

U.S. Army Corps of Engineers New England District

FINAL
2005 ANNUAL REPORT
AREAS OF CONTAMINATION 32 AND 43A
LONG-TERM GROUNDWATER MONITORING

DEVENS, MASSACHUSETTS

CONTRACT GS-10F-0157K DELIVERY ORDER NO. W912WJ-05-F-0036

Prepared for:

U.S. Army Corps of Engineers New England District Concord, Massachusetts

Prepared by:

MACTEC Engineering and Consulting, Inc. Portland, Maine

MARCH 2007

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March 19, 2007

Mr. Randy Godfrey
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SUBJECT:

Final 2005 Annual Report

Areas of Contamination 32 and 43A Long-Term Groundwater Monitoring

Devens, Massachusetts

Dear Mr. Godfrey:

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Stanley W/Reed, P.E.

Principal Engineer

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Senior Scientist

W

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EXECUTIVE SUMMARY

This annual report documents the results of long-term monitoring activities performed in 2005 at Areas of Contamination (AOCs) 32 and 43A at Devens, Massachusetts (the former Fort Devens). Fort Devens was identified for cessation of operations and closure under Public Law 101-510, the Defense Base Closure and Realignment Act of 1990 (BRAC Act, or BRAC), and was officially closed in September 1996. AOCs 32 and 43A are located in Transfer Lot 10, an area transferred to MassDevelopment and redeveloped as a warehouse in 2001.

AOCs 32 and 43A are historically contaminated locations in the northeast portion of what was the Main Post at the former Fort Devens, near the intersection of Cook and Market Streets and just south of Shepley's Hill Landfill. AOC 32 comprises the former Defense Reutilization and Marketing Office (DRMO) West Yard, East Yard, Tire Recycling Yard, office, and warehouse. The DRMO East Yard and office are now covered by the northern third of the current warehouse. The primary contaminants at AOC 32 are detected in groundwater in the vicinity of the former location of waste oil underground storage tank (UST) No. 13 and consist of chlorobenzene, dichlorobenzenes, trichloroethene (TCE), and volatile petroleum hydrocarbons. The former location of UST No. 13 lies above the eastern portion of a north-south trending bedrock ridge beneath the warehouse. UST No. 13 was installed just above shallow bedrock. There is no overburden aquifer at the former location of UST No.13, and contamination extends into bedrock.

AOC 43A, the former Petroleum, Oil, and Lubricants (POL) Storage Area, is located adjacent to AOC 32. AOC 43A is mostly covered by the western third of the warehouse and paved areas west of the warehouse. Contaminants historically detected at the POL area include total petroleum hydrocarbons, TCE, benzene, toluene, ethylbenzene, and xylene. Arsenic and manganese have also been detected above cleanup goals and may be attributed to reducing conditions caused by the contaminants. AOC 43A lies to the west of the bedrock ridge. Bedrock is deeper at AOC 43A than at AOC 32, and the water table at AOC 43A lies within overburden materials.

The U.S. Army Corps of Engineers – New England District collected groundwater elevation data in June and October 2005 at a total of 27 monitoring wells at AOCs 32 and 43A to aid in assessing groundwater flow and contaminant migration. Analytical samples were collected at nine AOC 32 and nine AOC 43A monitoring wells. Interpretive groundwater elevation contours based on 2005 data indicate contaminant migration potential is to the east in the vicinity of UST No. 13 before turning north to northeast with regional flow. At AOC 43A, contaminant migration potential is interpreted to be southerly near the northwest corner of the warehouse before turning to the southwest and west across the southern end of Shepley's Hill and along a westward trending bedrock trough. Bedrock groundwater flow at AOC 43A is interpreted to be to the southwest. It should be noted however, that actual bedrock groundwater flow directions at both AOCs are determined by both hydraulic gradients and fracture orientation. These interpretations are consistent with the conceptual site model for the sites.

