined that landfill cap has reduced the volume of water beneath the cap resulting in a more northerly groundwater flow (SWEC, 1998). Groundwater flow patterns will be re-evaluated during the next 5 year review.

In light of data collected for the first Five-Year Review performed in accordance with the Record of Decision for the Shepley's Hill Landfill Operable Unit, HLA is performing supplemental groundwater investigations which includes performing a hydrogeologic assessment at Shepley's Hill Landfill to obtain additional data to evaluate the effectiveness of the selected remedial action at minimizing groundwater elevation fluctuations within the capped area. In addition, the data will be used as inputs for refinement of the groundwater model for the landfill. Groundwater elevation data will be collected from new piezometers and existing piezometers/monitoring wells at approximately monthly intervals for one year. The data will be used to characterize groundwater flow, prepare groundwater elevation isopleths, and as input to the groundwater model. In addition, the Army plans to install continuous water level monitors in three wells at the landfill. These monitors will provide data concerning the response of the groundwater system to precipitation events both within and outside the area of the landfill.

TABLE 5-1
Monitoring Wells and Elevations

Groundwater Elevations (Ft NGVD)		
Well Identification	May 11, 1998	November 2, 1998
SHL-3	218.70*	217.94
SHL-4	218.78	218.02
SHL-5	216.83	213.94
SHL-9	215.69	213.08
SHL-10	218.83	217.56
SHM-93-10C	218.84	218.20
SHL-11	218.15	217.44
SHL-19	219.34	217.96
SHL-20	218.31	217.54
SHL-22	215.29	213.08
SHM-93-22C	215.33	213.09
SHM-96-22B	215.23	213.02
SHM-96-5B	215.46	213.34
SHM-96-5C	215.45	213.33

* Well SHL-3 was measured on May 13, 1998

6.0 GROUNDWATER SAMPLING

Groundwater sampling activities at the landfill are conducted semi-annually. Groundwater sampling activities for the third year were conducted in the spring (May 11 - 13, 1998) and in the fall (November 2 - 4, 1998). Wells are designated as either Group 1 or Group 2 wells. Wells which have historically attained cleanup goals are given a Group 1 designation. Wells which have not historically attained cleanup goals are designated as Group 2 wells. Initially, all existing wells were designated as Group 2 wells and the three new wells that were installed in 1996 were to be designated during the first five year site review (SWEC, August 1998). During the first five year site review six wells (SHL-3, SHL-5, SHL-9, SHL-22, SHL-93-10C, and SHL-93-22C) achieved cleanup levels for all COCs and were reclassified as Group 1 wells. All other wells, including the three new wells, were classified as Group 2 wells. These group designations are presented in Table 6-1, located at the end of this section. Well designations will be reviewed again during the second Five-Year review.

6.1 Preparation for Sampling

Wells sampled as part of the long term monitoring program included SHL-3, SHL-4, SHL-5, SHL-9, SHL-10, SHL-11, SHL-19, SHL-20, SHL-22, SHM-93-10C, SHM-93-22C, SHM-96-22B, SHM-96-5B, and SHM-96-5C. Locations of the wells are shown on Figure 4-1. Sampling activities were coordinated with the Devens BRAC office and the contract laboratory prior to commencement of sampling. The contract laboratory was contacted approximately 3 weeks prior to sampling and was requested to prepare and deliver sampling bottles, quality assurance bottles and coolers to New England District approximately 1 week prior to the sampling event. Bottles were checked to insure that they complied with the requirements of the sampling program. Sampling equipment (including the YSI water quality meters, Heron water level indicators, and the teflon lined tubing) was reserved for rental from U.S. Environmental and picked up in the days preceding the sampling event. NAE used their own Grunfos Rediflow II pumps, controllers, DRT-15CE turbidity meters, and portable generator for the sampling. All equipment was inventoried and tested to ensure it was accounted for and functioning. The well logs of each of the wells to be sampled was reviewed by the field team prior to the scheduled event to determine tubing requirements, and brought to the landfill during the sampling event to confirm the screened intervals.

6.2 Sampling

The third year of sampling was conducted by USACE, New England District on May 11 - 13, 1998 and November 2 - 4, 1998. Monitoring wells were purged and sampled in accordance with *EPA's Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells* (July 1996) using an adjustable rate, low flow submersible pump. Teflon lined tubing was used for sample collection and was disposed after each well was sampled.

Before sampling activities commenced, groundwater elevations were measured at each well location to be sampled. YSI water quality meters and turbidity meters were calibrated at the beginning of each day of use. A calibration check was also performed at the end of each day. During sampling, the generator used to power the pumps was located at an upwind area at least 30 feet away from the well being sampled, to minimize potential contamination from the exhaust. Upon initial opening of each well, headspace readings

and initial water levels measurements were collected. The pump intake was lowered to the middle of the screen of each well to be sampled when possible. When the water level was below the top of the screen, the pump was positioned to a depth between the top of the water level and the bottom of the screen.

Once the pumping was initiated, at least one volume greater than the stabilized drawdown volume plus the extraction tubing volume was purged. Water quality parameters, including temperature (temp), specific conductance, pH, oxidation reduction potential (ORP), turbidity, and dissolved oxygen (DO) were collected every 3 to 5 minutes to ensure proper purging of the wells before each well was sampled. The results are listed on Groundwater Field Analysis Forms located in Appendix C. All water quality parameters, except turbidity, were monitored using a flow-thru cell and a Sonde-YSI water meter. Turbidity samples were not collected from the flow through cell due to the silt buildup which can occur in the cell. An Y-connector with a shut off valve was set up before the flow through cell to take the turbidity readings. Sampling was conducted when parameters became stabilized for three consecutive reading. The tubing was disconnected from the flow-through cell and samples were collected directly from the discharge tubing. Observations made during the sampling activities include:

- There were no headspace concentrations above background recorded from any of the sampled monitoring wells during both sampling events.

- To ensure precision of water level measurements, well casings that had faded marks or no marks were remarked during the May event.

- The locks on the three newer wells (SHM-96-5B, SHM-96-5C, and SHM-96-22B) were replaced with new locks in May 1998 to be keyed alike the rest of the monitoring wells.

- In cases where the water level was lower than the top of the screen, the pumps were lowered to approximately midpoint between the water level and the bottom of the screen. This procedure occurred at several wells during each event.

- During the November sampling the ORP readings for wells SHL-4, SHM-93-10C, SHL-10, SHL-20, and SHL-22 had to be disregarded as it was later learned that the ORP readings were off due to a malfunctioning sonde. That YSI meter was not used again after discovering this.

6.3 Equipment Decontamination

All non-disposable sampling and testing equipment that came in contact with the sampling medium was decontaminated to prevent cross contamination between sampling points. The submersible pump was decontaminated using the following procedure:

- Upon removal of the pump from the well following sample collection, the pump was submersed in a 4-inch PVC riser containing potable water and detergent (Alconox) solution. At least 1 to 2 gallons of the detergent solution was pumped through (started 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 to minimize the transfer of soap to the rinser.
- The pump was then submersed in a riser filled with potable water and at least 1 to 2 gallons were pumped through.
- The pump was then submersed in a riser filled with 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.

TABLE 6-1
Monitoring Well Designations

Monitoring Well Identification	Well Designation (Based on Final Five Year Review, SWEC, Aug 1998)
SHL-3	Group 1
SHL-4	Group 2
SHL-5	Group 1
SHL-9	Group 1
SHL-10	Group 2
SHM-93-10C	Group 1
SHL-11	Group 2
SHL-19	Group 2
SHL-20	Group 2
SHL-22	Group 1
SHM-93-22C	Group 1
SHM-96-22B	Group 2
SHM-96-5B	Group 2
SHM-96-5C	Group 2

7.0 LABORATORY TESTING

Groundwater was sampled in fourteen monitoring well locations using the low-flow method in accordance with the procedures outlined in the approved Long Term Monitoring and Maintenance Plan, Shepley's Hill Landfill (SWEC, May 1996). Samples were sent to Severn Trent Laboratories (formerly Intertek Testing Services Environmental Laboratories) in Colchester, Vermont for analysis. The samples were collected on May 11-13 and November 2-4, 1998. Samples were placed in containers compatible with the intended analysis and properly preserved prior to shipment to the laboratory. Each sealed container was placed in a leakproof plastic bag and placed in a strong thermal ice chest (cooler) filled with foam packing material, or equivalent, to ensure sample integrity during shipment. Ice or equivalent was added to cool samples to at least 4^0 C. Chains of Custody (COCs) were used to identify and document the samples being shipped (copies are included in Appendix D). Sample custody was initiated by the sampling team upon collection of samples and COC forms were placed in waterproof plastic bags and taped to the inside lid of the cooler. The cooler was sealed with chain-of-custody seals and shipped to the laboratory via overnight delivery.

7.1 Analyses

Water analyses were conducted according to EPA methods 8260B for volatile organics, 6010B for metals, and general inorganics analyses, including chemical oxygen demand by method 410.1, biochemical oxygen demand by method 405.1, hardness by method 130.2, alkalinity by method 310.1, cyanide by SW8946 method 9012A, anions by method 300, and total dissolved solids by method 160.1, and total suspended solids by method 160.2. These analyses were conducted at all wells. Table 7-1 indicates the analysis and procedures used for groundwater samples collected at Shepley's Hill Landfill.

7.2 Results

The approach for evaluating the effectiveness of the remedy is presented in the Record of Decision (ABB-ES, 1995). Of the chemicals of concern identified in the ROD, only those chemicals which present carcinogenic risk were considered trigger chemicals in the Long Term Monitoring and Maintenance Plan (SWEC, May 1996). The trigger chemicals are arsenic, dichlorobenzenes, and 1,2-dichloroethane. Therefore, the evaluation of effectiveness of Alternative SHL-2 is based on the reduction of carcinogenic risk rather than reduction of contamination as a measure of progress toward attainment of cleanup. This approach prevents a situation in which failure to attain a concentration reduction goal for a minor contributor to risk (i.e. 1,2-dichloroethane) overshadows the achievement of a 50 percent reduction of concentration of a higher carcinogenic risk (arsenic). Risk reduction was evaluated during the first five year review in August 1998. However, for the annual reports the contaminant concentrations will be referenced against the cleanup levels as a benchmark. It should be noted that the majority of the risk present at Shepley's Hill landfill is due to arsenic in the groundwater.

Arsenic was the only trigger chemical detected above cleanup levels at the site during the 1998 sampling events. Analytical results for groundwater analyses are presented in the form of a hits only table for chemical contaminants, as presented in Tables 7-2 and 7-3, for the spring and fall rounds, respectively. This table presents only detectable concentrations of chemical contaminants, compared against the

TABLE 7-1
Groundwater Sample Analysis and Procedures

PARAMETERS	METHOD
Volatile Organic Compounds	USEPA 8260
xylenes	USEPA 8260
Acetone	
2-butanone	
2-methyl pentanone	
1,2,-dichlorobenzene	
1,3,-dichlorobenzene	
1,4,-dichlorobenzene	
Inorganics	EPA-SW 6010
Arsenic	
Barium	
Cadmium	
Chromium	
Cyanide (wet chemistry)	
Iron	
Lead	
Manganese	
Mercury	
Selenium	
Silver	
Copper	
Zinc	
General Parameters (measured in Laboratory)	
Total Dissolved Solids	NED METHODS
Total Suspended Solids	USEPA 160.2
Chloride	USEPA 300
Hardness	
Nitrite-Nitrate as N	USEPA 354.1
Sulfate	SW9056
Alkalinity	USEPA 310.1
Biochemical Oxygen Demand	
Chemical Oxygen	
General Parameters (measured in the field)	
pH	
Temperature	
Specific Conductance	
Dissolved Oxygen	
Oxygen Reduction Potential	
VOCs (Headspace)	

USEPA - U.S. Environmental Protection Agency

VOCs - Volatile Organic Compounds

TABLE 7-2
Groundwater Analytical Results - May 11 - 13, 1998 Sampling Event
Shepley's Hill Landfill
Devens, Massachusetts
(SHEET 1 of 1)

	Well No.	SHL-3	SHL-4	SHL-5	SHM-96-5B	SHM-96-5B DUP	SHM-96-5C	SHL-9	SHL-10	SHM-93-10C	SHL-11	SHL-19	SHL-20	SHL-22	SHM-96-22B	SHM-96-22C
PARAMETERS	CLEANUP	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
	LEVEL (1)															
	ug/L															
VOLATILES (8260)																
Xylenes	10,000 (2)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone	3,000 (4)	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	9.8 J	<10.0	15	<10.0	<10.0	<10.0	<10.0	<10.0	11
2-Butanone	-	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
4-Methyl-2-Pentanone	-	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0	<10.0
Benzene	5 (2)	<5.0	<5.0	<5.0	1.5 J	1.4 J	1.3 J	<5.0	<5.0	<5.0	2.0 J	<5.0	<5.0	<5.0	1.2 J	<5.0
Methyl-t-Butyl Ether	70 (4)	<5.0	<5.0	<5.0	1.8 J	1.9 J	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	2.0 J	1.7 J	<5.0
1,1-Dichloroethane	70 (4)	<5.0	<5.0	<5.0	2.7 J	2.6 J	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	1.6 J	<5.0
1,2-Dichloroethene (total)	70 (2)	<5.0	<5.0	<5.0	3 J	3.1 J	2.2 J	<5.0	<5.0	1.6 J	3.1 J	<5.0	2.3 J	2.4 J	2.2 J	<5.0
1,2-Dichloroethane	5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Dichlorobenzene	600 (2)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dichlorobenzene	5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	2.1 J	<5.0	4.7 J	<5.0	<5.0	<5.0
1,2-Dichlorobenzene	600	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
TAL METALS (6010)																
Arsenic	50	<5.0	37.4	<5.0	**4,300**	**4,330**	49.5	15	<5.0	7.5	**348**	**77.5**	**238**	10.6	**365**	31.6
Barium	2,000 (2)	<7.6	23	7.6	63.5	64.2	57	12.5	<7.6	<7.6	123	9	105	14.5	86.1	86.8
Cadmium	5 (2)	1	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7	<0.7
Chromium	100	4.8	<2.0	<2.0	3.3	3.7	2.9	<2.0	<2.0	<2.0	2.2	<2.0	3.8	3.7	<2.0	2.8
Copper	1,300 (3)	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	<3.4	4.2	<3.4
Iron	9,100	177	3,230	1,390	**39,700**	**40,000**	**73,700**	4,110	<70.8	<70.8	**90,800**	**9,940**	**19,600**	1,190	**66,300**	728
Lead	15	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6
Manganese	1,715	5.2	418	377	**10,100**	**10,100**	**4,500**	393	1.9	39.2	**3,250**	1,350	**8,190**	1,240	**3,070**	667
Mercury (7470A)	2 (2)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	100	3.6	<3.5	<3.5	18.3	19	5.4	<3.5	<3.5	<3.5	4.8	<3.5	16.1	5.6	6.5	<3.5
Selenium	50 (2)	<3.1	<3.1	<3.1	5.1	4.6	<3.1	<3.1	<3.1	<3.1	<3.1	<3.1	5.3	<3.1	<3.1	<3.1
Silver	40 (4)	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6	<2.6
Zinc	2,000 (4)	14	27.8	20.1	39.9	34.4	134	26.6	9.4	36.7	30.3	12.5	23.8	79.2	35.5	22.7
Aluminum	6,870	193	43.7	285	49.2	45.1	51.5	161	38.3	34.9	66.1	53.5	32.5	<27.7	51.8	35.3
Sodium	20,000	1,620	8,040	2,480	**45,700**	**46,300**	**31,300**	2,200	1,600	9,030	**44,100**	2,380	**54,100**	**51,900**	**74,700**	**23,700**
GENERAL CHEMISTRY																
Alkalinity	-	7,000	56,000	34,000	358,000	358,000	334,000	49,000	16,000	198,000	306,000	32,000	398,000	436,000	396,000	248,000
Biochemical Oxygen Demand	-	<2,000	<2,000	<2,000	<2,000	<2,000	<2,000	<4,000	3,900	<2,000	<2,000	5,200	<2,000	<2,000	<2,000	<2,000
Chloride	-	600	1,600	800	64,300	61,800	39,300	1,200	900	28,300	48,600	800	62,700	67,200	55,000	38,600
Chemical Oxygen Demand	-	<5,000	6,000	27,000	29,000	30,000	31,000	19,000	6,000	<5,000	38,000	<5,000	34,000	16,000	30,000	13,000
Cyanide (Total)	200 (2)	<5.0	<5.0	<5.2	<5.0	<5.1	<5.0	<5.0	<5.0	<5.1	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Hardness	-	10,000	50,000	33,000	365,000	355,000	235,000	50,000	18,000	242,000	195,000	35,000	400,000	455,000	255,000	305,000
Nitrate-Nitrite (Total)	10,000 (2)	300	800	<100	<100	<100	<100	<100	300	<100	200	200	<100	<100	<100	<100
Sulfate	500,000 (2)	3,500	4,100	1,300	3,000	3,100	7,500	2,400	3,700	21,500	900	6,100	5,400	3,000	1,000	24,800
Total Dissolved Solids	-	34,000 JB	72,000 JB	151,000	516,000	515,000	429,000	106,000 JB	44,000 JB	304,000	418,000	60,000 JB	565,000	639,000	556,000	420,000
Total Suspended Solids	-	4,300	3,900	2,700	76,600	74,800	111,000	26,700	1,700	900 JB	56,600	16,000	28,100	3,500	120,000	3,400

Notes:

Shaded areas with bold numbers indicate cleanup level exceedance. - 25

J = Estimated value

B = Analyte is also present in equipment blank sample

(1) Cleanup values as developed in the ROD (unless otherwised noted)

(2) No cleanup values were developed so the Maximum Contamination Level (MCLs) were used

(3) No cleanup values were developed so the MMCLs were used

(4) No cleanup values were developed so the MCP GW-1 standard was used

TABLE 7-3
Groundwater Analytical Results - November 2 - 4, 1998 Sampling Event
Shepley's Hill Landfill
Devens, Massachusetts
(SHEET 1 of 1)

	Well No.	SHL-3	SHL-4	SHL-5	SHM-96-5B	SHM-96-5B DUP	SHM-96-5C	SHL-9	SHL-10	SHM-93-10C	SHL-11	SHL-19	SHL-20	SHL-22	SHM-96-22B	SHM-93-22C
PARAMETERS	**CLEANUP**	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
	LEVEL (1)															
	ug/L															
VOLATILES (8260)																
Xylenes	10,000 (2)	<5.0	<5.0	<5.0	<5.0	<5.0	4.4 J	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Acetone	3,000 (4)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2-Butanone	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
4-Methyl-2-Pentanone	-	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Benzene	5 (2)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
Methyl-t-Butyl Ether	70 (4)	<5.0	<5.0	<5.0	<5.0	1.9 J	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,1-Dichloroethane	70 (4)	<5.0	<5.0	<5.0	2.6 J	2.6 J	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichloroethene (total)	70 (2)	<5.0	<5.0	<5.0	3.2 J	3.0 J	2.7 J	<5.0	<5.0	<5.0	3.8 J	<5.0	2.8 J	<5.0	3.0 J	<5.0
1,2-Dichloroethane	5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,3-Dichlorobenzene	600 (2)	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,4-Dichlorobenzene	5	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
1,2-Dichlorobenzene	600	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
METALS (6010)																
Arsenic	50	<5.4	89.1	11.5	3,080	3,100	46.8	27.2	<5.4	10.2	376	145	218	<5.4	406	51.1
Barium	2,000 (2)	<6.6	176	9.3	53.5	53.8	56.6	11.9	<6.6	8.9	111	26.3	100	11.2	97.3	68.7
Cadmium	5 (2)	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3
Chromium	100	9.7	<0.9	1.0 B	3.7 B	3.9 B	2.0 B	1.0 B	1.0 B	3.5 B	<0.9	1.1 B	1.0 B	<0.9	<0.9	1.8 B
Copper	1,300 (3)	1.6 B	<1.4	<1.4	2.4 B	2.2 B	3.9 B	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	<1.4	4.7 B	<1.4
Iron	9,100	206	10,400	3,690	27,800	27,900	57,500	6,470	<46.1	621	83,400	30,200	13,600	478	72,800	1,140
Lead	15	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0	<2.0
Manganese	1,715	5.8 B	552	598	13,300	13,400	6,590	368	<0.6	43.7 B	2,760	4,070	9,080	722	4,530	648
Mercury (7470A)	2 (2)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	100	7.5	8.3	<2.1	12.4	11.3	<2.1	<2.1	<2.1	3.9	<2.1	9.5	14.2	5.7	3.2	<2.1
Selenium	50 (2)	<4.6	<4.6	<4.6	<4.6	<4.6	<4.6	<4.6	<4.6	<4.6	<4.6	<4.6	<4.6	<4.6	<4.6	<4.6
Silver	40 (4)	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2	<1.2
Zinc	2,000 (4)	26	23.9	27.5	41.3	40.4	63.2	17.6 B	31.9	20.5 B	39.5	28.9	41.0	45.3	11.1 B	77.6
Aluminum	6,870	127	21.7	261	108	126	<21.1	65	37.2	520	<21.1	<21.1	<21.1	<21.1	33.5	<21.1
Sodium	20,000	1,560	22,500	4,100	45,400	45,700	36,600	1,170	913	7,760	41,400	3,090	47,100	47,400	46,000	22,100
GENERAL CHEMISTRY																
Alkalinity	-	32,000	176,000	56,000	384,000	384,000	340,000	70,000	25,000	196,000	610,000	102,000	418,000	450,000	350,000	280,000
Biochemical Oxygen Demand	-	<2,000	<2,000	<2,000	<2,000	<2,000	<2,000	<2,000	<2,000	<2,000	<2,000	<2,000	<2,000	<2,000	<2,000	<2,000
Chloride	-	500	33,900	1,400	65,000	64,300	50,000	1,400	1,000	29,300	47,100	3,300	58,800	70,400	66,600	43,800
Chemical Oxygen Demand	-	<5,000	9,000	24,000	26,000	28,000	31,000	27,000	<5,000	<5,000	29,000	<5,000	21,000	14,000	35,000	7,000
Cyanide (Total)	200 (2)	<5.1	<5.0	<5.3	<5.0	<5.0	<5.0	<5.3	<5.0	<5.0	<5.0	<5.1	<5.0	<5.1	<5.3	<5.0
Hardness	-	33,000	150,000	60,000	370,000	360,000	290,000	65,000	27,000	236,000	192,000	72,000	410,000	452,000	290,000	315,000
Nitrate as Nitrogen	10,000 (2)	400	700	<300	<300	<300	<300	<300	400	<300	<300	<300	<300	<300	<300	<300
Sulfate	500,000 (2)	5,100	8,500	5,700	3,600	3,700	2,500	900	3,900	21,100	<300	14,000	6,300	3,300	900	25,000
Total Dissolved Solids	-	50,000 JB	258,000	86,000 JB	521,000	519,000	455,000	87,000 JB	35,000 JB	299,000	416,000	150,000	585,000	561,000	491,000	380,000
Total Suspended Solids	-	9,600	8,600	4,400	50,800	50,600	33,300	700 JB	600 JB	8,200	76,400	16,900	19,100	1,500 JB	99,000	4,700

Notes:

Shaded areas with bold numbers indicate cleanup level exceedance. -

J = Estimated value

B = Analyte is also present in equipment blank sample

(1) Cleanup values as developed in the ROD (unless otherwise noted)

(2) No cleanup values were developed so the Maximum Contamination Level (MCLs) were used

(3) No cleanup values were developed so the MMCLs were used

(4) No cleanup values were developed so the MCP GW-1 standard was used

applicable cleanup level or MCL if there is no established cleanup level. Results of all wet chemistry analyses are also included in the table. The results of sampling are summarized below.

Results from the spring sampling round are described as follows:

Volatile Organic Compounds (VOCs) were analyzed in the fourteen monitoring wells. None of the wells had detectable concentrations above the established cleanup levels for any of trigger chemicals (or any of the chemicals of concern). The only trigger compound detected was 1,4-dichlorobenzene (2.1 J µg/L) in monitoring well SHL-11 and (4.7 J µg/L) in monitoring well SHL-20. The trigger compounds 1,2-dichloroethane and 1,2-dichlorobenze were not detected in any of the wells. Other volatile organic compounds detected at levels below MCLs in groundwater samples include 1,1-dichloroethane (at 2.7 J µg/L), 1,2-dichloroethene (total) (at 3.1 J µg/L), benzene (at 2 J µg/L), Methyl-t-Butyl Ether (at 2 J µg/L), and Acetone (at 15 µg/L).

Of the identified chemicals of concern for metals, only arsenic was identified as a trigger chemical. Arsenic was detected at concentrations greater than the cleanup level of 50 µg/L in the following monitoring wells: SHL-11 (346 µg/L), SHL-19 (77.5 µg/L), SHL-20 (238 µg/L), SHM-96-22B (365 µg/L), and SHM-96-5B (4,300 µg/L). A duplicate sample of well SHM-96-5B had a concentration of 4,330 µg/L. The only other chemicals of concern (non-trigger) detected at concentrations above the cleanup levels were Manganese, Iron and Sodium. Wells SHM-96-5B, SHM-96-5C, SHL-11, SHL-20, and SHM-96-22B had concentrations of Manganese above the cleanup level of 1,715 µg /L. The maximum value detected for Manganese was 10,100 µg /L at SHM-96-5B. Iron was detected at levels above its cleanup level of 9,100 µg /L at wells SHM-95-5B, SHM-96-5C, SHL-11, SHL-19, SHL-20, and SHM-96-22B, with the maximum detected (90,800 µg /L) at well SHL-11. Sodium was detected at levels above its cleanup level of 20,000 µg /L at wells SHM-95-5B, SHM-96-5C, SHL-11, SHL-20, SHL-22, SHM-96-22B, and SHM-96-22C with the maximum detected (74,700 µg /L) at well SHM-96-22B.

Results from the Fall sampling round are described as follows:

Volatile Organic Compounds (VOCs) were analyzed in the fourteen monitoring wells. None of the wells had detectable concentrations of the trigger chemicals (or any of the chemicals of concern). Other volatile organic compounds detected in groundwater samples include 1,1-dichloroethane (at 2.6 J µg/L), 1,2-dichloroethene (total) (at 3.8 J µg/L), Methyl-t-Butyl Ether (at 1.9 J µg/L), and Xylenes (at 4.4 J µg/L).

Of the identified chemicals of concern for metals, only arsenic was identified as a trigger chemical. Arsenic was detected at concentrations greater than the cleanup level of 50 µg/L in the following monitoring wells: SHL-4 (89.1 µg /L), SHL-11 (376 µg/L), SHL-19 (145 µg/L), SHL-20 (218 µg/L), SHM-96-22C (51.1 µg/L), SHM-96-22B (406 µg/L), and SHM-96-5B (3,080 µg/L). A duplicate sample of well SHM-96-5B had concentrations of 3,100 µg/L. The only other chemicals of concern detected at concentrations above the cleanup levels were Manganese, Iron and Sodium. Wells SHM-96-5B, SHM-96-5C, SHL-11, SHL-19, SHL-20, and SHM-96-22B had concentrations of Manganese above the cleanup level of 1,715 µg /L. The maximum value detected for Manganese was

13,300 µg /L at SHM-96-5B. Iron was detected at levels above its cleanup level of 9,100 µg /L at wells SHL-4, SHM-95-5B, SHM-96-5C, SHL-11, SHL-19, SHL-20, and SHM-96-22B, with the maximum detected (83,400 µg /L) at well SHL-11. Sodium was detected at levels above its cleanup level of 20,000 µg /L at wells SHL-4, SHM-95-5B, SHM-96-5C, SHL-11, SHL-20, SHL-22, SHM-96-22B, and SHM-96-22C with the maximum detected (47,400 µg /L) at well SHL-22.

Tables 7-2 and 7-3 summarize the monitoring wells that had contaminant concentrations above the cleanup levels during the 1998 monitoring period. These values were compared to previous years data. A comparison of arsenic concentrations detected above the cleanup levels during the 1998 period with historical data is presented in Table 7-4. The comparison indicates the following:

General decrease in arsenic concentrations except for well SHM-96-5B. Wells SHM-96-5C, SHL-11, SHL-20, SHM-96-22B, and SHM-93-22C indicated no definitive change over historic values.

Table 7-4
Comparison of Historic Arsenic Results
Shepley's Hill Landfill Groundwater Monitoring

Well ID	Arsenic (*u* g/L)								
	Aug-91	Dec-91	Mar-93	Jun-93	Nov-96	May-97	Oct-97	May-98	Nov-98
SHL-3	35	**120**	6.5	NS	NS	<10 U	< 10 U	< 5 U	< 5.4 U
SHL-4	**260**	**140**	2.54	NS	48.8	**73.6 J**	**180**	37.4	**89.1**
SHL-5	23	38	11.4	NS	12	< 10 U	< 10 U	< 5 U	11.5
SHM-96-5B	NS	NS	NS	NS	**1440**	**3300 J**	**2040**	**4300**	**3080**
SHM-96-5C	NS	NS	NS	NS	**71**	43.2	43.1	49.5	46.8
SHL-9	37	**67**	42.4	NS	46.9	16.1 J	25.2	15	27.2
SHL-10	**67**	**120**	**280**	NS	3.4 B	< 10	**209**	< 5 U	< 5.4 U
SHM-93-10C	NS	NS	21.3	18.1	12.4	< 10 U	10.5	7.5	10.2
SHL-11	**320**	**320**	**340**	NS	**332**	**252 J**	**366**	**346**	**376**
SHL-19	**340**	**710**	**390**	NS	**138**	< 10 U	**298**	**77.5**	**145**
SHL-20	**98**	**89**	**330**	NS	**244**	< 10 U	**227**	**238**	**218**
SHL-22	27	25	32.9	NS	24.8	< 10 U	34.8	10.6	< 5.4 U
SHM-96-22B	NS	NS	NS	NS	**324**	**318 J**	**352**	**365**	**406**
SHM-93-22C	NS	NS	**68.9**	49.8	44.6	40.4	< 10 U	31.6	**51.1**

Notes:

J: Estimated value below the quantitation limit
U: Not detected above the quantitation limit
B: Detected in associated blank
NS: Not sampled
Bold numbers indicate cleanup level exceedances (MCL cleanup level is 50 *u* g/L)

8.0 QUALITY CONTROL

Quality assurance/quality control (QA/QC) samples were collected to monitor the sample collection, transportation, and analysis procedures.

8.1 Field Quality Control

One set of equipment (rinsate) blank samples was collected from the pump after decontamination had been conducted for each sampling event (May and November) and analyzed for the full suite of analytical parameters. All target analytes were undetected at levels above the laboratory's practical quanitication limits for the Spring equipment blanks, however, Fall blanks showed trace levels of Cadmium, Chromium, Copper, Manganese, and Zinc. All were well below the cleanup levels and are noted in the hits only table that they were present in the equipment blanks as required. One field duplicate groundwater sample was collected during each sampling round at well SHM-96-5B and analyzed for the full suite of analytical parameters. Results of duplicate samples are shown on Tables 7-2 and 7-3 and are also discussed below. One trip blank sample was collected per shipped cooler, and submitted for VOC analysis only to evaluate potential cross-contamination of samples during transport. No contaminants were detected in the trip blanks.

A Photoionization Detector (Hnu) was used to monitor ambient air conditions during the groundwater sampling. The instrument was calibrated prior to sampling on a daily basis. If the instrument calibration drift was evident at any time during sampling, the equipment was recalibrated.

8.2 Laboratory Quality Control

One set of QA samples were also collected by the sampling team and sent to the designated QA laboratory (an independent testing laboratory) in the form of duplicates for each sampling round. The QA samples represent approximately 10% of the groundwater samples collected. A QA sample was collected during each sampling round at well SHM-96-5B and analyzed for the full suite of analytical parameters. QA samples were collected, packaged and shipped in the same manner as the other groundwater samples. Appendix E presents the Quality Assurance Report for each sampling round.

8.3 Data Evaluation

Fourteen groundwater samples were collected from Shepley's Hill Landfill at Devens, MA during each round of sampling. The samples were analyzed at Severn Trent Laboratories (formerly Intertek Testing Services) in Colchester VT for Volatile Organic Compounds (VOCs), Target Analyte List (TAL) Metals, Alkalinity, Anions (including Nitrate, Sulfate, and Chloride), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Total Hardness, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), and Cyanide. The spring samples were collected on May 11-13, 1998 and the fall samples on November 2-4, 1998 (fall) (see Groundwater Analytical Results Tables in section 7).

The results were evaluated for acceptability in accordance with the laboratory's defined acceptance limits, with standard EPA SW846 guidance and/or with guidelines provided in the draft USACE Methods Compendium document.

All sample coolers were packed with ice packs and ice in the field. Sample shipments were received at the laboratory on May 12, 13, and 14, 1998 for the spring samping, and November 3, 4, and 5, 1998 for the fall sampling. All samples were appropriately preserved by the procedures shown in Table 8-1. There are no sample shipment or receipt anomalies associated with these samples.

Samples were extracted and analyzed in accordance with the methods and holding time requirements cited in Table 8-1.

8.3.1 Data Evaluation for Samples Collected May 1998

Volatile Organic Compound (VOC) Analysis

Fourteen groundwater samples were analyzed for VOCs using SW846 method 8260B. In addition, the laboratory analyzed: one field duplicate (MW-SHL-DUP-98-01, a duplicate of sample MW-SHL-5B-98-01); three trip blanks (dated 05/11/98, 05/12/98, and 05/13/98); and one equipment blank (MW-SHL-EB-01-98-01, dated 05/11/98).

Laboratory Method Blank, Trip Blank and Equipment Blank Results: Target analytes were undetected at levels above the laboratory's practical quantitation limit (PQL) for method blank, trip blank, and equipment blank samples. Isopropyl alcohol (which is not a target analyte) was detected in the equipment blank sample. The presence of isopropyl alcohol was most likely an artifact of the decontamination process (i.e., insufficient rinsing). It was not detected in any other sample, therefore, no action was taken.

Field Duplicate Sample Results: The results of the VOCs for sample MW-SHL-5B-98-01, and its duplicate, sample MW-SHL-DUP-98-01, show less than 20 % relative percent difference for all detected analytes. The field duplicate sample shows acceptable comparative results.

Surrogate Results: All VOC sample surrogate recoveries are within the laboratory's stated acceptance limits. All results are acceptable.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results: One set of matrix spike/matrix spike duplicate (MS/MSD) samples were analyzed for this project. All MS/MSD recoveries and relative percent differences (RPD) are within the laboratory's acceptance limits for VOC analysis, except for 2-Chloroethylvinylether, which showed 0% recovery. As this analyte is not a site-specific contaminant, no action was taken.

Target Analyte List (TAL) Metals Analysis

Fourteen groundwater samples were analyzed for TAL metals using SW846 method 6010B or 7000 series methods. In addition, the laboratory analyzed: one field duplicate (MW-SHL-DUP-98-01, a duplicate of sample MW-SHL-5B-98-01); and one equipment blank (MW-SHL-EB-01-98-01, dated 05/11/98).

Laboratory Preparation Blank and Equipment Blank Results: All target analytes were undetected at levels above the laboratory's practical quantitation limit (PQL) for preparation blank and equipment blank samples. All results are acceptable.

Field Duplicate Sample Results: The results of the metals for sample MW-SHL-5B-98-01, and its duplicate, sample MW-SHL-DUP-98-01, show less than 20 % relative percent difference for all detected analytes. The field duplicate sample shows acceptable comparative results.

Matrix Spike (MS) and Duplicate Results: One set of matrix spike (MS) and duplicate samples was analyzed for this project. All MS recoveries are within the 75-125 % recovery acceptance limits, except for iron and manganese, which both had native sample concentrations greater than four times the concentration of the spike. All duplicate RPDs are within the 20% RPD acceptance limits for metals analysis, except for selenium and zinc. The values reported for selenium are less than five times the PQL. The RPD between the duplicate values reported for zinc is 52.7%. Since the field duplicate sample results showed acceptable RPD (see paragraph above), no action was taken. All results are acceptable.

General Inorganic Analyses

Fourteen groundwater samples were analyzed for general inorganic analyses, including Alkalinity by EPA method 310.1, Anions (including Nitrate, Sulfate, and Chloride) by EPA method 300, Biochemical Oxygen Demand (BOD) by EPA method 405.1, Chemical Oxygen Demand (COD) by EPA method 410.1, Total Hardness by EPA method 130.2, Total Dissolved Solids (TDS) by EPA method 160.1, Total Suspended Solids (TSS) by EPA method 160.2, and Cyanide by SW846 method 9012A. In addition, the laboratory analyzed: one field duplicate (MW-SHL-DUP-98-01, a duplicate of sample MW-SHL-5B-98-01); and one equipment blank (MW-SHL-EB-01-98-01, dated 05/11/98).

Laboratory Preparation Blank and Equipment Blank Results: All target analytes were undetected at levels above the laboratory's practical quantitation limit (PQL) for preparation blank sample. The equipment blank sample showed elevated levels of BOD (2,800 ug/L) and COD (227,000 ug/L). These values are higher than most of the sample results and are most likely caused by the elevated level of isopropyl alcohol present in the sample (see Volatile Organic Compound (VOC) Analysis - Laboratory Method Blank, Trip Blank and Equipment Blank Results section, above). Since detectable levels of isopropyl alcohol were not detected in the field samples, no action was

taken. The equipment blank also showed detectable levels of TDS (30,000 ug/L) and TSS (300 ug/L). Sample values which are within five times of the amount detected in the equipment blank are qualified with JB as estimated (J) with potential blank interference (B).

Field Duplicate Sample Results: The results of the general inorganic analyses for sample MW-SHL-5B-98-01, and its duplicate, sample MW-SHL-DUP-98-01, show less than 20 % relative percent difference for all detected analytes. The field duplicate sample shows acceptable comparative results.

Matrix Spike/Duplicate (MS/MSD) Results: One set of matrix spike/matrix spike duplicate (MS/MSD) samples was analyzed for Cyanide and one MS sample was analyzed for Anions. All MS/MSD and MS recoveries and RPDs are within the laboratory's acceptance limits (75-125 % recovery; 20% RPD) for these analyses. All results are acceptable.

Conclusion

Laboratory reports were reviewed for adherence to acceptable laboratory practices. Based on the data evaluation elements reviewed (including holding times, blank sample results, surrogate recoveries, and MS/MSD recoveries), all data may be reported without qualification, except as summarized below:

- General Inorganic Analyses: The equipment blank showed detectable levels of TDS (30,000 ug/L) and TSS (300 ug/L). Sample values which are within five times of the amount detected in the equipment blank are qualified with JB as estimated (J) with potential blank interference (B) in the sample summary table (Table 7-2).

8.3.2 Data Evaluation for Samples Collected November 1998

Volatile Organic Compound (VOC) Analysis

Fourteen groundwater samples were analyzed for VOCs using SW846 method 8260B. In addition, the laboratory analyzed: one field duplicate (MW-SHL-DUP-98-02, a duplicate of sample MW-SHL-5B-98-02); three trip blanks (dated 11/02/98, 11/03/98, and 11/04/98); and one equipment blank (MW-SHL-EB-98-02, dated 11/04/98).

Laboratory Method Blank, Trip Blank and Equipment Blank Results: Target analytes were undetected at levels above the laboratory's practical quantitation limit (PQL) for method blank, trip blank, and equipment blank samples. Acetone, Methylene Chloride, and Chloroform (which are not target analytes) were detected in equipment blank sample. Methylene Chloride (which is not a target analyte) and Acetone, both common laboratory contaminants, were detected in the equipment blank at concentrations 8.4 ug/L and 6.9 ug/L respectively, which exceed the

laboratory 's PQLs (5 ug/L). Also, Chloroform (which is not a target analyte) was detected in the equipment blank sample at the concentration 5.0 ug/L, which exceeded the laboratory's PQL 5 ug/L. These three compounds were not detected in any other sample, therefore, no action was taken.

Field Duplicate Sample Results: The results of the VOCs for sample MW-SHL-5B-98-02 and its duplicate MW-SHL-DUP-98-02, show less than 20 % relative percent difference (RPD) for all the detected analytes, except for Methyl-t-Butyl Ether, which showed 89.8% RPD. Although the RPD for Methyl-t-Butyl Ether exceeds the acceptance limit, it was not detected above the laboratory's PQL (5 ug/L). Methyl-t-Butyl Ether was not detected in the sample MW-SHL-5B-98-02 (5 U ug/L) but, in its duplicate sample, the analyte was detected 1.9 J ug/L, an estimated value below the laboratory's PQL, and no further action was taken. The field duplicate samples show acceptable comparative results.

Surrogate Results: All VOC sample surrogate recoveries are within the laboratory's stated acceptance limits. All results are acceptable.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results: One set of matrix spike/matrix spike duplicate (MS/MSD) samples were analyzed for this project. All MS/MSD recoveries and relative percent differences (RPD) are within the laboratory's acceptance limits for VOC analysis, except for 2-Chloroethylvinylether (and a few other non-target compounds), which showed 0% recovery. As this analyte is not a site-specific contaminant, no action was taken.
For the other compounds, Bromochloromethane, 1,3,5-Trimethylbenzene, Chloroethane, Chloroform, Methylene Chloride, and Styrenen, the MS/MSD recoveries are marginally outside the acceptance limits, which are not site-specific contaminants. These compounds were not detected in any of the samples and no further action was taken. All the MS/MSD recoveries are within acceptable limits.

Target Analyte List (TAL) Metals Analysis

Fourteen groundwater samples were analyzed for TAL metals using SW846 method 6010B or 7000 series methods. In addition, the laboratory analyzed: one field duplicate (MW-SHL-DUP-98-02, a duplicate of sample MW-SHL-5B-98-02); and one equipment blank (MW-SHL-EB-98-02, dated 11/04/98).

Laboratory Preparation Blank and Equipment Blank Results: All target analytes were undetected at levels above the laboratory's PQL for preparation blank and equipment blank samples. All results are acceptable.

Field Duplicate Sample Results: The results of the metals for sample MW-SHL-5B-98-02, and its duplicate, sample MW-SHL-DUP-98-02, show less than 20 % relative percent difference for all detected analytes. The field duplicate sample shows acceptable comparative results.

Matrix Spike (MS) and Duplicate Results: One set of matrix spike (MS) and duplicate samples was analyzed for this project. All MS recoveries are within the 75-125 % recovery acceptance limits, except for iron and manganese, which had native sample concentrations greater than four times the concentration of the spike. All duplicate RPDs are within the 20% RPD acceptance limits for metals analysis, except for thallium and zinc. The RPD between the duplicate values reported for thallium is 23.3%, which is not a target analyte. The RPD between the duplicate values reported for zinc is 33.6%. Since the field duplicate sample results showed acceptable RPD (see paragraph above), no action was taken. All the results are acceptable.

General Inorganic Analyses

Fourteen groundwater samples were analyzed for general inorganic analyses, including Alkalinity by EPA method 310.1, Anions (including Nitrate, Sulfate, and Chloride) by EPA method 300, Biochemical Oxygen Demand (BOD) by EPA method 405.1, Chemical Oxygen Demand (COD) by EPA method 410.1, Total Hardness by EPA method 130.2, Total Dissolved Solids (TDS) by EPA method 160.1, Total Suspended Solids (TSS) by EPA method 160.2, and Cyanide by SW846 method 9012A. In addition, the laboratory analyzed: one field duplicate (MW-SHL-DUP-98-02, a duplicate of sample MW-SHL-5B-98-02); and one equipment blank (MW-SHL-EB-98-02, dated 11/04/98).

Laboratory Preparation Blank and Equipment Blank Results: All target analytes were undetected at levels above the laboratory's PQL for preparation blank samples. The equipment blank sample showed all target analytes were undetected at levels above the laboratory's PQLs except for TDS (23,000 ug/l) and TSS (400 ug/L). Sample values which are within five times of the amount detected in the equipment blank are qualified with JB as estimated (J) with potential blank interference (B).

Field Duplicate Sample Results: The results of the general inorganic analyses for sample MW-SHL-5B-98-02, and its duplicate, sample MW-SHL-DUP-98-02, show less than 20 % relative percent difference for all detected analytes. The field duplicate sample shows acceptable comparative results.

Matrix Spike/Duplicate (MS/MSD) Results: One set of matrix spike/matrix spike duplicate (MS/MSD) samples was analyzed for Anions and one MS sample was analyzed for Cyanide. All MS/MSD and MS recoveries and RPDs are within the laboratory's acceptance limits (75-125 % recovery; 20% RPD) for these analyses, except for Orthophoshate (126.2%), which marginally excceded the acceptance limits. All results are acceptable.

Conclusion

Laboratory reports were reviewed for adherence to acceptable laboratory practices. Based on the data evaluation elements reviewed (including holding times, blank sample results, surrogate recoveries, and MS/MSD recoveries), all data may be reported without qualification, except as summarized below:

- General Inorganic Analyses: The equipment blank showed detectable levels of TDS (23,000 ug/L) and TSS (400 ug/L). Sample values which are within five times of the amount detected in the equipment blank are qualified with JB as estimated (J) with potential blank interference (B) in the sample summary table (Table 7-3). All the results are acceptable.

- Target Analyte List (TAL) Metals Analyses: The equipment blank showed detectable levels of Aluminum (21.1 ug/L), Cadmium (0.42 ug/L), Copper (1.4 ug/L), Manganese (8.9 ug/L), and Zinc (4.3 ug/L). Cadmium was not detected in any of the field sample and no qualification of results is required. Sample values which are within five times of the amount detected in the equipment blank are qualified with JB as estimated (J) with potential blank interference (B) in the sample summary table (Table 7-3). All the results are acceptable.

TABLE 8-1

Sample Preparation and Analysis Methods, Containers, Holding Times, and Preservatives

Parameter	Prepar-action Method[1]	Analysis Method[1]	Sample Container[2]	Minimum Volume	Preservative	Holding Time (VTS)[3]
VOCs	5030B	8260B	3 X 40 mL vials with Teflon septa screw caps[4]	40 mL	HCl to pH less than 2 (No Headspace) 4+/- 2°C	14 days
Metals [5]	3010A	6010B - Trace ICAP or 7000 series	1-Liter HDPE	300 mL	HNO_3 to pH less than 2	180 days (except Hg) 28 days (Hg)
Hardness	NA	130.2		100 mL		180 days
Cyanide	NA	9012A	500-mL HDPE	500 mL	NaOH to pH greater than 12, 4+/- 2°C	14 days
Anions [6]	NA	300	500-mL HDPE	100 mL	4+/- 2°C	48 hours for ortho-Phosphate and Nitrate; 28 days for Sulfate and Chloride
Alkalinity	NA	310.1		100 mL		14 days
TDS	NA	160.1		100 mL		48 hours
COD	NA	410.1	250-mL HDPE	250 mL	H_2SO_4 to pH less than 2, 4+/- 2°C	28 days
BOD	NA	405.1	1-Liter HDPE	1000 mL	4+/- 2°C	48 hours
TSS	NA	160.2	1-Liter HDPE	1000 mL	4+/- 2°C	7 days

1 "Methods for Chemical Analysis of Water and Wastes", Cincinnati, OH, March 1979, EPA 600-4-79-020.
"Test Methods for Evaluating Solid Waste, Physical and Chemical Methods", U.S. EPA SW-846, 3rd Edition.

2 Additional sample containers/volume is required for matrix quality control samples.

3 VTS - Verified Time when the Sample was collected.

4 Two vials will be shipped to the laboratory; one will be measured for pH in the field to verify that the sample has been preserved correctly (i.e. pH less than 2)).

5 TAL metals include Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Vanadium, and Zinc.

6 Anions include Nitrate, Sulfate, and Chloride.

NA = Not Applicable Hg = Mercury

9.0 CORRECTIVE ACTION

Corrective action required for the landfill cover is focused primarily on regrading and reseeding eroded areas along with clearing unwanted vegetation in drainage channels. Along with the corrective actions listed in the report, the following problem areas are the most critical and should be addressed before the next inspection: (1) Clear the earth and vegetation obstruction in the east side drainage swale just upstream of the new riprap section. Drain the area of standing water in the channel upstream of the obstruction and clear, regrade, and reseed or riprap the channel; (2) Clear and mow the existing settled area between gas vents #3 and #4 during a dry period. If it does not dry out it should be cleared by hand to eliminate woody and wetland species; (3) Repair the eroded gully between gas vents #1 and #3; (4) Repair and replace the security fence and gates as required to control access to the site; and (5) monitor the lack of vegetation on the east side near the new riprap channel..

With the exception of the repairs mentioned above, and the other repairs recommended in the report, the landfill is in fair condition and appears to be functioning adequately.

APPENDIX A

LANDFILL MAINTENANCE CHECKLIST

APPENDIX A
Landfill Maintenance Checklist

To be completed in indelible ink. Inspections are to be performed annually.

DATE: 26 October 1998
INSPECTOR: Thomas J. Marcotte ORGANIZATION: U.S Army Corps of Engineers, New England District

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/ UNSAT
Monitoring Wells	1. Inspection performed by groundwater monitoring team	None	SAT
Piezometers	1. Inspection performed by groundwater monitoring team	None	SAT
Cover Surface	1. Vegetative cover is generally satisfactory except as noted in the comments that follow. Various species growing; recently mowed to about 6 inches height.	See specific comments under the sections that follow.	SAT
Vegetative Growth	1. Approximately midway along the south drainage swale, on the upper part of the outside channel side slope, there is an area about 10 feet by 15 feet which lacks adequate vegetation. It is just beginning to show signs of erosion. 2. In the vicinity of the new rock channel on the east side, there are large areas with very sparse or no vegetation. The soil in these bare areas is mostly sand. During the fall of 1998, hydroseeding of some of these barren areas was performed, but at the time of the site inspection very little germination had occurred. Some evidence of natural revegetation can be seen, but there are still many areas vulnerable to erosion. Erosion in these areas would directly contribute to the large sand delta that has accumulated in Plow Shop Pond.	1. This area should be reseeded, with hay or straw placed on the surface, to prevent further erosion. 2. This area should be closely watched to see if adequate vegetation can become established in the sandy soils. No action is recommended at this time, but if the hydroseeded areas do not vegetate, the application of topsoil and seed next season may be necessary.	UN-SAT SAT
Landfill Gas Vent Wells	1. The gas vents are in good condition. All screens and pipes are in functional condition and no repairs are required at this time. Many of the vents had animal burrows adjacent to them. The location of the burrows is noted on the gas vent monitoring result table.	1. All animals should be eliminated with suitable repellents and then the burrow holes should be backfilled, with reseeding as required.	UN-SAT

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/ UNSAT
Drainage Swales	1. Most of the drainage swale on the south side is being invaded by woody species. There are also intermittent zones of standing water indicating a lack of proper channel slope and drainage.	1. The south side drainage swale should be cleared of woody vegetation and regraded as needed to properly drain all areas of standing water. Depending on water velocities, the channel should then be reseeded or riprap should be placed.	UN-SAT
	2. In the east side drainage swale, in the vicinity of gas vent #13 and continuing downstream to the new rock-lined channel, the drainage swale is heavily overgrown with woody vegetation and wetland 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 channel into a pond.	2. This reach of the drainage swale should be cleared of the obstruction, all vegetation and accumulated silt and sand, and regraded to drain properly. Seeding, or riprap placement, should follow, depending on water velocities.	UN-SAT
Culverts	1. The concrete drainage structure at the terminus of the catch basin and underground conduit system on the south side is overgrown with vegetation, including some larger woody species, 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.	UN-SAT
Catch Basins	1. Catch Basin #2 near the entrance to the site has a broken surface grate.	1. The surface grate should be replaced.	UN-SAT
	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.	2. The rim of this catch basin should be lowered to the surrounding grade as it is ineffective as is.	UN-SAT
	3. Catch basin #7 near the southwest corner of the site is substantially overgrown by the adjacent vegetation and will soon be completely overgrown and hidden from view. The catch basin is partially filled with many small pieces of PVC pipe.	3. This catch basin should be cleared of encroaching vegetation and the PVC pipe pieces should be removed.	UN-SAT
Settlement	1. In the settled area between gas vents #3 and #4, 6 to 12 inches of standing water was observed and wetland species are becoming established. No areas of erosion were seen, however. Woody species are just starting to grow on the periphery of this settled area.	1. During a dry period, the settled area should be mowed to eliminate woody species and to slow the encroachment of wetland species.	UN-SAT
	2. On the west side between gas vent #3 and #6 there is a small area of settlement, about 15 feet by 15 feet, with about three inches of standing water. There is no erosion in this settled area, and vegetation is still growing well.	2. This area should be monitored for further settlement and wetland encroachment. No action is requird at this time.	SAT

LANDFILL ATTRIBUTE	OBSERVATIONS	RECOMMENDATIONS	SAT/ UNSAT
Erosion	1. In the northwest extremity, between gas vent #1 and #3, there is an eroded gully leading to the west drainage swale. It is about one to two feet wide and 15 feet long. 2. In the vicinity of gas vent #1, there is an oval-shaped area of erosion, about five feet by ten feet. 3. On the west side near gas vent #9, a shallow sloped area is undergoing mild erosion. Vegetation is not well established and minor erosion is forming shallow gullies.	1. The placement of topsoil and seed in the gully should be sufficient to repair this area. 2. The placement of topsoil and seed in the eroded area should be sufficient to repair this area. 3. The placement of topsoil and seed, with a surface treatment of broadcast hay or straw, should be sufficient to repair this area and stop the erosion process.	UN-SAT UN-SAT UN-SAT
Access Roads	1. The access roads on the site are in generally fair to good condition. Some work was performed on these roads in the Fall of 1998 to upgrade the surface.	1. There are no problems on access roads which warrant repair at this time.	SAT
Security Fencing	1. The perimeter chain-link security fence is in poor condition. Fence sections and gates are missing and unrestricted access to the site is available at many locations. Some evidence of off-road vehicles (ATV's, dirt bikes, etc.) using the turfed cap area was seen.	1. The security fence should be repaired, with all missing fence sections, including gates, replaced or repaired.	UN-SAT
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. These locations have been noted in above comments.	1. Wetland encroachment should be eliminated by simple mowing in some areas, and by draining and regrading channels in other areas. The above comments address the actions to take at specific locations.	UN-SAT

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. Clear the earth and vegetation obstruction in the east side drainage swale just upstream of the new riprap section. Drain the area of standing water in the channel upstream of the obstruction and clear, regrade, and reseed or riprap the channel.