Analytical samples collected at AOC 32 monitoring wells showed persistent exceedances of cleanup goals at monitoring well 32M-01-18XBR, located immediately south of the UST No. 13 tank grave, although dichlorobenzene concentrations were lower in October 2005 than in several previous sampling events. This decrease in contaminant concentrations is encouraging; however, continued sampling is necessary to determine whether this is part of a trend or, alternately, reflective of groundwater and sampling/analysis variability. The only other AOC 32 exceedances were for arsenic, lead, and manganese in well pair 32M-01-14XOB/-14XBR approximately 180 feet northeast of the UST No. 13 tank grave. Arsenic, lead, and manganese have not been shown to be associated with UST 13, and their source has not been identified.

High arsenic and manganese concentrations could be associated with reducing conditions created by degrading organic material. No contaminant exceedances were noted in other AOC 32 monitoring wells, several of which are located in the vicinity of 32M-01-18XBR and the former location of UST No. 13. These wells show no evidence of the migration of contaminants away from the UST No. 13 area at levels of concern.

Because analytical samples collected at AOC 43A in June, similar to samples collected in 2003, and 2004, did not show any cleanup goal exceedances, AOC 43A samples were not collected in October 2005, in accordance with the recommendation of the 2004 annual report.

Groundwater flow directions interpreted from 2005 data appear consistent with historical interpretations in spite of recent construction at Transfer Lot 10 and use of a different array of monitoring wells from which to collect data.

In addition to the monitoring well inspection performed during sampling activities, AOC 32 and 43A monitoring wells were inspected in detail in December 2005 and January 2006 to identify maintenance needs and priorities. The inspection identified the need for several new road boxes and other maintenance items. Maintenance activities were performed in January 2006 and included replacing or resetting the road boxes and/or surface seal for 12 wells. In addition, the internal riser of one well was repaired, and three wells were redeveloped.

Recommendations for 2006 sampling consist of the following:

- Discontinue sampling for chemical analysis at SHL-15 and 32M-92-01X, but retain for groundwater elevation measurements.
- With the exception of SHL-15 and 32M-92-01X, continue monitoring contaminant trends, seasonal effects, and geochemical trends (dissolved oxygen, oxidationreduction potential) in the same wells monitored in October 2005.
- With the exception of SHL-15 and 32M-92-01X, continue semiannual sampling frequency in the same wells monitored in October 2005.
- Complete preparation of an updated Long-term Monitoring Plan for the combined sites to reflect the warehouse post-construction conditions.
- Measure groundwater elevations at all AOC 32 and 43A wells for use in plotting groundwater contours and evaluating flow directions.

1.0 INTRODUCTION

This annual report documents the results of long-term monitoring activities performed in 2005 at Areas of Contamination (AOCs) 32 and 43A, Devens, Massachusetts. Long-term monitoring activities were completed by the U.S. Army Corps of Engineers (USACE) - New England District in accordance with the Record of Decision (ROD) (Horne, 1998), and the approved Long-Term Monitoring Plans (LTMPs) (SWETS, 2001a, 2001b). MACTEC Engineering and Consulting, Inc. (MACTEC) prepared this annual report as a component of Contract GS-10F-0157K, Delivery Order W912WJ-05-F-0036, under the direction of the USACE - New England District. This annual report covers June and October 2005 sampling events.

Fort Devens was identified for cessation of operations and closure under Public Law 101-510, the Defense Base Closure and Realignment Act of 1990 (BRAC Act, or BRAC), and was officially closed in September 1996. Portions of the property formerly occupied by Fort Devens were retained by the Army and renamed the Devens Reserve Forces Training Area (RFTA). Areas not retained as part of the Devens RFTA were, or are in the process of being transferred to new owners for reuse and redevelopment. AOCs 32 and 43A are located in Transfer Lot 10, an area transferred to MassDevelopment and redeveloped as a warehouse in 2001. Because residual groundwater contamination remains at AOC 32, the Army continues to perform long-term monitoring at the AOCs.

AOCs 32 and 43A are historically contaminated locations in the northeast portion of what was the Main Post at the former Fort Devens (Figure 1-1). AOC 32 comprises the former Defense Reutilization and Marketing Office (DRMO) West Yard, East Yard, Tire Recycling Yard, office, and warehouse located near the former intersection of Cook and Market Streets (Figure 1-2). The DRMO East Yard and office are now covered by the northern third of the current warehouse (Figure 1-3). AOC 43A, the former Petroleum, Oil, and Lubricants (POL) Storage Area, is located east of Cook Street and between the former locations of Market Street to the north and Antietam Street to the south (Figure 1-2). An extensive bedrock outcrop existed just outside the fence defining the eastern edge of AOC 43A. AOC 43A is now mostly covered by the western third of the warehouse and paved areas west of the warehouse (Figure 1-3).

The land surfaces at AOCs 32 and 43A were modified by the construction of a large warehouse that was completed in 2001 (Figures 1-2 and 1-3). Bedrock outcrops east of the DRMO East Yard and east of the POL Storage Area were removed to make room for construction of the warehouse, and the warehouse and pavements cover major portions of both AOCs, altering local recharge patterns to overburden and bedrock and potentially altering the site hydrology. Most existing monitoring wells were destroyed in the process. New replacement monitoring wells were installed at locations to monitor groundwater flow patterns and contamination around former release points.

A Site Investigation (SI), Remedial Investigation (RI), and a Feasibility Study (FS) were completed for each AOC, but the sites were combined administratively under one ROD and are combined in one section of the Five-Year Site Review (HLA, 2000, Nobis, 2005). There are separate Monitored Natural Attenuation (MNA) Reports (SWETS, 2000b and 2000c) and current LTMPs are appendices to them (SWETS, 2001a and 2001b).

1.1 AOC 32 BACKGROUND

AOC 32 was an active materials storage facility from at least 1964 to 1995. It consisted of three fenced areas where various materials were processed and stored. The former location of 5,000-gallon waste oil underground storage tank (UST) No.13, located northeast of the DRMO office (Building T-204), is also included in AOC 32. The DRMO Yard on the west side of Cook Street (West Yard) contained used equipment, including lead-acid batteries, telecommunications equipment, and administrative equipment. The yard on the east side of Cook Street (East Yard) was used for disassembling vehicles and contained scrap metal, tires, stored items ready for sale, and used photographic solutions. The Tire Recycling Yard bordered the north edge of the East Yard.

Upon excavation and removal in 1992, UST No.13 was found to be in good condition with no holes, perforations, or severe corrosion (ATEC, 1994). Associated piping appeared to be in good condition; however, soil located at the south end of the tank in the vicinity of the fill port appeared contaminated. In addition, soil within the excavation along the bottom and at the south end was contaminated and had a petroleum odor. Approximately 227 cubic yards (369 tons) of waste-oil contaminated soil was removed and disposed of off-site as part of the tank excavation. Bedrock was encountered at between five and nine feet below grade. Figure 1-3 shows the footprint of the new warehouse overlying former AOC 32 features.

1.2 AOC 43A BACKGROUND

AOC 43A consisted of a fenced lot that served as the central distribution point for all gasoline stations at Fort Devens during the 1940s and 1950s, and was subsequently used to store fuels for various purposes. Early configurations of the distribution facility consisted of a main gasoline station (T-401) and a pump house associated with two 12,000-gallon aboveground storage tanks (ASTs) and two 8,000-gallon ASTs, and a second gasoline pump house (T-186) which was associated with four 12,000-gallon USTs and one 10,000-gallon UST (Figure 1-2). Gasoline was delivered by rail car and transferred to tanks (Horne, 1998).

Between 1965 and 1972, four ASTs located in pit behind T-401 were removed, and in 1989 and 1990, three USTs and 800 cubic yards of soil were removed from beneath the pump house (Ecology and Environment [E&E], 1994; Horne, 1998). Also in 1989 and 1990, five USTs located near the pump house and listed as storage tanks for fuel oil were excavated. By 1990 all the historical USTs and ASTs had been removed and replaced with 5 double-wall fiberglass 20,000-gallon USTs that were used to store fuel for military vehicles. These 20,000 gallon tanks were removed in 1998 are not known to have been a source of contamination (Dames & Moore, 1998a, b, c, d, and e). Figure 1-3 shows the footprint of the new warehouse overlying former AOC 43A features.