2. Clear and mow the existing settled area between gas vents #3 and #4 during a dry period. If it does not dry out it should be cleared by hand to eliminate woody and wetland species.

3. Repair the eroded gully between gas vents #1 and #3.

4. Repair and replace the security fence and gates as required to control access to the site.

General Comments: With the exception of the four items mentioned in the above paragraph, and the other repairs recommended, the landfill fair condition and appears to be functioning adequately. Several items were noted which should be monitored closely, especially the lack of vegetation on the east side near the new riprap channel, but no other action is required at this time.

APPENDIX B

LANDFILL GAS MONITORING FORM

APPENDIX B
Landfill Gas Monitoring

To be completed in indelible ink. *Monitoring is to be performed annually*

DATE: 26 October 1998

INSPECTOR: T.J. Marcotte, E. Iorio ORGANIZATION: U.S. Army Corps of Engineers, New England District

WEATHER: (Temp, rain, sun, etc.): 45 to 50 degrees F, Full Sun BAROMETRIC PRESSURE: 30.2 "/Hg

Vent Number	VOCs (ppm)	O_2 (%)	H_2S (ppm)	LEL (%)	CO (ppm)	CO_2 (%)	CH_4 (%)	REMARKS (Visual observations, odor, etc.)
	PID	CGI	CGI	CGI	CGI	GA-90	GA-90	
Vent - 1	0	21.0	0	0	0	0	0	animal burrow
Vent - 2	0	21.0	0	0	0	0	0	animal burrows
Vent - 3	0	21.0	0	0	0	0	0	animal burrow
Vent - 4	0	21.0	0	0	0	0	0	
Vent - 5	0	21.0	0	0	0	0	0	
Vent - 6	0	21.0	0	0	0	0	0	
Vent - 7	0	21.1	0	0	0	0	0	animal burrows
Vent - 8	0	21.0	0	0	0	0	0	animal burrows
Vent - 9	0	21.1	0	0	0	0	0	
Vent - 10	0	21.1	0	0	0	0	0	
Vent - 11	0	21.0	0	0	0	0	0	animal burrow
Vent - 12	0	21.0	0	0	0	0	0	
Vent - 13	0	21.0	0	0	0	0	0	
Vent - 14	0	21.2	0	0	0	0	0	
Vent - 15	0	21.6	0	0	0	0	0	animal burrows
Vent - 16	0	21.0	0	0	0	0	0	
Vent - 17	0	21.0	0	0	0	0	0	
Vent - 18	0	21.1	0	0	0	0	0	

Note: See grid for well identifiers and locations.
Mark all vents with appropriate number during initial sampling.

APPENDIX C

GROUNDWATER FIELD ANALYSIS FORMS

Groundwater Field Analysis Forms
Spring 1998

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

GWM well # SHL-3

SCREENED INTERVAL DEPTH: 25-35 feet (from top casing)

H2O LEVEL: PRE PUMP INSERTION 29.80 feet (from top casing)

POST PUMP INSERTION 29.80 feet (from top casing)

DEPTH SAMPLED: 33 feet (from top casing)

DATE: 05/13/98 TIME: 1300

SAMPLED BY: B. Waz

RECORDED BY: B. Waz

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1404	30.40	117.6	400		11.04	0.023	6.87	156.8	11.58	14.8	
1408	30.30	118.3	300		12.36	0.022	7.13	147.5	11.09	9.4	
1412	30.25	119.1	300	1 gallon	13.45	0.022	7.12	146.0	11.04	6.4	
1418	30.25	125.0	200		15.06	0.022	7.07	148.8	10.83	5.8	
1420	30.25	166.0	300		14.77	0.022	7.07	149.0	10.91	5.2	
1422	30.25	186.0	175	2 gallon	14.60	0.022	7.04	148.7	10.72	5.0	
1425	30.25	201.0	100		14.88	0.022	7.03	147.9	10.62	4.8	

NOTES:

SAMPLE TAKEN AT 1430

YSI GROUP # 1

TURBIDITY GROUP # 2

GWM well # SHL-4

SCREENED INTERVAL DEPTH: 5.8 - 15.8 feet

H2O LEVEL: PRE PUMP INSERTION 9.69 feet

POST PUMP INSERTION 9.69 feet

DEPTH SAMPLED: 12 feet

DATE: 05/13/98 TIME: 1030

SAMPLED BY: S. Simmer

RECORDED BY: S. Simmer

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1100	9.69	70.3	300		10.78	0.135	6.48	255.6	2.30	25.0	orange color
1105	9.70	70.3	350		12.22	0.135	6.62	228.6	2.99	15.3	
1110	9.70	70.3	325	1 gallon	12.83	0.131	6.59	216.1	2.84	10.4	clear color
1115	9.70	70.3	400		12.87	0.128	6.57	203.2	2.38	6.0	
1120	9.70	70.3	400		12.74	0.126	6.58	196.8	2.22	3.5	
1125	9.70	70.3	400	2 gallon	12.57	0.125	6.58	188.3	1.92	4.6	
1130	9.70	70.3	450		12.52	0.124	6.56	184.1	1.74	5.5	
1135	9.70	70.3	450	3 gallon	12.28	0.122	6.56	180.6	1.58	4.9	
1140	9.70	70.3	450		12.26	0.122	6.54	176.9	1.45	2.6	
1145	9.70	70.3	475	4 gallon	12.16	0.122	6.53	174.2	1.34	3.9	

NOTES:

SAMPLE TAKEN AT 1145

YSI GROUP # 2

TURBIDITY GROUP # 1

GWM well # SHL-5

SCREENED INTERVAL DEPTH: 5.2 - 15.2 feet (from top casing)

H2O LEVEL: PRE PUMP INSERTION 1.62 feet (from pvc)

POST PUMP INSERTION 1.63 feet (from pvc)

DEPTH SAMPLED: 12 feet (from top casing)

DATE: 05/12/98 TIME: 1230

SAMPLED BY: S. Simmer

RECORDED BY: S. Simmer

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1230	1.80	36.3	200		12.12	0.070	5.87	75.0	6.44	105	orange color
1235	1.78	36.3	200		11.32	0.069	5.94	25.9	3.06	51	
1240	1.90	37.3	400		10.69	0.068	5.93	5.6	1.59	21	color clearer
1245	1.91	36.8	400	1 gallon	11.19	0.066	5.83	4.6	1.12	14.7	
1250	1.85	36.6	300		11.37	0.066	5.84	1.8	1.09	4.3	
1255	1.85	37.0	300		11.66	0.067	5.79	-0.3	1.08	2.7	
1300	1.85	37.0	300	2 gallon	11.74	0.067	5.82	-4.5	0.90	3.7	
1305	1.85	37.0	300		11.80	0.068	5.80	-8.5	0.77	3.9	
1310	1.85	37.0	300		11.86	0.069	5.80	-11.0	0.64	2.9	
1315	1.85	37.0	300	3 gallon	11.88	0.069	5.80	-12.9	0.63	3.1	
1320	1.85	37.0	300		11.85	0.069	5.80	-13.7	0.63	2.7	

NOTES:

SAMPLE TAKEN AT 1320

YSI GROUP # 1

TURBIDITY GROUP # 1

GWM well # SHL-9

SCREENED INTERVAL DEPTH: 16.3 - 26.3 feet (from top casing)

H2O LEVEL: PRE PUMP INSERTION 6.93 feet (top pvc) time 0900

POST PUMP INSERTION 7.20 feet (top pvc) time 1200

DEPTH SAMPLED: 22 feet (top pvc)

DATE: 05/12/98 TIME: 1200

SAMPLED BY: B. Waz

RECORDED BY: B. Waz

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1246	7.50	63.2	400	1 gallon	9.69	0.080	6.21	219.3	1.51	39.5	considerable
1250	7.50	63.2	400		9.96	0.084	6.24	212.6	1.38	30.0	rust
1253	7.50	63.2	400		9.99	0.084	6.27	207.6	1.26	14.3	
1256	7.50	63.2	400	2 gallon	10.18	0.086	6.26	202.6	1.22	14.4	
1259	7.50	63.2	400		10.23	0.088	6.28	194.8	0.96	14.0	
1302	7.50	63.2	400		10.23	0.089	6.29	188.8	0.88	7.3	
1306	7.50	63.2	400	3 gallon	10.28	0.092	6.30	179.5	0.76	4.9	
1309	7.50	63.2	400		10.28	0.093	6.31	173.8	0.77	4.7	
1312	7.50	63.2	400		10.32	0.094	6.31	168.9	0.78	4.3	
1315	7.50	63.2	400	4 gallon	10.27	0.095	6.32	163.4	0.75	3.9	
1318	7.50	63.2	400		10.29	0.095	6.33	158.9	0.73	3.6	

NOTES:

SAMPLE TAKEN AT 1320

YSI GROUP # 2 TURBIDITY GROUP # 2

GWM well # SHL-10

SCREENED INTERVAL DEPTH: 17.8 - 41.8 feet

H2O LEVEL: PRE PUMP INSERTION 31.01 feet

POST PUMP INSERTION 30.35 feet

DEPTH SAMPLED: 37 feet

DATE: 05/13/98 TIME: 1500

SAMPLED BY: B. Waz

RECORDED BY:B. Waz

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1507	30.50	121.0	300		11.07	0.049	7.22	165.0	11.58	2.9	
1510	30.50	122.1	550		10.88	0.047	7.13	155.4	11.10	3.2	
1513	30.50	122.1	575	1 gallon	12.81	0.043	7.03	153.5	10.83	6.8	
1515	30.50	122.1	600		13.13	0.042	6.97	155.1	10.82	1.9	
1518	30.50	122.1	600	2 gallon	13.25	0.042	6.90	158.0	10.79	1.8	
1521	30.50	122.1	600		13.26	0.041	6.88	160.8	10.79	1.8	
1524	30.50	122.1	600		13.32	0.041	6.85	163.1	10.78	1.8	
1527	30.50	122.1	600	3 gallon	13.34	0.041	6.83	164.4	10.76	1.9	

NOTES:

SAMPLE TAKEN AT 1530

YSI GROUP # 1

TURBIDITY GROUP # 2

GWM well # SHL-11

SCREENED INTERVAL DEPTH: 14.8 - 29.8 feet

H2O LEVEL: PRE PUMP INSERTION 18.05 feet

POST PUMP INSERTION 18.05 feet

DEPTH SAMPLED: 22 feet

DATE: 05/13/98 TIME: 800

SAMPLED BY: B. Waz

RECORDED BY: B. Waz

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
832	18.10	87.6	400		10.66	0.703	3.97	280.3	0.68	169.0	very orange
836	18.10	89.5	400	1 gallon	11.72	0.737	6.05	49.1	0.73	54.0	rusty water
841	18.10	89.5	400		12.89	0.751	6.23	32.3	0.61	28.0	
844	18.10	88.0	500	2 gallon	12.37	0.749	6.29	24.9	0.52	18.8	
848	18.10	89.1	500		12.10	0.748	6.31	21.8	0.56	16.2	
850	18.10	89.1	650	3 gallon	12.94	0.744	6.31	20.3	0.61	18.9	
854	18.10	89.1	500		12.71	0.750	6.33	17.7	0.57	20.2	
857	18.10	89.1	500		12.18	0.752	6.33	16.5	0.56	18.8	
900	18.10	89.1	500	4 gallon	12.24	0.750	6.34	15.3	0.6	16.9	
905	18.10	89.1	475		12.36	0.750	6.34	15.2	0.62	17.2	
908	18.10	89.1	475		12.40	0.749	6.34	15.3	0.66	15.9	

NOTES:

SAMPLE TAKEN AT 0910

YSI GROUP # 1

TURBIDITY GROUP # 2

GWM well # SHL-19

SCREENED INTERVAL DEPTH: 17 - 32 feet

H2O LEVEL: PRE PUMP INSERTION 21.75 feet

POST PUMP INSERTION 21.76 feet

DEPTH SAMPLED: 23 feet

DATE: 05/13/98 TIME: 1100

SAMPLED BY: B. Waz

RECORDED BY: B. Waz

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1106	21.80	100.3	400		9.26	0.155	6.43	78.5	2.22	23.1	
1111	21.80	100.3	400	1 gallon	11.62	0.152	6.56	44.2	0.93	4.3	
1116	21.80	100.3	400		12.92	0.153	6.56	36.6	0.84	3.4	
1120	21.80	100.3	400		13.14	0.150	6.56	33.9	0.85	3.4	
1122	21.80	100.3	400	2 gallon	13.18	0.148	6.57	33.0	0.75	4.5	
1126	21.80	100.3	400		13.21	0.142	6.52	32.8	0.77	3.7	
1130	21.80	100.3	400		13.17	0.139	6.54	32.6	0.79	1.0	
1133	21.80	100.3	400	3 gallon	13.19	0.137	6.56	33.4	0.80	1.0	
1136	21.80	100.3	400		13.20	0.136	6.56	33.9	0.88	0.9	
1139	21.80	100.3	400	4 gallon	13.25	0.134	6.56	35.0	0.92	0.8	

NOTES:

SAMPLE TAKEN AT 1140

YSI GROUP # 1

TURBIDITY GROUP # 2

GWM well # SHL-20

SCREENED INTERVAL DEPTH: 41 - 51 feet

H2O LEVEL: PRE PUMP INSERTION 18.42 feet

POST PUMP INSERTION 18.42 feet

DEPTH SAMPLED: 46 feet

DATE: 05/13/98 TIME: 800

SAMPLED BY: S. Simmer

RECORDED BY: S. Simmer

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
820	18.46	95.5	600		10.8	0.860	6.06	230.6	0.87	17.5	slight
825	18.47	95.5	750	1 gallon	11.2	0.871	6.36	212.3	0.48	13.8	brownish
830	18.47	95.5	700		11.7	0.871	6.44	200.1	0.35	11.1	color
835	18.47	95.1	650	2 gallon	11.9	0.869	6.47	183.1	0.29	7.0	
840	18.47	95.1	700		11.9	0.868	6.49	170.5	0.25	7.5	
845	18.47	95.1	650	3 gallon	12.0	0.869	6.49	160.1	0.23	6.9	
850	18.47	95.1	650	4 gallon	12.1	0.869	6.49	152.8	0.22	6.2	
855	18.47	95.1	650	5 gallon	12.1	0.869	6.50	148.0	0.21	5.9	
900	18.47	95.1	650	6 gallon	12.2	0.869	6.50	143.1	0.21	6.1	

NOTES:

SAMPLE TAKEN AT 0900 MS/MSD SAMPLES ALSO TAKEN AT THIS WELL

YSI GROUP # 2 TURBIDITY GROUP # 1

GWM well # SHL-22

SCREENED INTERVAL DEPTH: 106 - 116 feet

H2O LEVEL: PRE PUMP INSERTION 5.98 feet

POST PUMP INSERTION 4.80 feet

DEPTH SAMPLED: 111 feet

DATE: 05/12/98 TIME: 1400

SAMPLED BY: B. Waz

RECORDED BY: B. Waz

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1420	5.25	61.3	375		10.28	0.483	6.99	297.0	3.52	7.5	
1423	5.26	61.3	300		10.19	0.738	6.76	240.6	2.92	3.5	
1427	5.29	61.3	300		10.08	0.854	6.76	191.8	2.59	1.7	
1430	5.30	61.3	325	1 gallon	10.02	0.892	6.79	153.0	2.22	1.0	
1434	5.30	61.3	325		10.08	0.897	6.81	127.9	2.06	1.1	
1438	5.32	61.3	325		10.16	0.898	6.81	114.6	1.94	1.1	
1441	5.32	61.3	300	2 gallon	10.20	0.897	6.83	108.5	1.90	1.0	
1445	5.32	61.3	300		10.21	0.897	6.82	103.2	1.76	1.0	
1448	5.32	61.3	300		10.19	0.897	6.83	99.8	1.55	1.0	
1451	5.32	61.3	300		10.20	0.898	6.83	95.0	1.60	1.0	
1453	5.32	61.3	300	3 gallon	10.23	0.898	6.83	92.4	1.57	0.9	
1457	5.32	61.3	300		10.22	0.898	6.83	87.8	1.55	1.0	

NOTES:

SAMPLE TAKEN AT 1500

YSI GROUP # 2

TURBIDITY GROUP # 2

GWM well # SHM-93-10C

SCREENED INTERVAL DEPTH: 46 - 56 feet

H2O LEVEL: PRE PUMP INSERTION 29.33 feet

POST PUMP INSERTION 28.98 feet

DEPTH SAMPLED: 51 feet

DATE: 05/13/98 TIME: 1330

SAMPLED BY: S. Simmer

RECORDED BY: S. Simmer

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1355	29.80	118.2	150		14.01	0.445	7.70	187.5	6.48	7.3	fairly clear
1400	29.85	120.3	350		11.71	0.444	7.63	189.7	3.83	5.3	
1405	29.95	120.3	275		11.65	0.444	7.59	187.3	3.43	4.9	very clear
1410	30.00	120.3	275	1 gallon	13.21	0.441	7.58	178.4	3.32	3.6	
1415	30.05	120.3	300		13.85	0.444	7.59	172.8	3.12	3.4	
1420	30.05	120.2	225		14.04	0.445	7.58	168.9	3.05	2.8	
1425	30.05	120.2	275	2 gallon	14.08	0.446	7.62	164.3	2.81	3.2	
1430	30.05	120.2	250		14.18	0.445	7.58	159.5	2.58	2.8	
1435	30.05	120.2	250		13.94	0.446	7.60	155.3	2.22	2.7	
1440	30.06	120.2	250	3 gallon	14.06	0.444	7.61	152.7	2.10	2.0	
1445	30.06	120.2	250		14.20	0.445	7.61	150.7	2.05	2.1	
1450	30.06	120.2	250	4 gallon	14.22	0.445	7.54	148.7	1.95	1.7	
1455	30.06	120.2	275		14.24	0.445	7.55	145.2	1.71	1.6	
1500	30.06	120.2	250		14.37	0.446	7.56	142.2	1.55	1.6	
1505	30.06	120.2	250	5 gallon	14.47	0.446	7.56	141.2	1.52	1.5	

NOTES:

SAMPLE TAKEN AT 1505

YSI GROUP # 2

TURBIDITY GROUP # 1

GWM well # SHM-93-22C

SCREENED INTERVAL DEPTH: 124 - 134 feet

H2O LEVEL: PRE PUMP INSERTION 6.03 feet

POST PUMP INSERTION 3.61 feet

DEPTH SAMPLED: 125 feet

DATE: 05/12/98 TIME: 1540

SAMPLED BY: B. Waz

RECORDED BY: B. Waz

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1548	4.60	41.5	400		9.67	0.406	6.98	-65.7	1.64	3.2	sulfur odor
1551	5.20	46.7	300		9.69	0.570	7.52	-116.8	1.15	3.5	
1555	5.32	47.8	300		9.96	0.580	7.58	-123.1	0.96	2.7	
1559	5.60	50.1	200	1 gallon	10.02	0.590	7.63	-126.3	0.87	2.4	
1601	6.20	54.5	450		9.26	0.590	7.65	-126.0	0.96	1.7	
1604	6.30	54.5	400		9.83	0.587	7.65	-126.2	0.89	1.5	
1607	6.32	54.5	375	2 gallon	10.14	0.588	7.65	-127.4	0.85	1.0	
1609	6.35	54.5	350		10.17	0.588	7.65	-128.0	0.88	1.1	
1611	6.40	54.7	350		10.20	0.589	7.66	-128.0	0.88	1.0	
1614	6.45	54.7	350		10.21	0.586	7.66	-128.1	0.85	1.0	

NOTES:

SAMPLE TAKEN AT 1615

YSI GROUP # 1

TURBIDITY GROUP # 1

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

GWM well # SHM-96-5B

SCREENED INTERVAL DEPTH: 80 - 90 feet

H2O LEVEL: PRE PUMP INSERTION 4.35 feet

POST PUMP INSERTION 4.32 feet

DEPTH SAMPLED: 85 feet

DATE: 05/11/98 TIME: 1015

SAMPLED BY: S. Simmer

RECORDED BY: S. Simmer

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1325	4.50	53.1	500		8.70	0.323	7.03	24.1	9.02	7.3	Rain delay
1330	4.60	52.4	350		9.14	0.770	6.83	-38.5	4.12	5.0	from pump
1335	4.60	52.4	350	1 gallon	9.23	0.580	6.90	-62.0	1.37	2.5	insertion
1340	4.60	52.4	350		9.41	0.831	6.91	-70.6	0.96	1.5	
1345	4.61	50.8	350	2 gallon	9.45	0.830	6.92	-74.1	0.95	1.8	
1350	4.62	50.8	400		9.53	0.829	6.92	-72.1	0.75	1.0	
1355	4.62	49.8	350	3 gallon	9.45	0.830	6.93	-80.7	0.69	0.9	
1400	4.62	49.8	400		9.56	0.830	6.93	-83.7	0.57	1.0	
1405	4.62	49.8	400	4 gallon	9.58	0.830	6.93	-85.2	0.55	1.1	
1410	4.63	49.8	400		9.62	0.830	6.93	-86.7	0.50	0.9	
1415	4.64	49.8	425	5 gallon	9.67	0.831	6.93	-86.7	0.46	1.0	
1420	4.64	49.8	425		9.73	0.831	6.94	-90.0	0.42	0.8	
1425	4.65	49.8	425	6 gallon	9.73	0.831	6.94	-91.1	0.39	1.2	
1430	4.66	49.8	425		9.78	0.831	6.94	-93.0	0.38	1.1	

NOTES:

SAMPLE TAKEN AT 1430 QA AND DUPLICATE SAMPLES ALSO TAKEN

EQUIPMENT BLANK SAMPLES WERE TAKEN AFTER EQUIPMENT WAS DECONTAMINATED FOLLOWING THIS WELL

YSI GROUP # 1 TURBIDITY GROUP # 1

GWM well # SHM-96-5C

SCREENED INTERVAL DEPTH: 50 - 60 feet

H2O LEVEL: PRE PUMP INSERTION 3.80 feet

POST PUMP INSERTION 3.80 feet

DEPTH SAMPLED: 55 feet

DATE: 05/11/98 TIME: 1030

SAMPLED BY: B. Waz

RECORDED BY: B. Waz

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1337	3.85	44.8	450	1 gallon	9.45	0.840	6.11	129.4	0.37	3.2	
1341	3.85	44.8	250		9.47	0.840	6.26	102.7	0.27	1.2	
1346	3.85	44.6	250	2 gallon	9.66	0.831	6.31	80.6	0.26	0.54	
1350	3.85	44.6	250		9.29	0.833	6.33	73.4	0.24	0.54	
1354	3.85	44.6	250		9.15	0.830	6.34	66.1	0.24	0.5	
1358	3.85	44.6	250	3 gallon	9.16	0.828	6.35	61.5	0.25	0.4	
1402	3.85	45.2	350		9.23	0.820	6.35	51.0	0.27	0.5	
1405	3.85	45.2	400		9.65	0.809	6.35	35.9	0.25	0.54	
1410	3.85	45.2	400	4 gallon	9.67	0.810	6.35	26.9	0.23	0.49	
1415	3.85	45.2	400		9.71	0.808	6.35	18.5	0.20	0.57	
1420	3.85	45.2	400	5 gallon	9.75	0.808	6.35	11.7	0.19	0.7	
1425	3.85	45.2	400		9.77	0.807	6.35	10.5	0.19	0.6	

NOTES:

SAMPLE TAKEN AT 1429

YSI GROUP # 2

TURBIDITY GROUP # 1

GWM well # SHM-96-22B

SCREENED INTERVAL DEPTH: 82 - 92 feet (below ground surface)

H2O LEVEL: PRE PUMP INSERTION 4.85 feet (from top pvc)

POST PUMP INSERTION 4.85 feet (from top pvc)

DEPTH SAMPLED: 87 feet (below ground surface)

DATE: 05/12/98 TIME: 1400

SAMPLED BY: S. Simmer

RECORDED BY: S. Simmer

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/HARDNESS 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 500 ml HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1415	4.85	60.2	550		8.19	1.128	8.94	176.0	8.44	11.3	yellow tint
1420	4.90	60.2	600	1 gallon	8.80	0.993	6.50	-112.7	5.09	19.7	green tint
1425	4.88	60.2	550	2 gallon	8.86	1.037	6.65	-105.2	4.70	6.6	clearer color
1430	4.90	60.2	550		8.95	1.037	6.74	-105.9	4.02	5.7	
1435	4.90	60.2	550	3 gallon	8.96	1.026	6.72	-105.6	3.70	5.8	
1440	4.90	60.2	550		9.01	1.019	6.78	-108.7	3.48	4.4	
1445	4.90	60.2	550	4 gallon	9.02	1.016	6.81	-110.8	3.26	4.5	
1450	4.90	60.2	550		9.05	1.013	6.85	-119.1	3.08	3.4	
1455	4.90	60.2	550	5 gallon	9.09	1.010	6.92	-120.2	2.96	3.8	
1500	4.90	60.2	550	6 gallon	9.12	1.009	6.94	-127.6	2.87	3.4	

NOTES:

SAMPLE TAKEN AT 1500

YSI GROUP # 1

TURBIDITY GROUP # 1

Groundwater Field Analysis Forms
Fall 1998

GWM well # SHM-93-10C

SCREENED INTERVAL DEPTH: 46 - 56 feet

H2O LEVEL: PRE PUMP INSERTION 30.22 feet

POST PUMP INSERTION 30.10 feet

DEPTH SAMPLED: 50 feet

DATE: 11/02/98 TIME: 0830

SAMPLED BY: B. Waz

RECORDED BY: B. Waz

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
0900	30.65	120.2	400		10.74	675	7.37	see note	69.6	11.2	
0905	30.76	120.2	400		11.80	667	7.41	below	71.7	9.5	
0908	30.76	120.2	400		12.22	670	7.42		72.7	9.0	
0911	30.80	120.2	400	1 gallon	12.59	671	7.43		74.7	6.4	
0914	30.83	120.2	400		12.76	675	7.43		74.7	5.4	
0917	30.84	120.2	350		12.86	677	7.44		77.8	5.3	
0920	30.85	120.2	375		13.03	679	7.44		76.8	5.5	
0923	30.85	120.2	400		13.00	679	7.44		77.8	5.9	
0926	30.86	120.2	400	2 gallons	13.10	679	7.44		77.8	6.0	
0929	30.87	120.2	400		13.06	680	7.44		78.8	5.9	
0932	30.88	120.2	400		13.19	680	7.44		78.8	5.6	
0935	30.88	120.2	400		13.13	679	7.44		78.8	4.3	
0938	30.88	120.2	400		13.11	679	7.44		79.8	4.1	
0941	30.88	120.2	400		13.22	680	7.44		79.8	3.7	
0944	30.90	120.2	400		13.32	680	7.44		80.8	3.4	
0948	30.90	120.2	400	3 gallons	13.34	680	7.44		80.8	3.4	
0951	30.90	120.2	400		13.30	680	7.44		80.8	3.3	

NOTES:

SAMPLE TAKEN AT 0955

Note: Disregard ORP readings - it was later found that ORP probe was off.