1.3 RECORD OF DECISION FOR AOC 32 AND AOC 43A

A ROD for the combined sites was signed in February 1998 (Horne, 1998). The selected remedy for the AOC 32 Soils Operable Unit was Alternative 6: Excavation and Off-site Disposal. The key components of this alternative consisted of the following:

- Excavation of 1,300 cubic yards of contaminated soil and asphalt from the central portion of the East Yard
- Disposal of excavated material at an off-site location
- Backfill and revegetation
- Monitoring groundwater after five years

The selected remedy for the AOC 32 UST 13 Groundwater Operable Unit and the AOCs 32 and 43A Groundwater Operable Unit was MNA (with long-term monitoring). The key components of this alternative consisted of the following:

- Establishing institutional controls to prevent intrusion into or installation of wells into the known areas of bedrock contamination;
- Allowing for MNA by naturally occurring microorganisms in the groundwater;
- Installing additional groundwater monitoring wells;
- Collecting and incorporating additional field data into groundwater flow and contaminant transport models;
- Performing long-term monitoring and reporting annually on groundwater quality;
- Reviewing field data, modeling predictions, and compliance with applicable or relevant and appropriate requirements at five-year intervals; and
- Reviewing the need for continued monitoring and additional action at the site every five years for 30 years or until contamination is reduced to acceptable concentrations.

The evaluation of contaminants and potential receptors at AOCs 32 and 43A considered that the sites would remain in an area restricted by deed to include limited development and a ban on the installation of wells for drinking water. The current combination of parking lot development and a warehouse (industrial use) is compatible with that intention, and no zoning changes are anticipated.

Groundwater is not to be available for human consumption. There is limited surface water and no identified aquatic habitat (an infiltration basin at the south-west corner of the warehouse is normally dry, with the water table estimated to be at least 10 feet below the bottom elevation of the basin).

If the MNA results indicate that the groundwater contamination plume cannot be remediated within 30 years, appropriate additional cleanup actions are to be evaluated and implemented. If there is an indication that contaminants are migrating into the currently established Zone II boundary or an area sufficiently inside that boundary according to criteria in the ROD (that at a minimum will meet drinking water standards), then the Army will implement an additional remedial action which will be protective of human health and the environment.

Because the selected remedies may result in hazardous substances remaining on-site in soil and ground water above certain health-based exposure levels, five-year reviews will be performed to ensure that the remedy at each AOC continues to provide adequate protection of human health and the environment.

1.4 SUMMARY OF MONITORED NATURAL ATTENUATION ASSESSMENT REPORTS

Quarterly groundwater sampling completed between January and October 1999 at AOCs 32 and 43A demonstrated that the contaminant plume did not appear to be migrating further, and semi-annual sampling rounds were recommended to monitor the downward trend of concentrations over time (SWETS, 2000b and 2000c). It was concluded that additional sampling was needed to determine whether the future warehouse would have an effect on the migration of contaminants or groundwater contours. Subsequently, a separate LTMP for each AOC was issued in April 2001 as Volume II, Appendix E to each report (SWETS, 2001a and 2001b).

1.4.1 AOC 32 Monitored Natural Attenuation Results

Additional piezometers and monitoring wells were installed in 1999 for a total of thirteen sampling points. Geochemical parameters were measured and the Mann-Kendall test was used to assess the statistical trend for wells where contaminants exceeded a cleanup goal, such as individual carbon range fractions comprising extractable petroleum hydrocarbons (EPH) or volatile petroleum hydrocarbons (VPH). Four data points were developed and trends for organics were downward, except for C₉-C₁₀ aromatics, which did not have a definable trend. Inorganics were not evaluated. Predominant metals exceeding clean-up goals were arsenic, lead, and manganese.

There was no significant change required to the remedies specified in the ROD.