YSI GROUP # 108 TURBIDITY GROUP # 76

GWM well # SHL-3

SCREENED INTERVAL DEPTH: 25.1-35.1 feet (from top casing)

H2O LEVEL: PRE PUMP INSERTION 30.56 feet (from top casing)

POST PUMP INSERTION 30.54 feet (from top casing)

DEPTH SAMPLED: 33.5 feet (from top casing)

DATE: 11/02/98 TIME: 0830

SAMPLED BY: S. Acone

RECORDED BY: S. Acone

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
0855	30.70	119.1	150								
0900	30.68	119.1	150		12.43	105	6.57	231.3	33.9	13.10	clear
0905	30.68	118.9	100		12.35	100	6.60	218.5	33.9	8.56	
0910	30.68	121.0	Flow stopped	flush pump							
0915	30.84	118.0	275		17.26	98	6.63	179.0	34.9	7.97	flow dropped
0920	30.60	128.8	125		17.72	102	6.64	165.1	34.9	7.88	flow dropped
0922	30.60	143.8	75								flow dropped
0923	30.66	158.5	50	1 gallon							flow dropped
0925	31.00	119.5	350		19.75	103	6.66	157.7	35.9	6.59	flushed pump
0930	30.71	119.5	200								flow stopped
0931	30.70	131.9	100		18.61	107	6.65	163.9	34.9	6.07	flow dropped
0933	30.74	142.3	125								flow stopped
0934	30.72	165.2	250								
0935	30.80	165.2	250	1.5 gallons	17.70	108	6.66	172.5	33.9	5.43	flow dropped
0936	30.80	167.5	175								flow stopped
0937	30.79	210.6	75	flush pump	4 times						
0940	30.90	118.7	200	2 gallons	20.36	103	6.63	164.5	34.9	4.87	flow dropped
0945	30.75	118.7	50		18.58	109	6.66	172.9	33.9	4.96	flow stopped
0950	30.82	163.7			17.20	109	6.66	182.1	33.9	4.21	flow stopped
1000	31.15	217.7	125	3 gallons							

NOTES:

SAMPLE TAKEN AT

0924 - Flushed pump 3 times - flow constantly decreasing w/increased pump speed - some recharge evident

0955 - Flow dropping, pump up to 275.8 w/no flow, then flow surged, pump seed turned down

YSI GROUP # 100 TURBIDITY GROUP # 75

GWM well # SHL-3 (Cont.)

SCREENED INTERVAL DEPTH: 25.1-35.1 feet (from top casing)

H2O LEVEL: PRE PUMP INSERTION 30.56 feet (from top casing)

POST PUMP INSERTIO 30.54 feet (from top casing)

DEPTH SAMPLED: 33.5 feet (from top casing)

DATE: 11/02/98 TIME: 0830

SAMPLED BY: S. Acone

RECORDED BY: S. Acone

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1001	30.61	217.7	50		17.68	107	6.67	181.6	33.9	4.87	Flow dropped
1002	30.68	277.4	100								
1005	30.71	277.6	150		18.23	109	6.66	182.3	33.9	3.91	
1010	Sample taken										

NOTES:

SAMPLE TAKEN AT 1010

YSI GROUP # 100 TURBIDITY GROUP # 75 SHEET 2 OF 2

GWM well # SHL-10

SCREENED INTERVAL DEPTH: 17.8 - 41.8 feet

H2O LEVEL: PRE PUMP INSERTION 31.20 feet

POST PUMP INSERTIO 31.20 feet

DEPTH SAMPLED: 37 feet

DATE: 11/02/98 TIME: 0930

SAMPLED BY: B. Waz

RECORDED BY:B. Waz

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1022	31.30	121.3	500		11.4	89.0	7.09	see note	43.1	9.4	
1025	31.30	121.3	500	1 gallon	12.95	86.0	7.03	below	43.1	4.7	
1028	31.30	121.3	500		13.95	85.0	7.00		44.1	3.6	
1031	31.30	121.3	500		14.84	85.0	6.98		44.1	2.6	
1033	31.30	121.3	500	2 gallons	15.14	85.0	6.96		44.1	2.0	
1036	31.30	121.3	500		15.25	85.0	6.95		44.1	2.0	
1039	31.30	121.3	350		15.36	85.0	6.95		44.1	2.1	Adjusted
1043	31.30	121.3			16.93	83.0	6.92		44.1		pump rate
1045	pump shut off										pump shut off
1050	31.30	121.3	600	3 gallons	14.32	85.0	7.01		44.1	3.0	
1053	31.30	121.3	600		13.82	84.0	6.95		43.1	3.5	
1056	31.30	121.3	600	4 gallons	14.18	84.0	6.94		43.1	3.2	
1059	31.30	121.3	600		14.09	85.0	6.93		44.1	2.6	
1101	31.30	121.3	600		14.38	86.0	6.93		44.1	1.8	
1104	31.30	121.3	600	5 gallons	14.68	87.0	6.93		44.1	1.8	
1107	31.30	121.3	600		14.74	88.0	6.93		44.1	1.6	
1110	31.30	121.3	600		14.73	88.0	6.93		44.1	1.0	
1113	31.30	121.3	600	6 gallons	14.77	89.0	6.93		44.1	1.1	
1116	31.30	121.3	600		14.84	89.0	6.93		44.1	1.0	

NOTES:

SAMPLE TAKEN AT 1120

Note: Disregard ORP readings - it was later found that ORP probe was off.

YSI GROUP # 108 TURBIDITY GROUP # 76

GWM well # SHL-19

SCREENED INTERVAL DEPTH: 17 - 32 feet

H2O LEVEL: PRE PUMP INSERTION 23.38 feet

POST PUMP INSERTION 23.39 feet

DEPTH SAMPLED: 27 feet

DATE: 11/02/98 TIME: 1050

SAMPLED BY: S. Simmer

RECORDED BY: S. Simmer

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1110	23.40	105.2	800		12.56	396	6.36	-10.4	26.7	228	very orange in color
1115	23.40	105.2	850	1 gallon	13.21	396	6.35	27.7	28.8	187	
1120	23.39	104.8	775		13.80	401	6.34	-3.4	29.8	162	orange color
1125	23.39	104.8	775	2 gallons	14.12	402	6.35	-4.7	29.8	117	
1130	23.39	104.8	775	3 gallons	14.28	399	6.34	-10.0	30.8	78	orange tint
1135	23.39	104.8	775	4 gallons	14.21	397	6.34	-12.7	29.8	67	
1138	23.39	104.8	775		14.09	397	6.33	-12.9	30.8	57	
1141	23.39	104.8	800	5 gallons	14.31	396	6.31	-8.8	30.8	40	
1144	23.39	104.8	775	6 gallons	14.36	395	6.32	31.3	30.8	36	
1147	23.39	104.8	775		14.42	395	6.32	-4.1	30.8	31	
1150	23.39	104.8	775	7 gallons	14.46	395	6.32	-7.9	30.8	29	
1153	23.39	104.8	775		14.42	395	6.31	-10.2	30.8	26	
1156	23.39	104.8	775	8 gallons	14.36	392	6.32	-12.0	30.8	23	
1159	23.39	104.8	775		14.30	391	6.31	-3.5	30.8	19	clear in color
1202	23.39	104.8	775	9 gallons	14.28	390	6.31	-10.6	30.8	20	
1205	23.39	104.8	775		14.21	391	6.32	-11.9	30.8	18	sample taken
	MS/MSD samples also taken										

NOTES:

SAMPLE TAKEN AT 1205

MS/MSD Samples taken at 1210

YSI GROUP # 100 TURBIDITY GROUP # 75

GWM well # SHL-4

SCREENED INTERVAL DEPTH: 5.7 - 15.7 feet

H2O LEVEL: PRE PUMP INSERTION 10.69 feet

POST PUMP INSERTIO 10.69 feet

DEPTH SAMPLED: 13 feet

DATE: 11/02/98 TIME: 1230

SAMPLED BY: B. Waz

RECORDED BY: B. Waz

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1315	10.80	71.5			13.64	700	4.51	see note	99.2		
1320	10.80	71.5	900	2 gallon	13.60	693	5.75	below	99.2	123.2	
1324	10.80	71.5	900	3 gallon	13.49	689	6.02		100.2	12.2	
1327	10.80	71.5	900		13.45	685	6.12		100.2	5.27	
1330	10.80	71.5	900	4 gallon	13.52	680	6.20		100.2	2.56	
1333	10.80	71.5	1000		13.41	675	6.21		100.2	1.67	
1336	10.80	71.5	950	5 gallon	13.42	671	6.22		100.2	1.17	
1339	10.80	71.5	1000	6 gallon	13.43	668	6.23		100.2	1.51	
1342	10.80	71.5	950		13.43	666	6.23		100.2	1.38	
1345	10.80	71.5	950		13.42	664	6.24		100.2	1.52	

NOTES:

SAMPLE TAKEN AT 1347

Note: Disregard ORP readings - it was later found that ORP probe was off.

YSI GROUP # 108 TURBIDITY GROUP # 76

GWM well # SHL-11

SCREENED INTERVAL DEPTH: 14.8 - 29.8 feet

H2O LEVEL: PRE PUMP INSERTION 18.90 feet

POST PUMP INSERTIO 18.90 feet

DEPTH SAMPLED: 25 feet

DATE: 11/02/98 TIME: 1315

SAMPLED BY: S. Simmer

RECORDED BY: S. Simmer

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1320	18.91	93.5	900	1 gallon	13.58	1170	5.85	13.5	38.0	36.0	Brown/Orange color
1325	18.92	93.1	875		14.43	1223	6.34	-41.6	42.0	23.0	
1330	18.91	93.1	850	2 gallons	14.65	1244	6.41	-55.4	41.0	12.0	
1335	18.91	93.1	850	3 gallons	14.73	1251	6.42	-60.3	42.0	7.1	clear in color
1340	18.91	93.1	850	4gallons	14.76	1270	6.43	-65.8	41.0	5.5	
1345	18.91	93.1	825	5 gallons						4.6	YSI readout stopped
1350	18.91	93.1	800	6 gallons	14.94	1274	5.86	-16.2	39.0	3.8	YSI reset - back on
1355	18.91	93.1	800	7 gallons	14.95	1271	6.39	-57.7	39.0	2.0	
1358	18.91	93.1	800		14.93	1261	6.41	-61.6	39.0	2.5	
1401	18.91	93.1	800	8 gallons	14.93	1263	6.43	-63.9	39.0	2.3	
1404	18.91	93.1	800	8.5 gallons	14.95	1260	6.43	-67.1	39.0	2.1	
1405											Sample taken

NOTES:

SAMPLE TAKEN AT 1405

YSI GROUP # 100 TURBIDITY GROUP #75

GWM well # SHL-20

SCREENED INTERVAL DEPTH: 41 - 51 feet

H2O LEVEL: PRE PUMP INSERTION 19.30 feet

POST PUMP INSERTION 19.30 feet

DEPTH SAMPLED: 46 feet

DATE: 11/02/98 TIME: 1345

SAMPLED BY: B. Waz

RECORDED BY: B. Waz

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1410	19.35	94.7	400	1 gallon	11.98	1300	6.34	see note	100.2	12.6	
1415	19.35	96.2	900		12.59	1325	6.45	below	100.2	8.1	
1418	19.35	96.2	900	2 gallon	12.83	1322	6.45		100.2	5.8	
1421	19.35	96.2	900	3 gallon	12.73	1324	6.46		100.2	6.7	
1424	19.35	96.2	900		12.76	1323	6.47		100.2	4.1	
1427	19.35	96.2	900	4 gallon	12.74	1321	6.47		100.2	3.3	
1430	19.35	96.2	900		12.78	1324	6.47		100.2	1.8	
1433	19.35	96.2	900	5 gallon	12.83	1324	6.47		100.2	1.9	
1436	19.35	96.2	900		12.74	1323	6.48		100.2	1.9	
1439	19.35	96.2	900	6 gallon	12.76	1324	6.48		100.2	1.8	
1442	19.35	96.2	900		12.78	1326	6.48		100.2	1.8	
1445	19.35	96.2	900	7 gallon	12.77	1327	6.48		100.2	1.6	
1448	19.35	96.2	900		12.78	1328	6.48		100.2	1.7	
1451	19.35	96.2	900	8 gallon	12.80	1327	6.48		100.2	1.3	
1454	19.35	96.2	900		12.73	1327	6.48		100.2	1.6	
1457	19.35	96.2	900	9 gallon	12.74	1329	6.48		100.2	1.7	

NOTES:

SAMPLE TAKEN AT 1500

Note: Disregard ORP readings - it was later found that ORP probe was off.

YSI GROUP # 108 TURBIDITY GROUP # 76

GWM well # SHM-93-22C

SCREENED INTERVAL DEPTH: 124.3 - 134.3 feet

H2O LEVEL: PRE PUMP INSERTION 8.48 feet

POST PUMP INSERTION 7.05 feet

DEPTH SAMPLED: 129 feet

DATE: 11/03/98 TIME: 0848

SAMPLED BY: D. Wood

RECORDED BY: D. Wood

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
0958	7.97	65.5	70								
1009	8.33	65.5	70								
1012	8.49	65.5	50		11.63	0.635	7.56	-66.7	4.41		
1017	8.53	65.5	30		11.80	0.637	7.52	-72.2	4.41		
1025	8.91	67.8	420	1 gallon							
1028	9.31	67.8	400								
1031	9.49	67.0	50		10.82	0.714	7.55	-101.3	4.20	1.7	
1036	9.52	66.3	50	1.1 gallon	10.76	0.715	7.56	-110.9	4.20	1.5	
1042	9.54				10.71	0.716	7.56	-113.4	4.20		very slow recharge
1054	9.83	69.2	230								(~ 50 ml/min)
1056	10.08	69.2	230	1.5 gallon	11.15	0.718	7.51	-90.5	4.10	1.2	
1101		69.2	120		11.07	0.715	7.42	-94.3	4.10		
1104	10.35	69.2	70		11.02	0.716	7.51	-105.1	4.10	0.9	
1107		69.2			10.92	0.716	7.54	-111.9	4.10	0.8	
1111	10.36	69.2	50	1.9 gallon	10.89	0.716	7.58	-113.5	4.10		
1114	10.36	69.2	50	1.95 gallon	10.84	0.716	7.58	-114.0	4.10	1.0	
1117	10.37	69.2	50		10.82	0.716	7.58	-113.2	4.10	0.9	
1124	10.39	69.2	50	2 gallons	10.92	0.716	7.59	-109.7	4.10	1.0	
1130	10.39	69.2	50		10.97	0.716	7.59	-106.5	4.10	1.0	
1135	10.39	69.2	50	2.1 gallons	11.02	0.716	7.59	-104.5	4.10	1.0	samples taken

NOTES:

SAMPLE TAKEN AT 1135

YSI GROUP # 100 TURBIDITY GROUP # 75

GWM well # SHM-96-22B

SCREENED INTERVAL DEPTH: 62.7 - 92.7 feet

H2O LEVEL: PRE PUMP INSERTION 7.24 feet

POST PUMP INSERTION 7.25 feet

DEPTH SAMPLED: 70 feet

DATE: 11/03/98 TIME: 0745

SAMPLED BY: D. Wood

RECORDED BY: D. Wood

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
0800	7.24										initial
0811	7.25										with pump
0816		84.2	700								
0819	7.27	84.2	700								
0822	7.27	84.2	750		10.60	1.069	8.52	322.0	5.63	5.0	
0827	7.27	84.2	750	2.2 gallons	10.91	1.070	9.82	249.3	5.63	4.2	
0831	7.27	84.2	750	3.0 gallons	10.97	1.068	9.96	227.3	5.43	4.1	
0834	7.27	84.2	750	3.3 gallons	10.97	1.069	10.04	211.2	5.33	4.4	
0837	7.27	84.3	750		11.00	1.067	10.09	198.0	5.33	4.4	
0841	7.27	84.3	750	4.5 gallons	11.01	1.064	10.10	184.7	5.02	5.0	
0845	7.27	84.3	750	5.0 gallons	11.03	1.063	10.14	173.4	5.02	5.3	
0848	7.27	84.3	750	6.0 gallons	11.06	1.064	10.11	165.7	4.92	4.8	
0851	7.27	84.3	750	6.7 gallons	11.04	1.065	10.13	157.0	4.92	4.3	
0856	7.27	84.3	750	7.4 gallons	11.09	1.068	10.13	148.3	4.82	4.5	
0900	7.27	84.3	750	8..0 gallons	11.10	1.066	10.14	140.1	4.82	4.2	
0903	7.27	84.3	750		11.10	1.067	10.13	134.9	4.71	4.4	
0909	7.27	84.3	750	9.5 gallons	11.12	1.067	10.15	125.1	4.71	4.8	
0912	7.27	84.3	750		11.12	1.000	10.14	120.7	4.71	4.8	
0918	7.27	84.3	750	12.0 gallons	11.17	1.071	7.07	-178.7	4.61	2.8	major chang in
0923	7.27	84.3	750		11.19	1.083	6.99	-163.3	4.61	2.1	color to green

NOTES:

YSI GROUP # 100 TURBIDITY GROUP # 75

GWM well # SHM-96-22B (Cont.)

SCREENED INTERVAL DEPTH: 62.7 - 92.7 feet

H2O LEVEL: PRE PUMP INSERTION 7.24 feet

POST PUMP INSERTION 7.25 feet

DEPTH SAMPLED: 70 feet

DATE: 11/03/98 TIME: 0745

SAMPLED BY: D. Wood

RECORDED BY: D. Wood

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
0927	7.27	84.2	750	13.5 gallons	11.20	1.084	6.99	-160.0	4.51	1.8	
0930	7.27	84.2	750		11.23	1.072	6.99	-155.7	4.41	1.6	
0933	7.27	84.2	750	14.7 gallons	11.22	1.073	6.98	-153.3	4.41	1.7	
0936	7.27	84.2	750	15.3 gallons	11.23	1.073	6.97	-152.5	4.31	1.5	
0939	7.27	84.2	750		11.22	1.077	6.96	-150.8	4.31	1.6	sample taken

NOTES:

SAMPLE TAKEN AT 0940

YSI GROUP # 100 TURBIDITY GROUP # 75 SHEET 2 OF 2

GWM well # SHL-22

SCREENED INTERVAL DEPTH: 106 - 116 feet

H2O LEVEL: PRE PUMP INSERTION 7.37 feet

POST PUMP INSERTION 7.20 feet

DEPTH SAMPLED: 111 feet

DATE: 11/03/98 TIME: 0800

SAMPLED BY: S. Acone

RECORDED BY: S. Acone

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
0812	7.72	66.6	500		10.41	711	4.59	see note	4.50	0.7	clear
0817	7.90	65.1	300		10.43	942	6.06	below	8.50	0.5	
0822	7.84	65.1	325		10.56	986	6.45		0.40	0.6	
0827	7.84	65.1	325		10.62	1006	6.59		1.00	0.5	
0832	7.84	65.1	325		10.66	1018	6.67		1.00	0.7	
0837	7.84	65.1	325		10.74	1020	6.49		1.00	0.5	
0842	7.84	65.1	325		10.76	1023	6.61		1.00	0.6	
0847	7.84	65.1	325	3 gallons	10.79	1034	6.72		0.92	0.7	
0850	7.84	65.1	325		10.79	1037	6.74		0.96	0.7	
0853	7.84	65.1	325		10.77	1031	6.75		0.94	0.6	
0856	7.84	65.1	325		10.79	1030	6.77		0.93	0.7	
0859	7.84	65.1	325		10.82	1030	6.77		0.91	0.7	
0902	7.84	65.1	325		10.83	1032	6.77		0.89	0.6	
0905	7.84	65.1	325	5 gallons	10.82	1034	6.77		0.88	0.7	
0908	7.84	65.1	325		10.84	1030	6.78		0.87	0.7	
0911	7.84	65.1	325		10.86	1033	6.78		0.86	0.8	
0914	7.84	65.1	325	6 gallons	10.85	1033	6.78		0.87	0.6	
0917	7.84	65.1	325		10.86	1033	6.78		0.86	0.7	

NOTES:

SAMPLE TAKEN AT 0920

Note: Disregard ORP readings - it was later found that ORP probe was off.