1.4.2 AOC 43A Monitored Natural Attenuation Results

Ten monitoring wells and four small-diameter microwells were available in 1999 for quarterly groundwater sampling. Natural attenuation parameters were measured as for AOC 32. The Mann-Kendall test was used to assess a statistical loss in contaminant concentrations. Four EPH and VPH data points were developed, and only trichloroethene (TCE) showed a downward trend. The other results were qualified. The Mann-Kendall tests were still calculated for inorganics. Most metals showed downward trends.

There was no significant change required to the remedies specified in the ROD.

1.5 SUMMARY OF LONG-TERM MONITORING PLANS

A LTMP for each AOC was prepared as Appendix E to each MNA Report (SWETS, 2001a and 2001b). The new warehouse was in its planning stage when the LTMPs were prepared, and the LTMPs described future groundwater sampling locations, frequency, and analyses. They also described components specified in the ROD to assess/report remedial progress, and establish specific performance standards for assessment. However, because each plan has some component that is specific to its AOC, a brief summary is provided.

1.5.1 AOC 32 Long-Term Monitoring Plan

The 2001 LTMP for AOC 32 is based on the interpretation that a north-south trending bedrock ridge lies under the former location of the DRMO Office and forms a groundwater divide. Groundwater east of the bedrock ridge was interpreted to flow generally to the east, while groundwater west of the ridge was interpreted to flow generally to the southwest. The UST No.13 area is near the centerline of the divide; however, groundwater was interpreted to flow to the east, which was considered when placing monitoring wells and borings. At the time of LTMP preparation, AOCs 32 and 43A were undergoing modification with the construction of a warehouse, and most existing monitoring wells were destroyed. The LTMP included the following items:

- Installing sixteen monitoring wells and piezometers to replace wells destroyed/abandoned during warehouse construction.
- Sampling designated monitoring wells for VPH, EPH, volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), manganese, arsenic, and lead.
- Monitoring groundwater levels quarterly at new and existing (32M-92-01X, 32Z-99-02X, and 32M-92-03X) monitoring wells on a quarterly basis for one year to observe the influence of the new building. Once the groundwater contours had stabilized, additional sentry wells would be installed, as necessary, based on flow direction.
- Installing additional wells, if needed, to identify flow directions.

Contaminant migration assessment had the following components:

- Natural attenuation would continue to be considered effective if the plume with concentrations exceeding cleanup goals did not increase in size and migrate from Lot 10.
- No additional wells would be installed if the contaminants of concern showed a
 reduction in concentration, demonstrating that MNA is working. Additional field
 actions might be implemented if cleanup goal exceedances were detected.
 Recommendations would be made in the Annual Report.
- NA would continue to be considered effective if contaminants of concern are being reduced to levels within the duration criteria in the ROD. The Mann-Kendall test would be used to assess for statistical loss in contaminant concentrations. Ideally, four to ten data points would be needed. Mann-Kendall statistics were provided only for those wells where contaminants exceeded a clean-up goal, such as the individual carbon range fractions that comprise VPH or EPH.
- The need for additional assessment/remedial action would be evaluated if contaminants
 of concern were not being reduced in the source wells. Trend analyses would be
 conducted every five years, to coincide with the Five-year Review, on source area
 wells with contaminants of concern exceeding cleanup concentrations.

1.5.2 AOC 43A Long-Term Monitoring Plan

The 2001 LTMP for AOC 43A is based on the interpretation that the AOC lies west of the north-south trending bedrock ridge and that groundwater beneath AOC 43A flows generally to the southwest. At the time of LTMP preparation, AOCs 32 and 43A were undergoing modification with the construction of a warehouse, and most existing monitoring wells were destroyed. The LTMP included the following items:

- Installing six monitoring wells to replace wells destroyed/abandoned during warehouse construction.
- Sampling designated monitoring wells semiannually for VPH, EPH, VOCs, PCBs, manganese, arsenic, and lead.
- Monitoring groundwater levels quarterly at new and existing (43M-93-05X and Campanelli property wells 63BD9901 through 63BD9904) monitoring wells on a quarterly basis for one year to observe the influence of the new building. Once the groundwater contours had stabilized, additional sentry wells would be installed, as necessary, based on flow direction.
- Installing additional wells, if needed, to identify flow directions.