YSI GROUP # 108 TURBIDITY GROUP # 76

GWM well # SHL-9

SCREENED INTERVAL DEPTH: 15 - 25 feet

H2O LEVEL: PRE PUMP INSERTION 9.77 feet

POST PUMP INSERTIO 9.77 feet

DEPTH SAMPLED: 20 feet

DATE: 11/03/98 TIME: 1205

SAMPLED BY: D. Wood

RECORDED BY: D. Wood

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1200	9.77										initial
1205	9.77										start pump
1214	9.93	71.8	380								
1219	9.93	71.8	380		12.56	0.147	6.72	2.5	3.49		
1223	9.93	71.8	420		13.06	0.155	6.70	-11.2	3.49		
1226	9.93	71.8	420	1 gallon	13.37	0.161	6.70	-21.0	3.49	0.9	
1229	9.93	71.8	420		13.36	0.164	6.71	-23.0	3.49	0.7	
1232	9.93	71.8	420	1.7 gallon	13.36	0.166	6.67	-23.4	3.39	0.6	
1236	9.95	71.8	440		13.35	0.167	6.68	-25.1	3.39	0.5	
1240	9.95	71.8	440	2.4 gallon	13.34	0.168	6.69	-25.3	3.39	0.6	
1243	9.95	71.8	440	3.0 gallon	13.41	0.168	6.69	-27.5	3.39	0.5	
1245											take sample

NOTES:

SAMPLE TAKEN AT 1245

YSI GROUP # 100 TURBIDITY GROUP # 75

GWM well # SHL-5

SCREENED INTERVAL DEPTH: 5.1 - 15.1 feet

H2O LEVEL: PRE PUMP INSERTION 4.60 feet

POST PUMP INSERTION 4.52 feet

DEPTH SAMPLED: 10.5 feet

DATE: 11/03/98 TIME: 1245

SAMPLED BY: D. Wood

RECORDED BY: D. Wood

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1245	4.60										Initial
1255	4.52										with pump
1317	4.78	50.8	250								start pump
1324	4.79	50.8	250	0.3 gallon	12.58	0.127	5.70	95.4	3.39		
1327	4.79	50.8	250		12.87	0.132	5.80	86.5	3.39	1.3	
1330	4.79	50.8	250	0.6 gallon	13.72	0.136	5.83	83.8	3.39	0.9	
1333	4.79	50.8	250	0.8 gallon	14.58	0.138	5.85	70.2	3.39		
1336	4.80	50.8	250	1.0 gallon	14.88	0.139	5.85	67.4	3.29	0.8	
1339	4.81	50.8	250	1.1gallon	15.05	0.140	5.85	66.3	3.29	0.7	
1342	4.82	50.8	250	1.3gallon	15.11	0.141	5.85	66.9	3.29	0.6	
1345	4.82	50.8	200	1.4 gallon	15.07	0.142	5.85	62.7	3.39	0.6	
1348	4.83	50.8	200	1.5 gallon	15.24	0.142	5.86	61.3	3.39	0.5	
1350				1.7 gallon							sample taken

NOTES:

SAMPLE TAKEN AT 1350

YSI GROUP # 100 TURBIDITY GROUP # 75

GWM well # SHM-96-5C

SCREENED INTERVAL DEPTH: 50.8 - 60.8 feet

H2O LEVEL: PRE PUMP INSERTION 5.95 feet

POST PUMP INSERTION 5.95 feet

DEPTH SAMPLED: 55 feet

DATE: 11/04/98 TIME: 0915

SAMPLED BY: B. Waz

RECORDED BY: B. Waz

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1035	6.00	56.1	600	1 gallon	10.18	1.025	5.43	45.1	47.1	1.4	Water is very clear
1038	6.00	56.1	600		10.50	1.050	6.10	40.0	48.2	0.8	
1041	6.00	56.1	600		10.67	1.055	6.24	-3.9	48.2	0.7	
1044	6.00	56.1	600	2 gallon	10.84	1.063	6.34	-7.2	48.2	0.4	
1047	6.00	56.1	600		10.86	1.067	6.38	-8.6	48.2	0.5	
1049	6.00	56.1	600	3 gallon	10.90	1.067	6.41	-10.2	48.2	0.4	
1052	6.00	56.1	600		10.90	1.065	6.43	-10.5	47.1	0.5	
1055	6.00	56.1	600	4 gallon	10.90	1.066	6.43	-10.8	47.1	0.4	
1058	6.00	56.1	500		10.96	1.064	6.44	-10.9	47.1	0.4	
1101	6.00	56.1	500	5 gallon	10.95	1.067	6.45	-10.0	47.1	0.5	
1104	6.00	56.1	500		10.98	1.067	6.46	-9.1	47.1	0.4	
1107	6.00	56.1	500	6 gallon	10.97	1.066	6.45	-9.5	46.1	0.4	sample taken

NOTES:

SAMPLE TAKEN AT 1107

YSI GROUP # 100 TURBIDITY GROUP # 75

GWM well # SHM-96-5B

SCREENED INTERVAL DEPTH: 81.3 - 91.3 feet

H2O LEVEL: PRE PUMP INSERTION 6.49 feet

POST PUMP INSERTION 6.41 feet

DEPTH SAMPLED: 86 feet

DATE: 11/04/98 TIME: 1040

SAMPLED BY: B. Waz

RECORDED BY: B. Waz

US Army Corps of Engineers

Groundwater Sampling Log Sheet

Project Name: Shepley's Hill Landfill, Devens, MA

SAMPLE METHOD: *EPA LOW STRESS METHOD*

SAMPLE BOTLES: METALS/hardnss 1 - 1L HDPE (ph<2)

CYANIDE 1 - 500ml HDPE (ph>12) VOC'S 2 - 40ml VOA's (ph<2)

Anions,Alkalinity,TDS 1- 500ml HDPE COD 1 - 1L HDPE (ph<2)

BOD 1 - 1L HDPE TSS 1 - 1L HDPE

TIME 24hr	WATER DPTH BELOW MP feet	PUMP SETTING	PURGE RATE ml/min	CUM. VOLUME PURGED	H20 TEMP C	SPECIFIC CONDUCTANCE	pH	ORP/Eh mv	D. O. mg/L	TURBIDITY NTU's	COMMENTS
1133	6.90	59.5	600	1 gallon	10.60	1.053	6.04	0.2	46.1	82.0	Water is cloudy
1136	6.90	59.5	600		10.90	1.090	6.58	-44.6	46.1	87.0	
1139	6.90	59.5	600		11.00	1.099	6.73	-54.8	44.1	64.6	
1142	6.90	59.5	600	2 gallons	10.95	1.114	6.77	-57.3	45.1	48.2	
1145	6.90	59.5	600		11.00	1.101	6.80	-60.0	45.1	34.9	
1148	6.90	59.5	600	3 gallons	11.05	1.106	6.81	-61.0	45.1	26.6	
1151	6.90	59.5	600		11.18	1.105	6.82	-62.3	45.1	16.2	
1154	6.90	59.5	600		11.00	1.109	6.82	-63.3	44.1	14.3	
1157	6.90	59.5	600	4 gallons	10.94	1.107	6.82	-63.8	45.1	11.6	
1200	6.90	59.5	600		10.96	1.108	6.83	-63.8	42.0	11.8	
1203	6.90	59.5	600		10.96	1.109	6.83	-61.8	44.1	7.3	
1206	6.90	59.5	600	5 gallons	10.94	1.109	6.84	-59.6	44.1	6.3	
1209	6.90	59.5	600		10.94	1.109	6.84	-56.1	44.1	5.9	
1212	6.90	59.5	600		10.95	1.108	6.84	-55.8	44.1	5.1	
1215	6.90	59.5	600	6 gallons	10.96	1.109	6.84	-55.3	44.1	4.0	
1218	6.90	59.5	600		10.96	1.110	6.84	-56.7	44.1	3.9	
1221	6.90	59.5	600	7 gallons	10.97	1.108	6.85	-56.4	44.1	3.7	sample taken

NOTES:

SAMPLE TAKEN AT 1224 QA AND DUPLICATE SAMPLES ALSO TAKEN

EQUIPMENT BLANK SAMPLES WERE TAKEN AFTER EQUIPMENT WAS DECONTAMINATED FOLLOWING THIS WELL

YSI GROUP # 100 TURBIDITY GROUP # 75

APPENDIX D

CHAIN OF CUSTODY FORMS

U.S. ARMY CORPS OF ENGINEERS

CHAIN OF CUSTODY RECORD

000005

PROJ. NO. E0776 | PROJECT NAME Shgpley's Hill Land Fill

SAMPLERS: (Signature) Brian J. Wu

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	VOA - method 8240B	Metals - method 6010B (anions, alkalinity, hardness, TDS)	CYANIDE - method 9010B	COD - method HACH 8000	BOD - method 405.1	TSS - method 160.2	REMARKS
	5/11/98	1430		X	MW-SHL-SC-98-01	8	2	1	1	1	1	1	1	
	5/11/98	1430		X	MW-SHL-SB-98-01	8	2	1	1	1	1	1	1	
	5/11/98	1430		X	MW-SHL-DUP-98-01	8	2	1	1	1	1	1	1	
PM 5/11/98	~~5/11/98~~	~~1430~~		~~X~~	~~MW-SHL-SBQA-98-01~~	~~8~~								
	5/11/98	1550		X	MW-SHL-GB-98-01	8	2	1	1	1	1	1	1	
	5/11/98				TRIP BLANK	1	1							

Paul Young

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Paul Young	5/11/98 1900	Federal Express AirBill # 802443601799			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time: 5/12/98 1030	Remarks	

Distribution: Original Accompanies Shipment; Copy 1 to Sample Custodian; Copy 2 to Coordinator Field Files

0523

U.S. ARMY CORPS OF ENGINEERS

CHAIN OF CUSTODY RECORD

000006

PROJ. NO.	PROJECT NAME
E0776	Shepley's Hill LF

SAMPLERS: *(Signature)* Brian J. Wa

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	VOA - method 8260B	Metals - Methods 6010B	Cyanide - method 9010B	Nitrate, Alkalinity, TDS method 300	COD - method Hach 8000	BOD - method 405.1	TSS - method 160.2	REMARKS
	5/12/98	1320		X	MW-SHL-9-98-01	8	2	1	1	1	1	1	1	
	5/12/98	1320		X	MW-SHL-5-98-01	8	2	1	1	1	1	1	1	
	5/12/98	1500		X	MW-SHL-22B-98-01	8	2	1	1	1	1	1	1	
	5/12/98	1500		X	MW-SHL-22-98-01	8	2	1	1	1	1	1	1	
	5/12/98	1615		X	MW-SHL-22C-98-01	8	2	1	1	1	1	1	1	
	5/12/98			X	TRIP BLANK	1	1							

Paul Young

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Paul Young	5/12/98 1930	Federal Express AirBills 802443601814 - cooler 1 802443601803 - cooler 2			
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time: 5/13/98 0920	Remarks	

...ution: Original Accompanies Shipment; Copy 1 to Sample Custodian; Copy 2 to ...dinator Field Files

0529

U.S. Y CORPS OF ENGINEERS

CHAIN OF CUSTODY RECORD

000007

PROJ. NO. E0776

PROJECT NAME: Shapley's Hill Landfill

SAMPLERS: (Signature) S. P. Lamar / Brian J. Hay

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	VOA - method 8260B	metals, Hardness method 6010B	CYANIDE - method 9010B	NITRATE, Nitrate/nitrite method 353.2	TOC - method SM5310B	COD - method HACH 8000	BOD - method 405.1	TSS - method 160.2	REMARKS
	5/13/98	0900		X	MW-SHL-20-98-01	8	2	1	1	1	1	1	1	1	
	5/13/98	0900		X	MW-SHL-20MS-98-01	5	2	1	1	1					
	5/13/98	0900		X	MW-SHL-20MSD-98-01	4	2	1	1						
	5/13/98	0910		X	MW-SHL-11-98-01	8	2	1	1	1	1	1	1	1	
	5/13/98	1140		X	MW-SHL-19-98-01	8	2	1	1	1	1	1	1	1	
	5/13/98	1145		X	MW-SHL-4-98-01	8	2	1	1	1	1	1	1	1	
	5/13/98	1430		X	MW-SHL-3-98-01	8	2	1	1	1	1	1	1	1	
	5/13/98	1505		X	MW-SHL-10C-98-01	8	2	1	1	1	1	1	1	1	
	5/13/98	1530		X	MW-SHL-10-98-01	8	2	1	1	1	1	1	1	1	
	5/13/98			X	TRIP BLANK	1	1								

Paul Young

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Paul Young	5/13/98 1800	FEDERAL EXPRESS AIRBILL #'S COOLER 1 - 800991475504 COOLER 2 - 800991475526			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature) Shaun Rein	Date / Time 5/14/98 0930	Remarks	

Distribution: Original Accompanies Shipment; Copy 1 to Sample Custodian; Copy 2 to Coordinator Field Files

0527

Severn Trent Laboratories
55 South Park Drive, Colchester, VT 05446 Tel: (802) 655-1203

CHAIN OF CUSTODY RECORD

Report to:	Invoice to
Company: US ARMY CORPS OF ENGRS	Company:
Address: 696 VIRGINIA RD CONCORD MA 01742	Address:
Contact: MARIE WOJTAS	Contact:
Phone: 978-318-8175	Phone:
Fax: 978-318-8663	PO/SO #:
Contract/ Quote #: EQ776	

Sampler's Name: S. ARONE, S. SAWYER, B. WAZ
Sampler's Signature: S. Arone, S. Sawyer, B. Waz

Proj. No.: EQ776
Project Name: SHEPLEY'S HILL LTM-1M

ANALYSIS REQUESTED: VOCs-8260B; METALS-6010B, HARDNESS-130.2; CYANIDE-9010B; ANIONS-300, ALKALINITY-310.1, TDS-160.1; COD-HACH 8000; BOD-405.1; TSS-160.2

Lab use only
Due Date:

Temp. of coolers when received (C°): 1 | 2 | 3 | 4 | 5

Custody Seal N / Y
Intact N / Y

Screened For Radioactivity ☐

Matrix[1]	Date	Time	Comp	Grab	Identifying Marks of Sample(s)	No./Type of Containers[2] VOA	A/G 1 Lt.	250 ml	P/O	VOCs-8260B	METALS-6010B, HARDNESS-130.2	CYANIDE-9010B	ANIONS-300, ALKALINITY-310.1, TDS-160.1	COD-HACH 8000	BOD-405.1	TSS-160.2	Lab Sample ID (Lab Use Only)
W	11/2/98	1010		X	MW-SHL-3-98-02	2			6	2	1	1	1	1	1	1	
W	11/2/98	0955		X	MW-SHM-93-10C-98-02	2			6	2	1	1	1	1	1	1	
W	11/2/98	1120		X	MW-SHL-10-98-02	2			6	2	1	1	1	1	1	1	
W	11/2/98	1205		X	MW-SHL-19-98-02	2			6	2	1	1	1	1	1	1	
W	11/2/98	1210		X	MW-SHL-19-MS-98-02	2			3	2	1	1	1				
W	11/2/98	1210		X	MW-SHL-19-MSD-98-02	2			2	2	1	1					
W	11/2/98	1347		X	MW-SHL-4-98-02	2			6	2	1	1	1	1	1	1	
W	11/2/98	1405		X	MW-SHL-11-98-02	2			6	2	1	1	1	1	1	1	
W	11/2/98	1500		X	MW-SHL-20-98-02	2			6	2	1	1	1	1	1	1	
W	11/2/98	—		X	TRIP BLANK	1				1							

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
S. Arone	11/2/98	1540	FED EX #809195750040	11/2/98	1540
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date: 11/3/98	Time: 0930

Remarks: 2 COOLERS SHIPPED

Client's delivery of samples constitutes acceptance of Severn Trent Laboratories terms and conditions contained in the Price Schedule.

[1] Matrix: WW - Wastewater W - Water S - Soil SD - Solid L - Liquid A - Air Bag C - Charcoal tube SI - Sludge O - Oil

[2] Cont. VOA - 40 ml vial A/G - Amber / Or Glass 1 Liter 250 ml - Glass wi... uth P/O - Plastic or other 1 L 500 ml

STL cannot accept ... changes. Please Fax writte... nges to (802) 655-1248

Severn Trent Laboratories
55 South Park Drive, Colchester, VT 05446 Tel: (802) 655-1203

CHAIN OF CUSTODY RECORD

Report to:	Invoice to
Company: US ARMY CORPS OF ENGRS	Company:
Address: 696 VIRGINIA RD CONCORD MA 01742	Address:
Contact: MARIE VOUTAS	Contact:
Phone: 978-318-8175	Phone:
Fax: 978-318-8603	PO/SO #:
Contract/ Quote #: EØ776	

Sampler's Name: S. SCONE, S. SIMMER
Sampler's Signature: P. WOOD

Proj. No.: EØ776
Project Name: SHEPLEY'S HILL LTM & M

Matrix[1]	Date	Time	Comp	Grab	Identifying Marks of Sample(s)	No./Type of Containers[2] VOA	A/G 1 Lt.	250 ml	P/O	VOCs-8260B	METALS-6010B, HARDNESS-130.2	CYANIDE-9010B	ANIONS-300, ALKALINITY-310.1, TDS-160.1	COD-HACH 8000	BOD-405.1	TSS-160.2	Lab Sample ID (Lab Use Only)
W	11/3/98	0920		X	MW-SHL-22-98-02	2			6	2	1	1	1	1	1	1	
W	11/3/98	0940		X	MW-SHM-96-22B-98-02	2			6	2	1	1	1	1	1	1	
W	11/3/98	1135		X	MW-SHM-93-22C-98-02	2			6	2	1	1	1	1	1	1	
W	11/3/98	1245		X	MW-SHL-9-98-02	2			6	2	1	1	1	1	1	1	
W	11/3/98	1350		X	MW-SHL-5-98-02	2			5	2	1	1	1	1	1		
W	11/3/98	-		X	TRIP BLANK	1				1							

Lab use only
Due Date:

Temp. of coolers when received (C°): 1 | 2 | 3 | 4 | 5

Custody Seal N / Y
Intact N / Y

Screened For Radioactivity ☐

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
	11/3/98	1515	FEDEX #809195750061	11/3/98	1515
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	11-4-98	0915

Remarks: 1 COOLER

Client's delivery of samples constitutes acceptance of Severn Trent Laboratories terms and conditions contained in the Price Schedule.

[1] Matrix: WW - Wastewater W - Water S - Soil SD - Solid L - Liquid A - Air Bag C - Charcoal tube SL - Sludge O - Oil

[2] Container: VOA - 40 ml vial A/G - Amber / Or Glass 1 Liter 250 ml - Glass wide mouth P/O - Plastic or other 1 L 500 ml

STL cannot accept verbal changes. Please Fax written changes to (802) 655-1248

Severn Trent Laboratories
55 South Park Drive, Colchester, VT 05446 Tel: (802) 655-1203

CHAIN OF CUSTODY RECORD

50006-A

Report to:	Invoice to
Company: US ARMY CORPS OF ENGR'S	Company:
Address: 696 VIRGINIA RD CONCORD MA 01742	Address:
Contact: MARIE WOJTAS	Contact:
Phone: 978-318-8175	Phone:
Fax: 978-318-8663	PO/SO #:
Contract/ Quote #: E0776	

Sampler's Name: SCOTT ACONE, STEVE SIMMER, BRIAN WAZ
Sampler's Signature: SAconne, SSimmer, BWaz

Proj. No.: E0776
Project Name: SHEPLEY'S HILL LTM & M

ANALYSIS REQUESTED: VOCs - 8260B; METALS - 6010B, HARDNESS - 130.2; CYANIDE - 9010B; ANIONS - 300, ALKALINITY - 310.1, TDS - 160.1; COD - HACH 8000; BOD - 405.1; TSS - 160.2

Lab use only
Due Date:

Temp. of coolers when received (C°): 1 | 2 | 3 | 4 | 5

Custody Seal N / Y
Intact N / Y

Screened For Radioactivity ☐

Matrix[1]	Date	Time	Comp	Grab	Identifying Marks of Sample(s)	No./Type of Containers[2] VOA	A/G 1 Lt.	250 ml	P/O	Lab Sample ID (Lab Use Only)
W	11/3/98	1350		X	MW-SHL-5-98-02				1	
W	11/4/98	1107		X	MW-SHM-96-5C-98-02	2			6	
W	11/4/98	1224		X	MW-SHM-96-5B-98-02	2			6	
W	11/4/98	1235		X	MW-SHL-DUP-98-02	2			6	
W	11/4/98	1330		X	MW-SHL-EB-98-02	2			6	
W	11/4/98	-		X	TRIP BLANK	1				

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
SAconne	11/4/98	1400	FEDEX # 809195750072	11/4/98	1400
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
				11-5-98	0915

Remarks

Client's delivery of samples constitutes acceptance of Severn Trent Laboratories terms and conditions contained in the Price Schedule.

[1] Matrix: WW - Wastewater; W - Water; S - Soil; SD - Solid; L - Liquid; A - Air Bag; C - Charcoal tube; Sl - Sludge; O - Oil

[2] Conta... VOA - 40 ml vial; A/G - Amber / Or Glass 1 Liter; 250 ml - Glass wid... th; P/O - Plastic or other...

STL cannot accept ve... l changes. Please Fax written ...ges to (802) 655-1...

APPENDIX E

QUALITY ASSURANCE REPORTS

Chemical Quality Assurance Report
Spring 1998

SHEPLEY'S HILL LANDFILL LONG TERM MONITORING
DEVENS, MASSACHUSETTS

CHEMICAL QUALITY ASSURANCE REPORT
No. E0776-110998

PREPARED BY
THE
ENVIRONMENTAL ENGINEERING
AND
GEOLOGY SECTION
ENGINEERING/PLANNING DIVISION

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS

NOVEMBER 9, 1998

SHEPLEY'S HILL LANDFILL LONG TERM MONITORING
DEVENS, MASSACHUSETTS

CHEMICAL QUALITY ASSURANCE REPORT
No. E0776-110998

TABLE OF CONTENTS

Paragraph	Title	Page
	Executive Summary	1
	Table 1- Data Comparison Summary	2
	Table 2 - Analyses Performed by QA Laboratory	3
1.	QA sample shipping and chain-of-custody deficiencies	4
2.	Data comparison for volatiles by Method 8260	4-5
3.	Data comparison for metals by Method 6010 and 7470	5
4.	Data comparison for cyanide by Method 9010B	6
5.	Data comparison for anions by Method 300.0	6
6.	Data comparison for COD and BOD by Method 410.4 and 405.1	6-7
7.	Data comparison for alkalinity by Method 310.1	7
8.	Data comparison for hardness by Method 130.2	7-8
9.	Data comparison for TDS and TSS by Methods 160.1 and 160.2	8
10.	References	8
	Appendix A - Key to comments on Data Comparison Code	
	Appendix B - Data Comparison Tables	
	Appendix C - Custody Documentation	

SHEPLEY'S HILL LANDFILL LONG TERM MONITORING
DEVENS, MASSACHUSETTS

CHEMICAL QUALITY ASSURANCE REPORT
No. E0776-110998

Executive Summary

QA samples from one shipment for Shepley's Hill Landfill Long Term Monitoring, Devens, Massachusetts were analyzed by the QA laboratory, resulting in a total of 81 target analyte determinations. The data report from ITS (Intertek Testing Services) Environmental Laboratories, Inc., dated 04 June 1998 was used in the comparison. In 28 of these determinations analytes were detected by one or both laboratories. Results from the analysis of QA samples were compared with results from analysis of the corresponding primary samples (Reference 9a). The primary and QA samples agreed overall in 80 (99%) of the comparisons. Primary and QA samples agreed quantitatively in 27 out of 28 (96%) of the comparisons. Quantitative agreement represents only those determinations where an analyte was detected by at least one laboratory. There were major discrepancies between results from the primary and QA samples in 1 (1.2%) of the comparisons and no minor discrepancies in any of the comparisons. Refer to Table 1 for a QA split sample data comparison summary.

The QA laboratory's QC data contained all of the necessary information and a complete evaluation was performed. All of the data comparisons for Methods VOA's-8260, TAL Metals-6010, CN, Anions, COD, Alkalinity, Total Hardness, TDS and TSS were in 100% overall and quantitative agreement. The only major discrepancy that occurred in sample MW-SHL-5BQA-98-01 in which the QA laboratory reported BOD at 150 mg/L and the primary laboratory reported < 2.0 mg/L. The only explanation why there was such a major difference in the BOD levels could possibliy be due to contamination of the low flow sampling pump with isopropyl aclohol during the decontamination process. The pump is rinsed with isopropyl alcohol and then flushed with deionized water prior to sampling a new well. Trace amounts of isopropyl alcohol could have elevated the BOD result. Besides the BOD discrepancy, the quantitative results compared almost identically for all of the target analytes that were reported as hits.

The primary laboratory's data report contained all of the necessary information and a complete evaluation was performed. There were 47 volatile compounds that were analyzed by both laboratories. The comparison of the volatile target analytes detected by both laboratories was excellent in 14 out of 14 cases. The primary laboratory was requested to check their BOD data for a possible error, but no obvious errors were noted.

QA analyses were performed by Quanterra Environment, Services, West Sacramento, CA (see Table 2 for analyses performed by the QA lab). The primary laboratory was Intertek Testing Services Environmental Laboratories, Colchester, VT.

Table 1
Quality Assurance Split Sample
Data Comparison Summary

Project: Shepley's Hill Landfill Long Term Monitoring, Devens, Massachusetts

Test Parameter	Overall Agreement (1)		Quantitative Agreement (2)	
	Number	Percent	Number	Percent
VOC	47/47	100	6/6	100
METALS	23/23	100	14/14	100
CYANIDE	1/1	100	1/1	100
ANIONS	4/4	100	2/2	100
COD	1/1	100	1/1	100
BOD	0/1	0	0/1	0
ALKALINITY	1/1	100	1/1	100
HARDNESS	1/1	100	1/1	100
TDS	1/1	100	1/1	100
TSS	1/1	100	1/1	100
Total	80/81	99	27/28	96

NOTES:

(1) Represents the number and percentage agreement of all determinations including analytes not detected by either laboratory.

(2) Represents the number and percentage agreement of only those determinations where an analyte was detected by at least one laboratory.

TABLE 2

QA ANALYSES PERFORMED

SAMPLE ID	MATRIX	SAMPLE DATE	ANALYSIS
MW-SHL-5BQA-98-01	WATER	05/11/98	VOC,METALS,CN,ANIONS, COD,BOD,ALK,HARDNESS, TDS,TSS
TRIP BLANK	WATER	05/11/98	VOC

SHEPLEY'S HILL LANDFILL LONG TERM MONITORING
DEVENS, MASSACHUSETTS

CHEMICAL QUALITY ASSURANCE REPORT
No. E0776-110998

QA Findings

1. QA sample shipping and chain-of-custody deficiencies.

One shipment of QA samples was received by Quanterra Environmental Services on 05/12/98. Proper sample handling protocols were followed for this shipment except there was no cooler receipt form provided.

A copy of the chain-of-custody form document is appended to this report for reference.

2. Data comparison for volatiles (VOC) by Method 8260.

There were 47 volatile determinations. In six of these determinations, target analytes were detected by one or both laboratories. There was overall agreement in 47 (100%) of the cases and quantitative agreement in six out of six (100%) of the cases. No major or minor data discrepancies were noted.

The QA laboratory's QC data were within the acceptance limits for all of the target analytes and a complete evaluation was performed. The method blank and the trip blank were free of contamination above the reporting limit for all of the target analytes. All of the samples, LCS/LCSD's, method blank, and trip blank's surrogates recoveries were within the acceptance limits. All of the LCS/LCSD's target analytes were also within the acceptance limits for accuracy and precision. The QA laboratory only spiked five of the target analytes into the LCS/LCSD. All of the samples were analyzed within the required holding times.

The primary laboratory QC data contained all the necessary information and a complete evaluation was performed. The method blank and the trip blank were free of contamination above the laboratory reporting limit for all of the target analytes. The surrogates for both the samples and the laboratory QC were all within the acceptance limits. The primary laboratory reported that the MS/MSD's performed on sample MW-SHL-20-98-01 were within the acceptance limits for all 70 target analytes and only two out of 140 target analytes recoveries were outside the acceptance limits. Only the compound 2-chloroethyl vinyl ether, was outside the acceptance limit in the MS/MSD. This analyte was not found in any of the samples. All of the target analytes in the LCS were also within the acceptance limits. All of the sample were analyzed within the required holding times. The primary laboratory was also requested by the

USACE project chemist Marie Wojtas, to report the presents of tentatively identified compounds (TIC's) and report the sample ID and the number of TIC's in the case narrative. The following samples had tentatively identified compounds (TIC's):

MW-SHL-5B	2 early TIC's
MW-SHL-DUP	2 early TIC's
MW-SHL-EB	1 TIC's, isopropyl alcohol
MW-SHL-22B	1 early TIC
MW-SHL-22	2 early TIC's
MW-SHL-20	2 early TIC's
MW-SHL-11	1 early TIC

The only QA sample, MW-SHL-5B-98-01, was reported to contain two early TIC's in the total ion chromatogram. These two tentatively identified compounds would need further qualitative investigation by GC/MS to give a possible mass spectral library identification. Isopropyl alcohol in the MW-SHL-EB-98-01 (equipment blank) was most likely due to the field decontamination process.

3. Data comparison for TAL metals by Method 6010 and mercury by Method 7470.

There were 23 metals determinations. In 14 of these determinations, target analytes were detected by one or both laboratories. There was overall agreement in 23 (100%) of the cases and quantitative agreement in 14 out of 14 (100%) of the cases. No major or minor data discrepancies were noted.