Contaminant migration assessment had the following components:

- Natural attenuation would continue to be considered effective if the plume with concentrations exceeding cleanup goals did not increase in size and migrate from Army property.
- No additional wells to be installed if reduced chemical of concern concentrations demonstrate that MNA is working. New field actions possible if uncharacteristic cleanup goal exceedances were detected. Recommendations to be made in the Annual Report.
- NA would continue to be considered effective if contaminants of concern are being reduced to levels within the duration criteria specified in the ROD. The Mann-Kendall non-parametric rank correlation trend analysis method was proposed to be used to assess statistical trends in contaminant concentrations. Mann-Kendall statistics would be provided only for those wells where contaminants exceeded a clean-up goal, such as the individual carbon range fractions that comprise VPH or EPH.
- The need for additional assessment/remedial action would be evaluated if contaminants
 of concern were not being reduced in the source wells. Regression analyses would be
 conducted every five years, to coincide with the Five-year Review, on source area
 wells with contaminant of concern that exceed cleanup concentrations.

New monitoring wells would be placed to determine groundwater contours first, and then to conduct monitoring according to the following guidance:

- As quarterly groundwater sampling conducted in 1999 demonstrated that the plume did not appear to be migrating further, semi-annual rounds would determine the downward trend of concentration over time.
- Additional sampling would be needed to determine if the warehouse and its associated
 pavements were found to be affecting the migration of contaminants or groundwater
 contours. Six wells were installed in 2001 to help with this assessment.

1.5.3 Post-Construction Replacement Wells and Piezometers

Wells replacing those destroyed during the warehouse construction were installed during December 2001 and January 2002 following discussion of the number and locations of the wells by USACE and regulators. Factors that determined locations were historic release areas, known bedrock locations, needed hydraulic gradient monitoring points, and spatial distributions. The resulting set of wells was considered adequate to define any plume migration from the former source areas, as envisioned in the ROD.

As a result of the installation of additional wells, four pre-existing and 14 replacement monitoring wells became available for groundwater chemical sampling. Twenty-six monitoring wells and piezometers became available for measuring water levels to evaluate groundwater flow direction around the warehouse. The spatial distribution of the wells relative to bedrock topography is discussed below.

The former AOC 32 UST site is situated beneath pavement along the outside edge of the warehouse over the eastern portion of an apparent rock ridge, which creates a hydraulic gradient and interpreted contaminant migration potential to the east. The monitoring wells and piezometers are distributed as follows:

- Three bedrock source area wells (32M-01-13XBR, 32M-01-15XBR, and 32M-01-18XBR) surround and are hydraulically downgradient of the former UST No. 13 site;
- Two bedrock wells (32M-01-16XBR, 32M-01-17XBR), one overburden/bedrock well pair (32M-01-14XOB/-14XBR), and well SHL-25 are sentry wells;
- Bedrock piezometer 32Z-01-10XBR and bedrock piezometer/well 32M-01-04XBR are on the flanks of the southern rock mound and are interpreted to be hydraulically cross gradient, but along strike south of the former location of UST No. 13.
- Bedrock piezometer 32Z-01-06XBR is interpreted to be hydraulically cross gradient, but along strike north of the former location of UST No. 13.
- Piezometer 32Z-99-02X provides water table control southeast of the UST No. 13 area.

Monitoring wells and piezometers 32M-01-01X, 32Z-01-07XOB, 32Z-01-08XOB, 32Z-01-11XBR, and 32Z-01-12XBR are southwest of a northwest-southeast trending groundwater divide north of the warehouse and provide hydraulically upgradient information for AOC 43A. Monitoring well SHL-15 is located northeast of the divide and helps confirm its presence.