The primary laboratory's QC data report contained all of the necessary QC information and a complete evaluation was performed. The method blanks were free of contamination above the reporting limit for all of the target analytes. The primary laboratory reported that the LCS recoveries were within the acceptance limits for all of the target analytes. All of the spike levels were appropriately indicated on the all of the QC reports. All of the samples were analyzed within the required holding times.

The QA laboratory's QC data were within the acceptance limits for all the target analytes and a complete evaluation was performed. The method blanks for both the water and the soil matrices were free of contamination above the reporting limits. The QA laboratory reported that the LCS/LCSD were within the acceptance limits for both accuracy and precision. All of the spike levels were appropriately indicated on all of the QC reports. The QA laboratory reported all of the metals by Method 6010 Trace-ICP, except for mercury which was analyzed by Method 7470-Hg Cold Vapor. All of the samples were analyzed within the required holding times.

4. Data comparison for total cyanide by Method 9010B.

There was one cyanide determination. There was 100% overall agreement in that cyanide was not detected by either laboratory. No major or minor data discrepancies were noted.

The primary laboratory's QC data were within the acceptance limits for cyanide and a complete evaluation was performed. The method blank was free of contamination above the laboratory reporting limit. The LCS's recovery was within the acceptance limits. The primary laboratory reported that the recovery of the low level independent calibration verification, at 77 percent, was below the laboratory control limits of 90 to 110 percent. This may indicate some low bias to the results. The sample was analyzed within the required holding time.

All of the QA laboratory's QC data were within acceptance limits and a complete evaluation was performed. The method blank was free of contamination above the laboratory's reporting limit. The LCS's recovery was within the acceptance limits. The QA laboratory analyzed the sample by modified Method 9012B, instead of Method 9010B as indicated on the chain of custody. The sample was analyzed within the required holding time.

5. The data comparison for anions by Method 300.0.

There were four anion determinations. In two of these determinations, target analytes were detected by one or both laboratories. There was overall agreement in four (100%) of the cases and quantitative agreement in two out of two (100%) of the cases. No major or minor data discrepancies were noted.

The QA laboratory's QC data were all within the acceptance limits and a complete evaluation was performed. The method blanks were free of contamination above the reporting limit for all of the target analytes. The LCS/LCSD were within the acceptance limits for both accuracy and precision and the spiking levels were also indicated. The MS/MSD were also within the acceptance limits for accuracy and precision for chloride, nitrate and sulfate. All of the samples were analyzed within the required holding times.

The primary laboratory's QC data were all within the acceptance limits and a complete evaluation was performed. The method blanks were free of contamination above the reporting limit for all of the target analytes. The LCS recoveries were within the acceptance limits. The primary laboratory did not report any MS/MSD results. All of the samples were analyzed within the required holding times.

6. Data comparison for COD by Method 410.4 and BOD by Method 405.1.

There was one COD and one BOD determination. In the COD determination, there was 100% overall and quantitative agreement. In the BOD determination there was zero out of one (0%) agreement and 0% quantitative agreement. The major BOD discrepancy occurred in sample

MW-SHL-5BQA-98-01 in which the QA laboratory reported the BOD result at 150 mg/L and the primary laboratory reported < 2.0 mg/L.

The primary laboratory's QC data were within the acceptance limits for all of the target analytes and a complete evaluation was performed. The method blank was free of contamination for both the COD and BOD results above the laboratory reporting limit. The LCS recoveries for COD and BOD were both within the acceptance limits. The primary laboratory did not report any MS/MSD's results. The samples were analyzed within the required holding times.

The QA laboratory's QC data were within the acceptance limits for all of the target analytes and a complete evaluation was performed. The method blank was free of contamination above the reporting limit. The LCS/LCSD's were within the acceptance limits for both accuracy and precision. All of the samples were analyzed within the required holding times of 48 hours. The QA laboratory's contracted lab (CLS Labs) reported a high result that may possibly be due to contamination of the low flow sampling pump with isopropyl alcohol during the decontamination process. Isopropyl alcohol was also detected as a TIC in a non-QA equipment rinse sample in the VOC analysis. This may be a possible explanation for this major discrepancy.

7. The data comparison for alkalinity by Method 310.1.

There was one alkalinity determination. In this one determination there was 100% overall and 100% quantitative agreement. No major or minor discrepancies were noted.

The QA laboratory's QC data was within the acceptance limit for alkalinity and a complete evaluation was performed. The method blank was free of contamination above the reporting limit. The QA laboratory reported that the LCS/LCSD's and the MS/MSD's were within the acceptance limits for both accuracy and precision. All of the samples were analyzed within the required holding times.

The primary laboratory's QC data was within the acceptance limit for alkalinity and a complete evaluation was performed. The method blank was free of contamination above the reporting limit. The primary laboratory reported that the LCS was within the acceptance limits. There was no MS/MSD data reported and no evaluation could be made on precision and accuracy. All of the samples were anlayzed within the required holding times.

8. Data comparison for total hardness by Method 130.2.

There was one hardness determination. In this one determination, there was 100% overall and 100% quantitative agreement. No major or minor discrepancies were noted.

The QA laboratory's QC data was within the acceptance limit for hardness and a complete evaluation was performed. The method blank was free of contamination above the reporting limit. The QA laboratory reported that the LCS/LCSD's and the MS/MSD's were

within the acceptance limits for both accuracy and precision. All of the samples were analyzed within the required holding times.

The primary laboratory's QC data was within the acceptance limit for alkalinity and a complete evaluation was performed. The method blank was free of contamination above the reporting limit. The primary laboratory reported that the LCS was within the acceptance limits. There was no MS/MSD data reported and no evaluation could be made on precision and accuracy. The primary laboratory analyzed for total hardness by method 314A instead of method 130.2 that was requested on the chain of custody. All of the samples were anlayzed within the required holding times.

9. Data comparison for TDS by Method 160.1 and TSS by Method 160.2.

There was one TDS and one TSS determination. In both the TDS and TSS determinations, there was 100% overall and quantitative agreement. No major or minor data discrepancies were reported.

The primary laboratory's QC data were within the acceptance limits for all of the target analytes and a complete evaluation was performed. The LCS recoveries for TDS and TSS were both within the acceptance limits. The samples were analyzed within the required holding times.

The QA laboratory's QC data were within the acceptance limits for all of the target analytes and a complete evaluation was performed. The method blanks for TDS and TSS were free of contamination above the laboratory reporting limit. The LCS/LCSD's were within the acceptance limits for both accuracy and precision. The QA laboratory reported that the matrix spike and the matrix duplicate for TDS were within the acceptance limits. Only a matrix duplicate was reported for the TSS and the replicates were within the acceptance limits. All of the samples were analyzed within the required holding times.

10. References.

a. Data Report for Shepley's Hill Landfill Long Term Monitoring, Devens, Massachusetts, prepared by, Intertek Testing Services, dated 4 June 1998.

b. EM 200-1-6, Chemical Quality Assurance for Hazardous, Toxic and Radioactive Waste (HTRW) Projects, dated 10 October 1997.

APPENDIX A
KEY TO COMMENTS ON DATA COMPARISON TABLES

0 - Data agrees if any one of the following apply:

- both values are less than respective detection limit (N<MDL)
- N_1<MDL_1 and N_2>MDL_2 but <MDL_1*
- both values are above respective detection limit (N>MDL) and difference between two values satisfies conditions below

For **all** analyses in a **water** matrix and for **metals** analysis in **soil**:
≤2X difference

For **all** other **soil** analyses:
≤4X difference

1 - Minor contamination by laboratory contaminant
2 - Not tested by both laboratories
3 - Minor data discrepancy, disagreement not serious, if any one of the following apply:

- N_1<MDL_1 and N_2>MDL_2 and the difference between values N_2 * does not exceed the upper limit (described below) defining a minor data discrepancy
- both values are above respective detection limit (N>MDL*) and conditions described below apply to the difference between the two values

For **all** analyses in a **water** matrix and for **metals** analysis in
soil:
2X<difference≤3X

For **all** other **soil** analyses:
4X<difference≤5X

4 - Major data discrepancy, disagreement serious, if any one of the following apply:

- N_1<MDL_1 and N_2>MDL_2 and the difference between values N_2 and MDL_1* exceeds the limit (described below) defining a major data discrepancy
- both values are above respective detection limit (N>MDL*) and conditions described below apply to the difference between the two values

For **all** analyses in a **water** matrix and for **metals** analysis in
soil:
>3X difference

. For **all** other **soil** analyses:
>5X difference

MDL = Method Detection Limit
N = Analytical result
* - not all < values are MDLs. Values which are not MDLs will be noted.

Key to data qualifiers:

B - detected in method blank
DO - Diluted out
J - estimated value, above MDL but below practical quantitation limit
NA - Not analyzed
ND - Not detected
NR - Not reported

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: Project No. E0776 Shepley's Hill Landfill

QA SAMPLE NO.:	099120-0001-SA	PRIMARY LAB ID NO.:	357538
QA FIELD ID:	MW-SHL-5BQA-98-01	CONTRACTOR'S FIELD ID:	MW-SHL-5B-98-01
QA ANALYSIS DATE:	5-24-98	PRIMARY LAB'S ANALYSIS DATE:	5-20-98
ANALYSIS METHOD:	8260B	ANALYSIS METHOD:	8260B
QA LABORATORY:	QUANTERRA	PRIMARY LABORATORY:	ITS

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 5-11-98
UNITS: ug/L

PARAMETER	QA LAB RL	RESULTS QA LAB	PRIMARY LAB RL	RESULTS PRIMARY LAB	COMPARISON CODE
Dichlorodifluoromethane		1.5	< 5.0		0
Chloromethane	< 1.0		< 5.0		0
Vinyl chloride	< 1.0		< 5.0		0
Bromomethane	< 1.0		< 5.0		0
Chloroethane		2.4	< 5.0		0
Trichlorofluoromethane	< 1.0		< 5.0		0
Acrolein	NR		< 10		
Feron TF	NR		< 5.0		
1,1-Dichloroethene	< 1.0		< 5.0		0
Acetone	< 10		< 10		0
Methyl Iodide	NR		< 10		
Carbon disulfide	NR		< 5.0		
Allyl Chloride	NR		< 10		
Methylene Chloride	< 1.0		< 5.0		0
Acrylonitrile	NR		< 10		
trans-1,2-Dichloroethene	< 1.0		< 5.0		0
1,2-Dichloroethene (total)	NR			3.0 J	
Methyl-t-Butyl Ether	NR			1.8 J	
1,1-Dichloroethane		2.5		2.7 J	0
Vinyl acetate	NR		< 10		
Chloroprene	NR		< 10		
cis-1,2-Dichloroethene		3.3		2.9 J	0
2-Butanone	< 10		< 10		0
Propionitrile	NR		< 10		
Methacrylonitrile	NR		< 5.0		
Bromochloromethane	< 1.0		< 5.0		0
Tetrahydrofuran	NR		< 250		
Chloroform	< 1.0		< 5.0		0
1,1,1-Trichloroethane	< 1.0		< 5.0		0
Carbon Tetrachloride	< 1.0		< 5.0		0
Isobutyl Alcohol	NR		< 250		
Benzene		1.4		1.5 J	0
1,2-Dichloroethane	< 1.0		< 5.0		0
Trichloroethene	< 1.0		< 5.0		0
1,2-Dichloropropane	< 1.0		< 5.0		0
Methyl Methacrylate	NR		< 5.0		
Dibromomethane	< 1.0		< 5.0		0
1,4-Dioxane	NR		< 250		
Bromodichloromethane	< 1.0		< 5.0		0
2-Chloroethyl Vinyl Ether	NR		< 10		
cis-1,3,-Dichloropropene	< 1.0		< 5.0		0
4-Methyl-2-pentaone	< 10		< 10		0
Toluene	< 1.0		< 5.0		0
trans-1,3-Dichloropropene	< 1.0		< 5.0		0
Ethyl Methacrylate	NR		< 10		
1,1,2-Trichloroethane	< 1.0		< 5.0		0

SEE APPENDIX A FOR KEY TO COMMENTS

COMPARISON OF QA & CONTRACTOR RESULTS- continued page 2.
PROJECT: Project No. E0776. Shepley's Hill Landfill

QA SAMPLE NO.:	099120-0001-SA	PRIMARY LAB ID NO.:	357538
QA FIELD ID:	MW-SHL-5BQA-98-01	CONTRACTOR'S FIELD ID:	MW-SHL-5B-98-01
QA ANALYSIS DATE:	5-24-98	PRIMARY LAB'S ANALYSIS DATE:	5-20-98
ANALYSIS METHOD:	8260B	ANALYSIS METHOD:	8260B
QA LABORATORY:	QUANTERRA	PRIMARY LABORATORY:	ITS

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 5-11-98
UNITS: ug/L

PARAMETER	QA LAB RL	RESULTS QA LAB	PRIMARY LAB QL	RESULTS PRIMARY LAB	COMPARISON CODE
Tetrachloroethene	< 1.0		< 5.0		0
2-Hexanone	NR		< 10		
Dibromochloromethane	< 1.0		< 5.0		0
1,2-Dibromoethane	< 1.0		< 5.0		0
Chlorobenzene	< 1.0		< 5.0		0
1,1,1,2-Tetrachloroethane	< 1.0		< 5.0		0
Ethyl Benzene	< 1.0		< 5.0		0
Xylene (total)	< 1.0		< 5.0		0
Styrene	< 1.0		< 5.0		0
Bromoform	< 1.0		< 5.0		0
Isopropylbenzene	< 1.0		< 5.0		0
cis-1,4-Dichloro-2-butene	NR		< 5.0		
1,1,2,2-Tetrachloroethane	< 1.0		< 5.0		0
1,2,3-Trichloropropane	< 1.0		< 5.0		0
trans-1,4-Dichloro-2-butene	NR		< 5.0		
1,3-Dichlorobenzene	< 1.0		< 5.0		0
1,4-Dichlorobenzene		1.2	< 5.0		0
1,2-Dichlorobenzene	< 1.0		< 5.0		0
1,2-Dibromo-3-Chloropropane	< 1.0		< 10		0
1,2,4-Trichlorobenzene	< 1.0		< 5.0		0
Hexachlorobutadiene	< 1.0		< 5.0		0
Naphthalene	< 1.0		< 5.0		0

SURROGATE RECOVERIES (%)

	QA		PRIMARY
1,2-Dichloroethane-d4 (75-121)	110	Toluene D8 (88-110)	100
Toluene-d8 (85-111)	108	1.2-Dichloroethane-d4 (72-141)	96
p-Bromofluorobenzene (81-117)	96	Bromofluorobenzene (72-122)	104
		1.2-Dichlorobenzene-d4 (69-124)	96

SEE APPENDIX A FOR KEY TO COMMENTS
* = SURROGATE RECOVERY OUTSIDE ACCEPTABLE RANGE
NR= NOT REPORTED

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: Project No. E0776 Shepley's Hill Landfill

QA SAMPLE NO.:	099120-0001-SA	PRIMARY LAB ID NO.:	357538
QA FIELD ID:	MW-SHL-5BQA-98-01	CONTRACTOR'S FIELD ID:	MW-SHL-5B-98-01
QA ANALYSIS DATE:	5-14-98;Hg-5-18-98	PRIMARY LAB'S ANALYSIS DATE:	5-15-98
ANALYSIS METHOD:	6010;Hg-7470	ANALYSIS METHOD:	6010;Hg-7470
QA LABORATORY:	QUANTERRA	PRIMARY LABORATORY:	ITS

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 5-11-98
UNITS: ug/L

PARAMETER	QA LAB RL	RESULTS QA LAB	PRIMARY LAB RL	RESULTS PRIMARY LAB	COMPARISON CODE
Aluminum	< 100			49.2	0
Antimony	< 5.0		< 10.7		0
Arsenic		4100		4300	0
Barium		61		63.5	0
Beryllium	< 2.0		< 0.30		0
Cadmium	< 2.0		< 0.70		0
Calcium		104000		108000	0
Chromium	< 5.0			3.3	0
Cobalt		17		16.6	0
Copper	< 10		< 3.4		0
Iron		35900		39700	0
Lead	< 3.0		< 2.6		0
Magnesium		15600		16400	0
Manganese		11000		10100	0
Mercury	< 0.20		< 0.10		0
Nickel		18		18.3	0
Potassium		9800		10600	0
Selenium	< 5.0			5.1	0
Silver	< 5.0		< 2.6		0
Sodium		42600		45700	0
Thallium	< 10		< 6.7		0
Vanadium	< 5.0		< 5.2		0
Zinc		32		39.9	0

SEE APPENDIX A FOR KEY TO COMMENTS

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: Project No. E0776 Shepley's Hill Landfill

QA SAMPLE NO.:	099120-0001-SA	PRIMARY LAB ID NO.:	357538
QA FIELD ID:	MW-SHL-5BQA-98-01	CONTRACTOR'S FIELD ID:	MW-SHL-5B-98-01
QA ANALYSIS DATE:	5-14-98	PRIMARY LAB'S ANALYSIS DATE:	5-13-98
ANALYSIS METHOD:	9012 Modified	ANALYSIS METHOD:	9010B
QA LABORATORY:	QUANTERRA	PRIMARY LABORATORY:	ITS

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 5-11-98
UNITS: ug/L

PARAMETER	QA LAB RL	RESULTS QA LAB	PRIMARY LAB RL	RESULTS PRIMARY LAB	COMPARISON CODE
Total Cyanide, CN	< 10		< 5.0		0

SEE APPENDIX A FOR KEY TO COMMENTS

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: Project No. E0776 Shepley's Hill Landfill

QA SAMPLE NO.:	099120-0001-SA	PRIMARY LAB ID NO.:	357538
QA FIELD ID:	MW-SHL-5BQA-98-01	CONTRACTOR'S FIELD ID:	MW-SHL-5B-98-01
QA ANALYSIS DATE:	5-12-98	PRIMARY LAB'S ANALYSIS DATE:	5-13-98
ANALYSIS METHOD:	Anions by 300.0	ANALYSIS METHOD:	Anions by 300.0
QA LABORATORY:	QUANTERRA	PRIMARY LABORATORY:	ITS

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 5-11-98
UNITS: mg/L

PARAMETER	QA LAB RL	RESULTS QA LAB	PRIMARY LAB RL	RESULTS PRIMARY LAB	COMPARISON CODE
Chloride, Cl		62.0		64.3	0
Nitrate, as N	< 0.050		< 0.1		0
Orthophosphate, as P	< 0.20		< 0.1		0
Sulfate, SO4		3.1		3.1	0

SEE APPENDIX A FOR KEY TO COMMENTS

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: Project No. E0776 Shepley's Hill Landfill

QA SAMPLE NO.:	099120-0001-SA	PRIMARY LAB ID NO.:	357538
QA FIELD ID:	MW-SHL-5BQA-98-01	CONTRACTOR'S FIELD ID:	MW-SHL-5B-98-01
QA ANALYSIS DATE:	5-15-98	PRIMARY LAB'S ANALYSIS DATE:	5-14-98
ANALYSIS METHOD:	410.4-COD	ANALYSIS METHOD:	410.4-COD
QA LABORATORY:	QUANTERRA	PRIMARY LABORATORY:	ITS

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 5-11-98
UNITS: mg/L

PARAMETER	QA LAB RL	RESULTS QA LAB	PRIMARY LAB RL	RESULTS PRIMARY LAB	COMPARISON CODE
Chemical Oxygen Demand (COD)		18.8		29	0

SEE APPENDIX A FOR KEY TO COMMENTS

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: Project No. E0776 Shepley's Hill Landfill

QA SAMPLE NO.:	099120-0001-SA	PRIMARY LAB ID NO.:	357538
QA FIELD ID:	MW-SHL-5BQA-98-01	CONTRACTOR'S FIELD ID:	MW-SHL-5B-98-01
QA ANALYSIS DATE:	5-14-98	PRIMARY LAB'S ANALYSIS DATE:	5-19-98
ANALYSIS METHOD:	310.1 Total Alkalinity as CaCO3	ANALYSIS METHOD:	310.1 Total Alkalinity as CaCO3
QA LABORATORY:	QUANTERRA	PRIMARY LABORATORY:	ITS

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 5-11-98
UNITS: mg/L

PARAMETER	QA LAB RL	RESULTS QA LAB	PRIMARY LAB RL	RESULTS PRIMARY LAB	COMPARISON CODE
Total Alkalinity as CaCO3		375		358	0

SEE APPENDIX A FOR KEY TO COMMENTS

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: Project No. E0776 Shepley's Hill Landfill

QA SAMPLE NO.:	099120-0001-SA	PRIMARY LAB ID NO.:	357538
QA FIELD ID:	MW-SHL-5BQA-98-01	CONTRACTOR'S FIELD ID:	MW-SHL-5B-98-01
QA ANALYSIS DATE:	5-14-98	PRIMARY LAB'S ANALYSIS DATE:	5-15-98
ANALYSIS METHOD:	314A Hardness as CaCO3	ANALYSIS METHOD:	130.2 Total Hardness as CaCO3
QA LABORATORY:	QUANTERRA	PRIMARY LABORATORY:	ITS

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 5-11-98
UNITS: mg/L

PARAMETER	QA LAB RL	RESULTS QA LAB	PRIMARY LAB RL	RESULTS PRIMARY LAB	COMPARISON CODE
Total Hardness as CaCO3		323		365	0

SEE APPENDIX A FOR KEY TO COMMENTS

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: Project No. E0776 Shepley's Hill Landfill

QA SAMPLE NO.:	099120-0001-SA	PRIMARY LAB ID NO.:	357538
QA FIELD ID:	MW-SHL-5BQA-98-01	CONTRACTOR'S FIELD ID:	MW-SHL-5B-98-01
QA ANALYSIS DATE:	5-18-98	PRIMARY LAB'S ANALYSIS DATE:	5-13-98
ANALYSIS METHOD:	NA	ANALYSIS METHOD:	405.1-BOD5
QA LABORATORY:	CLS-LABS	PRIMARY LABORATORY:	ITS

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 5-11-98
UNITS: mg/L

PARAMETER	QA LAB RL	RESULTS QA LAB	PRIMARY LAB RL	RESULTS PRIMARY LAB	COMPARISON CODE
Biological Oxygen Demand (BOD)		150	< 2.0		4

SEE APPENDIX A FOR KEY TO COMMENTS

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: Project No. E0776 Shepley's Hill Landfill

QA SAMPLE NO.:	099120-0001-SA	PRIMARY LAB ID NO.:	357538
QA FIELD ID:	MW-SHL-5BQA-98-01	CONTRACTOR'S FIELD ID:	MW-SHL-5B-98-01
QA ANALYSIS DATE:	5-15-98	PRIMARY LAB'S ANALYSIS DATE:	5-12-98 and 5-18-98
ANALYSIS METHOD:	160.1 (TDS) and 160.2 (TSS)	ANALYSIS METHOD:	160.1 (TDS) and 160.2 (TSS)
QA LABORATORY:	QUANTERRA	PRIMARY LABORATORY:	ITS

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 5-11-98
UNITS: mg/L

PARAMETER	QA LAB RL	RESULTS QA LAB	PRIMARY LAB RL	RESULTS PRIMARY LAB	COMPARISON CODE
Total Dissolved Solids (TDS by 160.1)		548		516	0
Total Suspended Solids (TSS by 160.2)		63.0		76.6	0

SEE APPENDIX A FOR KEY TO COMMENTS

U.S. A ' CORPS OF ENGINEERS

LXA ENG

CHAIN OF CUSTODY RECORD

PROJ. NO.	PROJECT NAME
E0776	SHEPLEY'S HILL LANDFILL

SAMPLERS (Signature) [signature]

STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	VOA - method 8260B	metals - method 6010B ANIONS; ALKALINITY; TDS method 300	CYANIDE - method 9010B	COD - method HACH 8000	BOD - method 405.1	TSS - method 160.2	REMARKS
	5/11/98	1430		X	MW-SHL-SBQA-98-01	8	2	1	1	1	1	1	1	
	5/11/98			X	TRIP BLANK	1	1							

Paul Young

Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Paul Young	5/11/98 1900	Federal Express AirBill 802443601788			
Relinquished by: (Signature)	Date / Time	Received by: (Signature)	Relinquished by: (Signature)	Date / Time	Received by: (Signature)
Relinquished by: (Signature)	Date / Time	Received for Laboratory by: (Signature)	Date / Time	Remarks	
		[signature]	05/12/98 11:30		

Distribution: Original Accompanies Shipment; Copy 1 to Sample Custodian; Copy 2 to Coordinator Field Files

Rec'd in good condition 05/12/98

0530

CHAIN-OF-CUSTODY

p1004

PROJECT NAME: US ARMY CORPS	***QUANTERRA*** *ENVIRONMENTAL SERVICES* 880 Riverside Parkway West Sacramento, CA 95605 Phone #: (916) 374-4362	**DUE:** 30 MAY 98 **TO:** Cal Lab Srvcs 3249 Fitzgerald Road Rancho Cordova, CA 95742
PO NUMBER: CONTACT PM		
PROJECT MANAGER: Diana Brooks		

SAMPLE DESCRIPTION	LAB ID	DATE	TIME	MATRIX	CONTAINERS	ANALYSES: BOD	REMARKS/ SPCL INSTR
MW-SHL-5BQA-98-01	099120-0001 SA	11 MAY 98	14:30	AQUEOUS	PB	X	

SIGNATURE	PRINT NAME	COMPANY/TITLE	DATE	TIME
Relinquished by:	Mary Dyas	Quantera WS	051298	1300
Received by:	Mike White	QES	5-12-98	1305
Relinquished by:	Mike White	QES	5-12-98	1350
Received by:	MARK THOMPSON	CLS	5-12-98	1350

Comments: PLEASE CONTACT DIANA BROOKS IF YOU HAVE ANY QUESTIONS. LOG 4630

Chemical Quality Assurance Report
Fall 1998

SHEPLEY'S HILL LANDFILL LONG TERM MONITORING
DEVENS, MASSACHUSETTS

CHEMICAL QUALITY ASSURANCE REPORT
No. E0776-031299

NOVEMBER 4, 1998 SAMPLING EVENT

PREPARED BY
THE
ENVIRONMENTAL ENGINEERING
AND
GEOLOGY SECTION
ENGINEERING/PLANNING DIVISION

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS

MARCH 12, 1999

SHEPLEY'S HILL LANDFILL LONG TERM MONITORING
DEVENS, MASSACHUSETTS
NOVEMBER 4, 1998 SAMPLING EVENT

CHEMICAL QUALITY ASSURANCE REPORT
No. E0776-031299

TABLE OF CONTENTS

Paragraph	Title	Page
	Executive Summary	1
	Table 1- Data Comparison Summary	2
	Table 2 - Analyses Performed by QA Laboratory	3
1.	QA sample shipping and chain-of-custody deficiencies	4
2.	Data comparison for volatiles by Method 8260	4-5
3.	Data comparison for metals by Method 6010 and 7470	5
4.	Data comparison for cyanide by Method 9010B	5-6
5.	Data comparison for anions by Method 300.0	6
6.	Data comparison for COD and BOD by Method 410.4 and 405.1	6-7
7.	Data comparison for alkalinity by Method 310.1	7
8.	Data comparison for hardness by Method 130.2	7
9.	Data comparison for TDS and TSS by Methods 160.1 and 160.2	8
10.	References	8
	Appendix A - Key to comments on Data Comparison Code	
	Appendix B - Data Comparison Tables	
	Appendix C - Custody Documentation	

SHEPLEY'S HILL LANDFILL LONG TERM MONITORING
DEVENS, MASSACHUSETTS
NOVEMBER 1998 SAMPLING EVENT

CHEMICAL QUALITY ASSURANCE REPORT
No. E0776-031299

Executive Summary

QA samples from one shipment for Shepley's Hill Landfill Long Term Monitoring, Devens, Massachusetts were analyzed by the QA laboratory, resulting in a total of 92 target analyte determinations. The shipment contained two QA water samples and was received in good condition. The data report from STL (Severn Trent Laboratories), dated 07 December 1998 was used in the comparison. In 21 of these determinations analytes were detected by one or both laboratories. Results from the analysis of QA samples were compared with results from analysis of the corresponding primary samples (Reference 10A). The primary and QA samples agreed overall in 92 (100%) of the comparisons. Primary and QA samples agreed quantitatively in 21 out of 21 (100%) of the comparisons. Quantitative agreement represents only those determinations where an analyte was detected by at least one laboratory. There were no major or minor discrepancies between results from the primary and QA samples in any of the comparisons. Refer to Table 1 for a QA split sample data comparison summary.

The QA laboratory's QC samples contained all of the necessary information and a complete evaluation was performed. All of the data comparisons for Methods VOA's-8260, TAL Metals-6010, CN, Anions, COD, BOD, Alkalinity, Total Hardness, TDS and TSS were in 100% overall and quantitative agreement. There were no major or minor data discrepancies noted in any of the analyzes performed. The quantitative results compared almost identically for all of the target analytes that were reported as hits. There was no bias to any of the sample results and the data appears to be complete and useable.

The primary laboratory's data report contained all of the necessary information and a complete evaluation was performed. As stated above, all of the data comparisons for all analyzes were in 100% overall and quantitative agreement. Several of the MS/MSD target analytes were slightly outside the acceptable limits for volatiles, but all of the LCS target analytes were within the acceptance limits. Since none of these matrix spike compounds were detected in the sample, it would have no impact on the sample results.

QA analyses were performed by Quanterra Environment, Services, West Sacramento, CA and CLS Labs, Rancho Cordova, CA (see Table 2 for analyses performed by the QA lab). The primary laboratory was Severn Trent Laboratories, Colchester, VT.

Table 1
Quality Assurance Split Sample
Data Comparison Summary

Project: Shepley's Hill Landfill Long Term Monitoring, Devens, Massachusetts

Test Parameter	Overall Agreement (1)		Quantitative Agreement (2)	
	Number	Percent	Number	Percent
VOC	63/63	100	5/5	100
METALS	18/18	100	9/9	100
CYANIDE	1/1	100	NA	NA
ANIONS	4/4	100	2/2	100
COD	1/1	100	1/1	100
BOD	1/1	100	NA	NA
ALKALINITY	1/1	100	1/1	100
HARDNESS	1/1	100	1/1	100
TDS	1/1	100	1/1	100
TSS	1/1	100	1/1	100
Total	92/92	100	21/21	100

NOTES:

(1) Represents the number and percentage agreement of all determinations including analytes not detected by either laboratory.

(2) Represents the number and percentage agreement of only those determinations where an analyte was detected by at least one laboratory.

TABLE 2

QA ANALYSES PERFORMED

SAMPLE ID	MATRIX	SAMPLE DATE	ANALYSIS
MW-SHM-96-5BQA-98-02	WATER	11/4/98	VOC,METALS,CN, ANIONS,COD,BOD,ALK, HARDNESS,TDS,TSS
TRIP BLANK	WATER	11/4/98	VOC

SHEPLEY'S HILL LANDFILL LONG TERM MONITORING
DEVENS, MASSACHUSETTS
NOVEMBER 1998 SAMPLING EVENT

CHEMICAL QUALITY ASSURANCE REPORT
No. E0776-110998

QA Findings

1. QA sample shipping and chain-of-custody deficiencies.

One shipment containing two QA water samples was received by Quanterra Environmental Services, West Sacramento, CA, on 11/5/98. Proper sample handling protocols were followed for this shipment except there was no cooler receipt form provided.

A copy of the chain-of-custody form document is appended to this report for reference.

2. Data comparison for volatiles (VOC) by Method 8260.

There were 63 volatile determinations. In five of these determinations, target analytes were detected by one or both laboratories. There was overall agreement in 63 (100%) of the cases and quantitative agreement in five out of five (100%) of the cases. No major or minor data discrepancies were noted.

The QA laboratory's QC samples were within the acceptance limits for all of the target analytes and a complete evaluation was performed. The method blank and the trip blank were free of contamination above the laboratory's reporting limit for all of the target analytes. All of the samples, LCS/LCSD's, method blank, and trip blank surrogates recoveries were within the laboratory's acceptance limits. All of the LCS/LCSD's target analytes were also within the acceptance limits for accuracy and precision. The QA laboratory only spiked five of the target analytes into the LCS/LCSD. The QA laboratory was not requested to perform MS/MSD's and no evaluation of matrix effects could be determined. All of the samples were analyzed within the required holding times.

The primary laboratory's QC samples contained all the necessary information and a complete evaluation was performed. The method blanks and the trip blanks were free of contamination above the laboratory reporting limit for all of the target analytes. The surrogates for both the samples and the laboratory's QC samples were all within the acceptance limits. The primary laboratory reported that the MS/MSD's performed on sample MW-SHL-19-98-02 were within the acceptance limits for all 84 target analytes for precision and twelve out of 168 target analytes recoveries were outside the acceptance limits for accuracy. All of the target analytes in

the LCS were recovered within the acceptance limits. All of the sampleS were analyzed within the required holding times. The primary laboratory was also requested by the USACE project chemist, Marie Wojtas, to report the number of tentatively identified compounds (TIC's) found in each sample and report the findings in the case narrative. The single QA sample had the following tentatively identified compounds:

MW-SHM-96-5B-98-02	ether and chlorofluoromethane

3. Data comparison for TAL metals by Method 6010 and mercury by Method 7470.

There were 18 metals determinations. In nine of these determinations, target analytes were detected by one or both laboratories. There was overall agreement in 18 (100%) of the cases and quantitative agreement in nine out of nine (100%) of the cases. No major or minor data discrepancies were noted.

The primary laboratory's QC data report contained all of the necessary QC information and a complete evaluation was performed. The method blanks were free of contamination above the reporting limit for all of the target analytes. The primary laboratory reported that the LCS recoveries were within the acceptance limits for all of the target analytes. The primary laboratory performed a matrix spike and a matrix duplicate on sample SHL-19-98-02. The matrix spike recoveries were all within the acceptance limits of 75-125% and the RPD's of the matrix duplicate were less than 20%. All of the spike levels were appropriately indicated on the all of the QC reports. All of the samples were analyzed within the required holding times.

The QA laboratory's QC data were within the acceptance limits for all the target analytes and a complete evaluation was performed. The method blanks for both the water and the soil matrices were free of contamination above the reporting limits. The QA laboratory reported that the LCS/LCSD were within the acceptance limits for both accuracy and precision. All of the spike levels were appropriately indicated on all of the QC reports. The QA laboratory reported all of the metals were analyzed by Method 6010 Trace-ICP, except for mercury, which was analyzed by Method 7470-Hg Cold Vapor. All of the samples were analyzed within the required holding times.

4. Data comparison for total cyanide by Method 9010B.

There was one cyanide determination. There was 100% overall agreement in that cyanide was not detected by either laboratory. No major or minor data discrepancies were noted.

The primary laboratory's QC data were within the acceptance limits for cyanide and a complete evaluation was performed. The method blank was free of contamination above the laboratory's reporting limit. The LCS's recovery was within the laboratory's acceptance limits. The matrix spike was recovered within the acceptance limits at 89.8%. The matrix duplicate and the original sample were reported below the laboratory's reporting limit. The sample was analyzed within the required holding time.

All of the QA laboratory's QC data were within acceptance limits and a complete evaluation was performed. The method blank was free of contamination above the laboratory's reporting limit. The LCS/LCSD's were within the acceptance limits for both accuracy and precision. The QA laboratory analyzed the sample by modified Method 9012B, instead of Method 9010B as indicated on the chain of custody. The sample was analyzed within the required holding time.

5. The data comparison for anions by Method 300.0.

There were four anion determinations. In two of these determinations, target analytes were detected by one or both laboratories. There was overall agreement in four (100%) of the cases and quantitative agreement in two out of two (100%) of the cases. No major or minor data discrepancies were noted.

The QA laboratory's QC data were all within the acceptance limits and a complete evaluation was performed. The method blanks were free of contamination above the reporting limit for all of the target analytes. The LCS/LCSD were within the acceptance limits for all of the target analytes for both accuracy and precision and the spiking levels were also indicated. All of the samples were analyzed within the required holding times.

The primary laboratory's QC data were all within the acceptance limits and a complete evaluation was performed. The method blanks were free of contamination above the reporting limit for all of the target analytes. The LCS recoveries were within the acceptance limits. The primary laboratory reported that the matrix spike and the matrix duplicate were within the acceptance limits for both accuracy and precision. All of the samples were analyzed within the required holding times.

6. Data comparison for COD by Method 410.4 and BOD by Method 405.1.

There was one COD and one BOD determination. In both the COD and BOD determinations, there was 100% overall and quantitative agreement. There were no major or minor data discrepancies noted.

The primary laboratory's QC samples were within the acceptance limits for all of the target analytes and a complete evaluation was performed. The method blank was free of contamination for both the COD and BOD results above the laboratory's reporting limit. The LCS recoveries for COD and BOD were both within the laboratory's acceptance limits. The primary laboratory did not report any MS/MSD's results. The samples were analyzed within the required holding times.

The QA laboratory's QC samples were within the acceptance limits for all of the target analytes and a complete evaluation was performed. The method blank was free of contamination above the reporting limit. The LCS/LCSD's were within the acceptance limits for both accuracy

and precision. The QA sample was analyzed within the required holding times of 48 hours. The QA laboratory's contracted lab (CLS Labs) performed the BOD analysis.

7. The data comparison for alkalinity by Method 310.1.

There was one alkalinity determination. In this determination, there was 100% overall and 100% quantitative agreement. No major or minor discrepancies were noted.

The QA laboratory's QC samples were within the acceptance limit for alkalinity and a complete evaluation was performed. The method blank was free of contamination above the reporting limit. The QA laboratory reported that the LCS/LCSD's and were within the acceptance limits for both accuracy and precision. There were no MS/MSD's performed for alkalinity and no evaluation of matrix effects could be determined. All of the samples were analyzed within the required holding times.

The primary laboratory's QC samples were within the acceptance limit for alkalinity and a complete evaluation was performed. The method blank was free of contamination above the reporting limit. The primary laboratory reported that the LCS was within the acceptance limits. There were no MS/MSD's performed for alkalinity and no evaluation of matrix effects could be determined. All of the samples were analyzed within the required holding times.

8. Data comparison for total hardness by Method 130.2.

There was one hardness determination. In this determination, there was 100% overall and 100% quantitative agreement. No major or minor discrepancies were noted.

The QA laboratory's QC samples were within the acceptance limit for hardness and a complete evaluation was performed. The method blank was free of contamination above the laboratory's reporting limit. The QA laboratory reported that the LCS/LCSD's were within the laboratory's acceptance limits for both accuracy and precision. All of the samples were analyzed within the required holding times.

The primary laboratory's QC samples were within the acceptance limit for alkalinity and a complete evaluation was performed. The method blank was free of contamination above the reporting limit. The primary laboratory reported that the LCS was within the laboratory's acceptance limits. There was no MS/MSD data reported and no evaluation of matrix effects could be determined. The primary laboratory analyzed for total hardness by method 314A instead of method 130.2 that was requested on the chain of custody. The different methodology performed did not appear to affect the comparison of the data. All of the samples were analyzed within the required holding times.

9. Data comparison for TDS by Method 160.1 and TSS by Method 160.2.

There was one TDS and one TSS determination. In both the TDS and TSS

determinations, there was 100% overall and quantitative agreement. No major or minor data discrepancies were reported.

The primary laboratory's QC samples were within the acceptance limits for all of the target analytes and a complete evaluation was performed. The LCS recoveries for TDS and TSS were both within the laboratory's acceptance limits. The samples were analyzed within the required holding times.

The QA laboratory's QC data were within the acceptance limits for all of the target analytes and a complete evaluation was performed. The method blanks for TDS and TSS were free of contamination above the laboratory's reporting limits. The LCS/LCSD's were within the acceptance limits for both accuracy and precision. The QA laboratory did not perform a MS/MSD and no evaluation of matrix effects could be determined. All of the samples were analyzed within the required holding times.

10. References.

a. Data Report for Shepley's Hill Landfill Long Term Monitoring, Devens, Massachusetts, prepared by Severn Trent Laboratories, dated 7 December 1998.

b. EM 200-1-6, Chemical Quality Assurance for Hazardous, Toxic and Radioactive Waste (HTRW) Projects, dated 10 October 1997.

APPENDIX A
KEY TO COMMENTS ON DATA COMPARISON TABLES

0 - Data agrees if any one of the following apply:

- both values are less than respective detection limit (N<MDL)
- N_1<MDL_1 and N_2>MDL_2 but <MDL_1*
- both values are above respective detection limit (N>MDL) and difference between two values satisfies conditions below

For **all** analyses in a **water** matrix and for **metals** analysis in **soil**:
≤2X difference

For **all** other **soil** analyses:
≤4X difference

1 - Minor contamination by laboratory contaminant
2 - Not tested by both laboratories
3 - Minor data discrepancy, disagreement not serious, if any one of the following apply:

- N_1<MDL_1 and N_2>MDL_2 and the difference between values N_2 * does not exceed the upper limit (described below) defining a minor data discrepancy
- both values are above respective detection limit (N>MDL*) and conditions described below apply to the difference between the two values

For **all** analyses in a **water** matrix and for **metals** analysis in
soil:
2X<difference≤3X

For **all** other **soil** analyses:
4X<difference≤5X

4 - Major data discrepancy, disagreement serious, if any one of the following apply:

- N_1<MDL_1 and N_2>MDL_2 and the difference between values N_2 and MDL_1* exceeds the limit (described below) defining a major data discrepancy
- both values are above respective detection limit (N>MDL*) and conditions described below apply to the difference between the two values

For **all** analyses in a **water** matrix and for **metals** analysis in
soil:
>3X difference

For **all** other **soil** analyses:
>5X difference

MDL = Method Detection Limit
N = Analytical result
* - not all < values are MDLs. Values which are not MDLs will be noted.

Key to data qualifiers:

B - detected in method blank
DO - Diluted out
J - estimated value, above MDL but below practical quantitation limit
NA - Not analyzed
ND - Not detected
NR - Not reported

APPENDIX B

DATA COMPARISON TABLES

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: SHEPLEY'S HILL LANDFILL, FALL 1998

QA SAMPLE No.:	302523-0001-SA	CONTRACTORS SAMPLE No.:	370932
QA FIELD ID:	MW-SHM-96-5BQA-98-02	CONTRACTORS FIELD ID:	MW-SHM-96-5B-98-02
QA ANALYSIS DATE:	11/18/98	CONTRACTOR'S ANALYSIS DATE:	11/6/98
QA LABORATORY:	QUANTERRA	CONTRACTOR'S LABORATORY:	STL
EXTRACTION METHOD:	5030B	EXTRACTION METHOD:	5030B
ANALYSIS METHOD:	8260B	ANALYSIS METHOD:	8260B

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 11/4/98
UNITS: ug/L

PARAMETER	QA LAB LRL	RESULTS QA LAB	CONTRACTOR LRL	RESULTS CONTRACTOR	COMPARISON CODE
Dichlorodifluoromethane	< 1.0		< 5.0		0
Chloromethane	< 1.0		< 5.0		0
Vinyl Chloride	< 1.0		< 5.0		0
Bromomethane	< 1.0		< 5.0		0
Chloroethane		2.6		3.8 J	0
Trichlorofluoromethane	< 1.0		< 5.0		0
Acrolein	NR		< 5.0		
Freon TF	NR		< 5.0		
1,1-Dichloroethene	< 1.0		< 5.0		0
Acetone	< 1.0		< 5.0		0
Methyl Iodide	NR		< 5.0		
Carbon Disulfide	NR		< 5.0		
Allyl Chloride	NR		< 5.0		
Methylene Chloride	< 1.0		< 5.0		0
Acrylonitrile	NR		< 5.0		
trans-1,2-Dichloroethene	< 1.0		< 5.0		0
1,2-Dichloroethene (total)	NR			3.2 J	
Methyl-t-Butyl Ether	NR		< 5.0		
1,1-Dichloroethane		2.5		2.6 J	0
Vinyl Acetate	NR		< 5.0		
Chloroprene	NR		< 5.0		
cis-1,2-Dichloroethene		2.8		3.0 J	0
2-Butanone	< 1.0		< 5.0		0
Proionitrile	NR		< 20		
Methacrylonitrile	NR		< 5.0		
Bromochloromethane	< 1.0		< 5.0		0
Tetrahydrofuran	NR		< 50		
Chloroform	< 1.0		< 5.0		0
1,1,1-Trichloroethane	< 1.0		< 5.0		0
Carbon Tetrachloride	< 1.0		< 5.0		0
Isobutyl Alcohol	NR		< 250		
Benzene		1.0	< 5.0		0
1,2-Dichloroethane	< 1.0		< 5.0		0
Trichloroethene	< 1.0		< 5.0		0
1,2-Dichloropropane	< 1.0		< 5.0		0
Methyl Methacrylate	NR		< 5.0		
Dibromomethane	< 1.0		< 5.0		0
1,4-Dioxane	< 1.0		< 250		0
Bromodichloromethane	< 1.0		< 5.0		0
2-Chloroethyl Vinyl Ether	NR		< 5.0		
cis-1,3-Dichloropropene	< 1.0		< 5.0		0

SEE APPENDIX A FOR KEY TO COMMENTS
NR=NOT REPORTED

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: SHEPLEY'S HILL LANDFILL, FALL 1998

QA SAMPLE No.:	302523-0001-SA	CONTRACTORS SAMPLE No.:	370932
QA FIELD ID:	MW-SHM-96-5BQA-98-02	CONTRACTORS FIELD ID:	MW-SHM-96-5B-98-02
QA ANALYSIS DATE:	11/18/98	CONTRACTOR'S ANALYSIS DATE:	11/6/98
QA LABORATORY:	QUANTERRA	CONTRACTOR'S LABORATORY:	STL
EXTRACTION METHOD:	5030B	EXTRACTION METHOD:	5030B
ANALYSIS METHOD:	8260B	ANALYSIS METHOD:	8260B

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 11/4/98
UNITS: ug/L

PARAMETER	QA LAB LRL	RESULTS QA LAB	CONTRACTOR LRL	RESULTS CONTRACTOR	COMPARISON CODE
4-Methyl-2-pentanone	< 1.0		< 5.0		0
Toluene	< 1.0		< 5.0		0
trans-1,3-Dichloropropene	< 1.0		< 5.0		0
Ethyl Methacrylate	NR		< 5.0		
1,1,2-Trichloroethane	< 1.0		< 5.0		0
Tetrachloroethene	< 1.0		< 5.0		0
2-Hexanone	NR		< 5.0		
Dibromochloromethane	< 1.0		< 5.0		0
1,2-Dibromoethane	< 1.0		< 5.0		0
Chlorobenzene	< 1.0		< 5.0		0
1,1,1,2-Tetrachloroethane	< 1.0		< 5.0		0
Ethylbenzene	< 1.0		< 5.0		0
Xylene (total)	< 1.0		< 5.0		0
Styrene	< 1.0		< 5.0		0
Bromoform	< 1.0		< 5.0		0
Isopropylbenzene	< 1.0		< 5.0		0
cis-1,4-Dichloro-2-butene	NR		< 5.0		
1,1,2,2-Tetrachloroethane	< 1.0		< 5.0		0
1,2,3-Trichloropropane	< 1.0		< 5.0		0
trans-1,4-Dichloro-2-butene	< 1.0		< 5.0		0
1,3-Dichlorobenzene	< 1.0		< 5.0		0
1,4-Dichlorobenzene	< 1.0		< 5.0		0
1,2-Dichlorobenzene	< 1.0		< 5.0		0
1,2-Dibromo-3-Chloropropane	< 1.0		< 5.0		0
1,2,4-Trichlorobenzene	< 1.0		< 5.0		0
Hexachlorobutadiene	< 1.0		< 5.0		0
Naphthalene	< 1.0		< 5.0		0
2,2-Dichloropropane	< 1.0		< 5.0		0
1,1-Dichloropropene	< 1.0		< 5.0		0
1,3-Dichloropropane	< 1.0		< 5.0		0
Bromobenzene	< 1.0		< 5.0		0
n-Propylbenzene	< 1.0		< 5.0		0
2-Chlorotoluene	< 1.0		< 5.0		0
4-Chlorotoluene	< 1.0		< 5.0		0
1,3,5-Trimethylbenzene	< 1.0		< 5.0		0
tert-Butylbenzene	< 1.0		< 5.0		0
1,2,4-Trimethylbenzene	< 1.0		< 5.0		0
sec-Butylbenzene	< 1.0		< 5.0		0
4-Isopropyltoluene	< 1.0		< 5.0		0
n-Butylbenzene	< 1.0		< 5.0		0
1,2,3-Trichlorobenzene	< 1.0		< 5.0		0

SURROGATE RECOVERIES (%)	QA		PRIMARY
1,2-Dichloroethane-d4 (75-121)	97	Toluene-d8 (88-110)	98
Toulene-d8 (85-111)	101	1,2-Dichloroethane-d4 (72-141)	94
p-Bromofluorobenzene (81-117)	95	Bromofluorobenzene (72-122)	92
		1,2-Dichlorobenzene-d4 (69-124)	100

SEE APPENDIX A FOR KEY TO COMMENTS
NR=NOT REPORTED
* = Surrogates outside of acceptable limits

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: SHEPLEY'S HILL LANDFILL, FALL 1998

QA SAMPLE No.:	302523-0001-SA	CONTRACTORS SAMPLE No.:	370932
QA FIELD ID:	MW-SHM-96-5BQA-98-02	CONTRACTORS FIELD ID:	MW-SHM-96-5B-98-02
QA ANALYSIS DATE:	11/17/98	CONTRACTOR'S ANALYSIS DATE:	11/8/98
QA LABORATORY:	QUANTERRA	CONTRACTOR'S LABORATORY:	STL
EXTRACTION METHOD:	3010A	EXTRACTION METHOD:	3010A
ANALYSIS METHOD:	6010B,Hg-7470A	ANALYSIS METHOD:	6010, Hg-7470

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 11/4/98
UNITS: ug/L

PARAMETER	QA LAB LRL	RESULTS QA LAB	CONTRACTOR LRL	RESULTS CONTRACTOR	COMPARISON CODE
Antimony	< 5.0		< 6.1		0
Arsenic		2700		3080	0
Barium		52.0		53.5 B	0
Beryllium	< 2.0		< 0.10		0
Cadmium	< 2.0		< 0.30		0
Chromium	< 5.0			3.7 B	0
Colbolt		15.0		16.2 B	0
Copper	< 10.0			2.4 B	0
Iron		25300		27600	0
Lead	< 3.0		< 2.0		0
Manganese		12400		13300	0
Mercury	< 0.20		< 0.10		0
Molybdenum	< 40.0			NR	
Nickel		18.0		12.4 B	0
Selenium	< 5.0		< 4.6		0
Silver	< 5.0		< 1.2		0
Thallium	< 10.0		< 5.2		0
Vanadium	< 5.0		< 2.3		0
Zinc		39.0		41.3	0

SEE APPENDIX A FOR KEY TO COMMENTS
NR=NOT REPORTED

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: SHEPLEY'S HILL LANDFILL, FALL 1998

QA SAMPLE No.:	302523-0001-SA	CONTRACTORS SAMPLE No.:	370932
QA FIELD ID:	MW-SHM-96-5BQA-98-02	CONTRACTORS FIELD ID:	MW-SHM-96-5B-98-02
QA ANALYSIS DATE:	11/11/98	CONTRACTOR'S ANALYSIS DATE:	11/8/98
QA LABORATORY:	QUANTERRA	CONTRACTOR'S LABORATORY:	STL
EXTRACTION METHOD:	NA	EXTRACTION METHOD:	NA
ANALYSIS METHOD:	9012 Modified	ANALYSIS METHOD:	9010B

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 11/4/98
UNITS: ug/L

PARAMETER	QA LAB LRL	RESULTS QA LAB	CONTRACTOR LRL	RESULTS CONTRACTOR	COMPARISON CODE
Cyanide (CN)	< 10.0		< 5.0		0

SEE APPENDIX A FOR KEY TO COMMENTS
NR=NOT REPORTED

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: SHEPLEY'S HILL LANDFILL, FALL 1998

QA SAMPLE No.:	302523-0001-SA	CONTRACTORS SAMPLE No.:	370932
QA FIELD ID:	MW-SHM-96-5BQA-98-02	CONTRACTORS FIELD ID:	MW-SHM-96-5B-98-02
QA ANALYSIS DATE:	11/5/98	CONTRACTOR'S ANALYSIS DATE:	11/12/98
QA LABORATORY:	QUANTERRA	CONTRACTOR'S LABORATORY:	STL
EXTRACTION METHOD:	NA	EXTRACTION METHOD:	NA
ANALYSIS METHOD:	300.0	ANALYSIS METHOD:	300.0

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 11/4/98
UNITS: mg/L

PARAMETER	QA LAB LRL	RESULTS QA LAB	CONTRACTOR LRL	RESULTS CONTRACTOR	COMPARISON CODE
Chloride,CL		60.1		65.0	0
Nitrate, as N	< 0.050		< 0.3		0
Orthophosphate, as P	< 0.20		< 0.3		0
Sulfate, SO4		3.5		3.6	0

SEE APPENDIX A FOR KEY TO COMMENTS
NR=NOT REPORTED

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: SHEPLEY'S HILL LANDFILL, FALL 1998

QA SAMPLE No.:	302523-0001-SA	CONTRACTORS SAMPLE No.:	370932
QA FIELD ID:	MW-SHM-96-5BQA-98-02	CONTRACTORS FIELD ID:	MW-SHM-96-5B-98-02
QA ANALYSIS DATE:	11/11/98	CONTRACTOR'S ANALYSIS DATE:	11/11/98
QA LABORATORY:	QUANTERRA	CONTRACTOR'S LABORATORY:	STL
EXTRACTION METHOD:	NA	EXTRACTION METHOD:	NA
ANALYSIS METHOD:	410.4-COD	ANALYSIS METHOD:	410.4-COD

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 11/4/98
UNITS: mg/L

PARAMETER	QA LAB LRL	RESULTS QA LAB	CONTRACTOR LRL	RESULTS CONTRACTOR	COMPARISON CODE
Chemical Oxygen Demand (COD)		21.0		26	0

SEE APPENDIX A FOR KEY TO COMMENTS
NR=NOT REPORTED

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: SHEPLEY'S HILL LANDFILL, FALL 1998

QA SAMPLE No.:	302523-0001-SA	CONTRACTORS SAMPLE No.:	370932
QA FIELD ID:	MW-SHM-96-5BQA-98-02	CONTRACTORS FIELD ID:	MW-SHM-96-5B-98-02
QA ANALYSIS DATE:	11/10/98	CONTRACTOR'S ANALYSIS DATE:	11/4/98
QA LABORATORY:	CLS Labs	CONTRACTOR'S LABORATORY:	STL
EXTRACTION METHOD:	NA	EXTRACTION METHOD:	NA
ANALYSIS METHOD:	405.1 BOD5	ANALYSIS METHOD:	405.1 BOD5

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 11/4/98
UNITS: mg/L

PARAMETER	QA LAB LRL	RESULTS QA LAB	CONTRACTOR LRL	RESULTS CONTRACTOR	COMPARISON CODE
Biological Oxygen Demand (5 Day)	< 3.0		< 2.0		0

SEE APPENDIX A FOR KEY TO COMMENTS
NR=NOT REPORTED

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: SHEPLEY'S HILL LANDFILL, FALL 1998

QA SAMPLE No.:	302523-0001-SA	CONTRACTORS SAMPLE No.:	370932
QA FIELD ID:	MW-SHM-96-5BQA-98-02	CONTRACTORS FIELD ID:	MW-SHM-96-5B-98-02
QA ANALYSIS DATE:	11/10/98	CONTRACTOR'S ANALYSIS DATE:	11/9/98
QA LABORATORY:	QUANTERRA	CONTRACTOR'S LABORATORY:	STL
EXTRACTION METHOD:	NA	EXTRACTION METHOD:	NA
ANALYSIS METHOD:	310.1 Total Alkalinity as CaCO3	ANALYSIS METHOD:	310.1 Alkalinity as CaCO3

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 11/4/98
UNITS: mg/L

PARAMETER	QA LAB LRL	RESULTS QA LAB	CONTRACTOR LRL	RESULTS CONTRACTOR	COMPARISON CODE
Total Alkalinity as CaCO3		390		384	0

SEE APPENDIX A FOR KEY TO COMMENTS
NR=NOT REPORTED

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: SHEPLEY'S HILL LANDFILL, FALL 1998

QA SAMPLE No.:	302523-0001-SA	CONTRACTORS SAMPLE No.:	370932
QA FIELD ID:	MW-SHM-96-5BQA-98-02	CONTRACTORS FIELD ID:	MW-SHM-96-5B-98-02
QA ANALYSIS DATE:	11/17/98	CONTRACTOR'S ANALYSIS DATE:	11/9/98
QA LABORATORY:	QUANTERRA	CONTRACTOR'S LABORATORY:	STL
EXTRACTION METHOD:	NA	EXTRACTION METHOD:	NA
ANALYSIS METHOD:	314A Hardness as CaCO3	ANALYSIS METHOD:	130.2 Hardness as CaCO3

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 11/4/98
UNITS: mg/L

PARAMETER	QA LAB LRL	RESULTS QA LAB	CONTRACTOR LRL	RESULTS CONTRACTOR	COMPARISON CODE
Total Hardness as CaCO3		342		370	0

SEE APPENDIX A FOR KEY TO COMMENTS
NR=NOT REPORTED

COMPARISON OF QA & CONTRACTOR RESULTS
PROJECT: SHEPLEY'S HILL LANDFILL, FALL 1998

QA SAMPLE No.:	302523-0001-SA	CONTRACTORS SAMPLE No.:	370932
QA FIELD ID:	MW-SHM-96-5BQA-98-02	CONTRACTORS FIELD ID:	MW-SHM-96-5B-98-02
QA ANALYSIS DATE:	11/9/98	CONTRACTOR'S ANALYSIS DATE:	11/9/98
QA LABORATORY:	QUANTERRA	CONTRACTOR'S LABORATORY:	STL
EXTRACTION METHOD:	NA	EXTRACTION METHOD:	NA
ANALYSIS METHOD:	160.1 and 160.2	ANALYSIS METHOD:	160.1 and 160.2

MATERIAL DESCRIPTION: WATER
DATE SAMPLED: 11/4/98
UNITS: mg/L

PARAMETER	QA LAB LRL	RESULTS QA LAB	CONTRACTOR LRL	RESULTS CONTRACTOR	COMPARISON CODE
Total Dissolved Solids (TDS by 160.1)		542		521	0
Total Suspended Solids (TSS by 160.2)		51.0		50.8	0

SEE APPENDIX A FOR KEY TO COMMENTS
NR=NOT REPORTED

APPENDIX C

SAMPLE RECEIPT & CUSTODY DOCUMENTATION

[redacted] [redacted]

Chain of Custody Record

Quanterra

QUA-4124 0797

Client: US ARMY CORPS OF ENGR'S	Project Manager: MARIE WOJTAS	Date: 11/4/98	Chain of Custody Number: 10544
Address: 696 VIRGINIA RD	Telephone Number (Area Code)/Fax Number: 978-318-8175 FAX 978-318-8663	Lab Number:	Page 1 of 1
City: CONCORD; State: MA; Zip Code: 01742	Site Contact: S. ADONE; Lab Contact: DIANA BROOKS		
Project Name: SHEPLEY'S HILL LTM 1M	Carrier/Waybill Number: 805936690552		
Contract/Purchase Order/Quote No.			

Sample I.D. No. and Description (Containers for each sample may be combined on one line)	Date	Time	Matrix: Aqueous	Sed.	Soil	Containers & Preservatives: Unpres	H2SO4	HNO3	HCl	NaOH	ZnAc/NaOH	Analysis: VOC-8260B	6010B, 130.2	CYANIDE 9010B	300, 310.1, 160.1	COD-HACH8000	BOD-405.1	TSS-160.2	Special Instructions/ Conditions of Receipt
MW-SHM-96-5BQA-98-02	11/4/98		X			3	1	1	2	1		2	1	1	1	1	1	1	Received in good Condition! MED 110598
TRIP BLANK	11/4/98	—	X						1			1							

S. Adone

Possible Hazard Identification: ☐ Non-Hazard ☐ Flammable ☐ Skin Irritant ☐ Poison B ☐ Unknown

Sample Disposal: ☐ Return To Client ☐ Disposal By Lab ☐ Archive For ______ Months (A fee may be assessed if samples are retained longer than 3 months)

Turn Around Time Required: ☐ 24 Hours ☐ 48 Hours ☐ 7 Days ☐ 14 Days ☐ 21 Days ☐ Other ______

QC Requirements (Specify)

	Date	Time		Date	Time
1. Relinquished By: S. C. Adone	11/4/98	1305	1. Received By: FED EX # 805936690552		
2. Relinquished By			2. Received By: M C Dyer	110598	10:15
3. Relinquished By			3. Received By		

Comments: USE ENCLOSED FED-EX AIRBILL TO RETURN COOLER

DISTRIBUTION: WHITE - Stays with the Sample; CANARY - Returned to Client with Report; PINK - Field Copy

CHAIN-OF-CUSTODY

P7989

PROJECT NAME: USACOE

PO NUMBER: CONTACT PM

PROJECT MANAGER: Diana Brooks

QUANTERRA *ENVIRONMENTAL SERVICES*
880 Riverside Parkway
West Sacramento, CA 95605

Phone #: (916) 374-4362

DUE: 23 NOV 98
TO: Cal Lab Srvcs
3249 Fitzgerald Road
Rancho Cordova, CA 95742

SAMPLE DESCRIPTION	LAB ID	DATE	TIME	MATRIX	CONTAINERS	ANALYSES: BOD	REMARKS/ SPCL INSTR
MW-SHM-96-5BQA-98-02	302523-0001 SA	04 NOV 98	12:35	AQUEOUS	PB	X	

SIGNATURE	PRINT NAME	COMPANY/TITLE	DATE	TIME
Relinquished by:	Diana Brooks	Quanterra / PM	11/5/98	1340
Received by:				
Relinquished by:	M. White	QES	11-5-98	1415
Received by:	M Thompson	CLS	11-5-98	1415

Comments: PLEASE CONTACT DIANA BROOKS IF THERE ARE ANY QUESTIONS. Log # 5013

373 4/96 CMD

ADD TO CLS

Quanterra Environmental Services

PROJECT RECEIPT CHECKLIST

QES West Sacramento

CLIENT US ARMY CORPS / CONCORD - SHEPLEY'S HILL LOG # 54-31

PROJECT# (LIMS ID) 302523 PROJECT COPIED 99120

LOCATION(S) W20B VC

		Initials	Date
DATE RECEIVED 110598	TIME RECEIVED 0945	MCD	110598

DELIVERED BY
- ☒ FEDEX
- ☐ CA OVERNIGHT
- ☐ CLIENT
- ☐ AIRBORNE
- ☐ GOLDENSTATE
- ☐ DHL
- ☐ UPS
- ☐ BAX GLOBAL
- ☐ GO-GETTERS
- ☐ QES COURIER
- ☐ OTHER _____

CUSTODY SEAL STATUS ☒ INTACT ☐ BROKEN ☐ N/A

CUSTODY SEAL #(S) None

SHIPPPING CONTAINER(S) ☐ QUANTERRA ☒ CLIENT ☐ N/A

TEMPERTURE RECORD (IN °C)

COC #(S) 10544

TEMPERATURE BLANK NA

AMBIENT TEMPERATURE 5°C

pH MEASURED ☒ YES ☐ ANOMALY ☐ N/A MC

LABELED BY..... MEG

LABELS CHECKED BY.....

SHORT HOLD TEST NOTIFICATION

SAMPLE RECEIVING
- WETCHEM ☐ N/A NV

☐ METALS NOTIFIED OF FILTER/PRESERVE VIA VERBAL & EMAIL ☐ N/A MDL

☐ COMPLETE SHIPMENT RECEIVED IN GOOD CONDITION WITH APPROPRIATE TEMPERATURES, CONTAINERS, PRESERVATIVES ☐ N/A

☐ ANOMALIES ☐ TEMPERATURE EXCEEDED (2 °-6 °C) ☒ N/A

☐ WET ICE ☐ BLUE ICE

☐ NO COOLING AGENTS USED ☐ PM NOTIFIED

LEAVE NO SPACES BLANK. USE "N/A" IF NOT APPLICABLE. INITIAL AND DATE ALL "N/A" ENTRIES.

APPENDIX F

GROUNDWATER ANALYTICAL DATA

APPENDIX G

REFERENCES

APPENDIX G

REFERENCES

Stone & Webster Environmental Technology & Services, 1996. *Long Term Monitoring and Maintenance Plan, Shepley's Hill Landfill,* Fort Devens, Massachusetts. Prepared for the U.S. Army Corps of Engineers, New England Division. March.

Stone & Webster Environmental Technology & Services, 1997. *Shepley's Hill Landfill, Annual Report 1996* , Devens, Massachusetts. Prepared for the U.S. Army Corps of Engineers, New England Division. April

Stone & Webster Environmental Technology & Services, 1998. *Final Five Year Review, Shepley's Hill Landfill, Long Term Monitoring,* Devens, Massachusetts. Prepared for the U.S. Army Corps of Engineers, New England District. August

Harding Lawson Associates, 1999. *Final Work Plan – Supplemental Groundwater Investigation at Shepley's Hill Landfill,* Devens Reserve Forces Training Area, Devens, Massachusetts. Prepared for the U.S. Army Corps of Engineers, New England District. February

U.S. Environmental Protection Agency (USEPA) Region 1, 1996. *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples From Monitoring Wells,* SOP #: GW 0001, Revision 2. July 30.

ABB Environmental Services, Inc. (ABB-ES), 1993. *Final Remedial Investigation Addendum Report,* Fort Devens Feasibility Study for Group 1A Sites. Prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland. Portland, Maine. December.

ABB Environmental Services, Inc. (ABB-ES), 1995a. *Final Feasibility Study, Shepley's Hill Landfill Operable Unit,* Fort Devens Feasibility Study for Group 1A Sites. Prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland. Portland, Maine. September.

ABB Environmental Services, Inc. (ABB-ES), 1995b. *Record of Decision, Shepley's Hill Landfill Operable Unit,* Fort Devens Feasibility Study for Group 1A Sites. Prepared for the U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland. Portland, Maine. September.

APPROXIMATELY 800 LF OF DRAINAGE SWALE AREA WAS REGRADED TO ABOUT 15 FEET WIDTH (SIDE SLOPES AND BOTTOM SWALE INCLUDED). FILTER FABRIC WAS PLACED ON REGRADED AREAS AND 6"-10" RIPRAP WAS PLACED ON TOP OF THE FILTER FABRIC TO A DEPTH OF 12"-15".

EROSION DOWNSTREAM OF RIPRAP AREA WAS BACKFILLED AND REGRADED WITH STONE DUST. ADDITIONAL FILTER FABRIC WAS PLACED AND 6"-10" STONE RIPRAP EXTENDED OVER THE FILTER FABRIC.

INSTALLATION OF NEW RIPRAP CURB IN THE DRAINAGE DITCH WHICH LEADS TO PLOW SHOP POND. THE LAST 200 FEET AT THE DOWNSTREAM END OF THE DRAINAGE SWALE SHOWED SEVERE EROSION ON THE SOUTHERN BANK WHICH SEPERATED THE STORMWATER DRAIN AND THE LANDFILL DRAINAGE SWALE. THIS BANK WAS RECONSTRUCTED AND COMPACTED, TOPSOILED AND EROSION CONTROL MATS WERE PLACED ON THE BANK.

SEVERAL EROSIONAL CHANNELS REPAIRED.

RESTORED ENTIRE ACCESS ROAD AND REGRADED WHERE NEEDED. APPROXIMATELY 1 MILE OF ROADWAY WAS UPGRADED BY PLACING 6 INCHES OF 3/4" CRUSHED STONE WITH UP TO 3 INCHES OF GRADED BASE STONE ON TOP FOR AN AVERAGE WIDTH OF 10 FEET. EXISTING TIRE RUTS WERE LEVELED AND REGRADED.

AREA REGRADED AND RESEEDED.

CROSS OVER RAMP INSTALLED.

APPROXIMATELY 800 LF OF DRAINAGE SWALE IN THE SANDY AREA WAS REGRADED. FLOW DIRECTION WAS CONTROLLED BY RESHAPING THE CURVE TO PREVENT SUPERCRITICAL FLOWS AND THEREBY EROSIN OF SANDY BANKS. THREE TREES WERE RELOCATED OUTSIDE THE BOUNDARY OF THE LANDFILL. FILTER FABRIC WAS PLACED ALONG THE ENTIRE LENGTH OF THE DRAINAGE SWALE ON THE BOTTOM AND 1'-2' OF EITHER SIDESLOPE. 6"-10" STONE RIPRAP WAS PLACED TO A DEPTH OF 12"-15" OVER THE FABRIC AND 6' OF THE SIDE SLOPES.

N

NOTES:

1. THE LOCATIONS OF SHM-96-5B, SHM-96-5C AND SHM-96-22B ARE APPROXIMATED.
2. VARIOUS ANIMAL BURROWS WERE REPAIRED.
3. SELECTED AREAS OF CAP WERE REVEGETATED.
4. LANDFILL VEGETATIVE COVER WAS MOWED.

HORIZONTAL DATUM: MASSACHUSETTS PLANE COORDINATE SYSTEM MAINLAND ZONE (NAD 1983)

VERTICAL DATUM: NGVD 1929

0 200 400 FEET
1" - 200'-0" HORIZONTAL

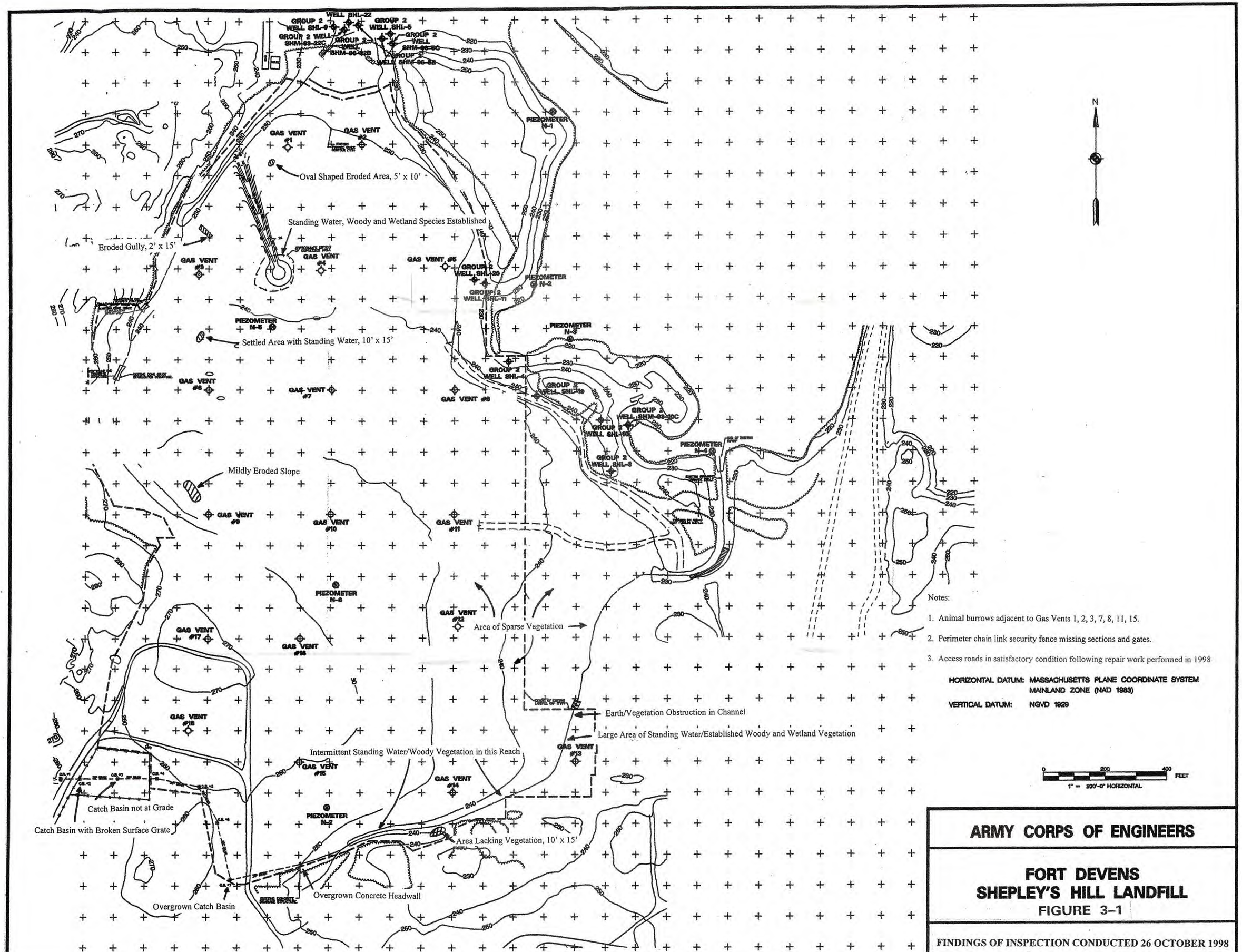
ARMY CORPS OF ENGINEERS

FIGURE 2-1
FORT DEVENS
SHEPLEY'S HILL LANDFILL REPAIRS

STONE & WEBSTER ENVIRONMENTAL TECHNOLOGY & SERVICES
BOSTON, MASSACHUSETTS

REVISED BY COE, NAE 3/99

FILE 1 2 3 4 DATE 1



Notes:

1. Animal burrows adjacent to Gas Vents 1, 2, 3, 7, 8, 11, 15.
2. Perimeter chain link security fence missing sections and gates.
3. Access roads in satisfactory condition following repair work performed in 1998

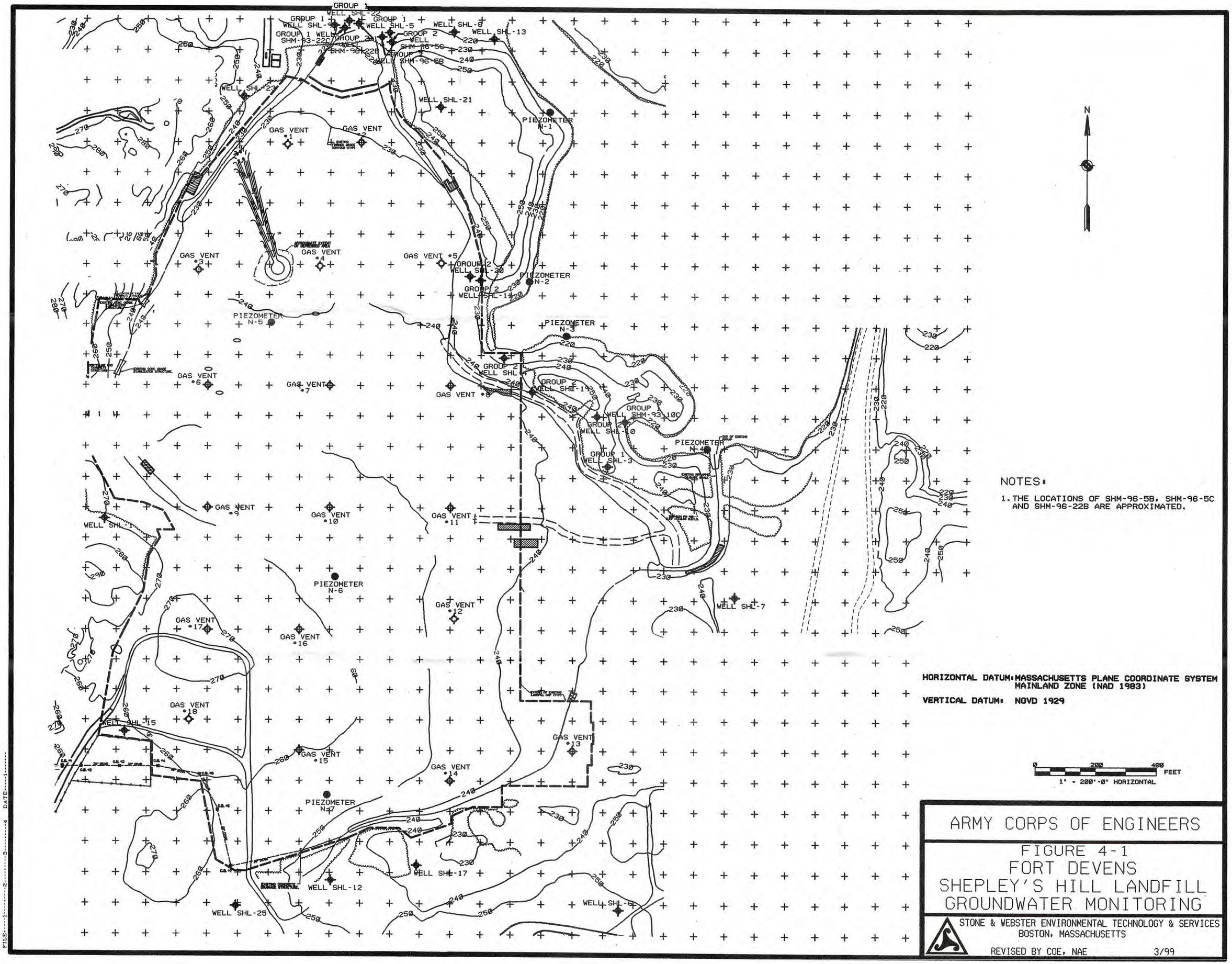
HORIZONTAL DATUM: MASSACHUSETTS PLANE COORDINATE SYSTEM MAINLAND ZONE (NAD 1983)

VERTICAL DATUM: NGVD 1929

ARMY CORPS OF ENGINEERS

FORT DEVENS
SHEPLEY'S HILL LANDFILL
FIGURE 3-1

FINDINGS OF INSPECTION CONDUCTED 26 OCTOBER 1998



NOTES:

1. THE LOCATIONS OF SHM-96-5B, SHM-96-5C AND SHM-96-22B ARE APPROXIMATED.

HORIZONTAL DATUM: MASSACHUSETTS PLANE COORDINATE SYSTEM MAINLAND ZONE (NAD 1983)

VERTICAL DATUM: NGVD 1929

0 200 400 FEET

1" = 200'-0" HORIZONTAL

ARMY CORPS OF ENGINEERS

FIGURE 4-1
FORT DEVENS
SHEPLEY'S HILL LANDFILL
GROUNDWATER MONITORING

STONE & WEBSTER ENVIRONMENTAL TECHNOLOGY & SERVICES
BOSTON, MASSACHUSETTS

REVISED BY COE, NAE 3/99

FILE----1----2----3----4 DATE----1----