The overburden/bedrock well pairs 43M-01-17XOB/-17XBR are considered to be AOC 43A source area wells; and well pairs 43M-01-16XOB/-16XBR and 43M-01-20XOB/-20XBR are

considered sentry well pairs. Existing well 32M-92-03X appears to be hydraulically cross-gradient to the POL source area, but is used as a sentry well. The two overburden piezometers 32Z-01-05XOB and 32Z-01-09XOB provide additional points to help determine groundwater flow directions on the west side of the warehouse.

1.5.4 Changes to Long-Term Monitoring Plans and Activities

Table 1-2 summarizes changes to LTMP that have been implemented since 2001.

No additional monitoring wells have been constructed as a result of any findings at the AOCs.

2.0 CONCEPTUAL SITE MODEL

This conceptual site model (CSM) has been prepared to summarize information on contaminant source areas, geology and hydrogeology, contaminant migration pathways, and potential receptors at AOCs 32 and 43A. It takes into account the changes to bedrock topography and potential changes to the local groundwater flow systems from decreased infiltration due to the warehouse and paved areas. The CSM will be updated, as appropriate, as more information about AOCs 32 and 43A becomes available.

2.1 CONTAMINANT SOURCE AREAS

There are two primary historical contaminant source areas at the Site, the former location of waste oil UST No.13 at AOC 32 and the former POL Area UST and AST locations at AOC 43A (Figures 1-2 and 1-3). Contaminants detected in the vicinity of UST No. 13 consist of chlorobenzene, dichlorobenzenes, TCE, and VPH. Inspection of the tank upon removal in 1992 showed that the tank was dented, but there were no holes or severe corrosion (ATEC, 1994). Contaminants are believed to have been released via surface spills or leaks in associated piping or appurtenances. Arsenic and manganese have also been detected above cleanup goals and may be attributed to reducing conditions caused by biodegradation of organic contaminants. Contaminated soils associated with the tank were excavated to a depth of approximately 9 feet and disposed offsite. Confirmatory samples collected during the UST No. 13 removal indicate that the bulk of the soil contamination was removed during the tank removal. Limited residual contaminants may remain, however, at the bedrock/overburden interface located approximately 8 to 10 feet below ground surface (bgs) at this location. Secondary releases of contaminants may have occurred during warehouse construction when bedrock blasting and excavation may have mobilized residual contaminants in groundwater.

Contaminants historically detected at the POL area USTs and ASTs include total petroleum hydrocarbons, TCE, and benzene, toluene, ethylbenzene, and xylene. Arsenic and manganese have also been detected above cleanup goals and may be attributed to reducing conditions caused by the biodegradation of organic contaminants. There has been no exceedance of site cleanup goals for VOCs or other fuel-related compounds since 2002.

Approximately 800 cubic yards of petroleum-contaminated soil were removed during the 1998/1999 tank removals at AOC 43A (E&E, 1994). The RI report states that the releases from the AST area occurred near the ground surface whereas the releases at the UST area occurred below the surface. More detailed documentation on the pre-1990 AOC 43A tank removals could not be located during preparation of this document. Residual fuel-related contamination, if present in soils, may serve as a secondary groundwater contaminant source; however, groundwater monitoring does not show evidence of this. The primary concern for this source area is contaminants in groundwater.

2.2 GEOLOGY AND HYDROGEOLOGY

Prior to 2000, two bedrock outcrop areas existed in the area now occupied the Lot 10 warehouse (Figure 2-1). These outcrops were flattened during bedrock excavation for the warehouse. Figure 2-2 shows interpreted subsurface bedrock topography following bedrock excavation and warehouse construction, based on historical geotechnical and boring log information. As shown on the figure, two localized bedrock highs remain, one beneath the northeast corner of the warehouse, and one

beneath the southeast corner, and a roughly north-south ridge runs beneath the eastern edge of the warehouse building. The finish floor of the warehouse is at El. 263.6 feet (Ostrowski, 2006), and, therefore, rock probably had to be removed to at least El. 260 feet. Bedrock outcrops remain north-northeast of the warehouse and on Shepley's Hill (which has extensive bedrock outcrops) northwest of the site.

Examination of the bedrock outcrop northeast of the warehouse shows a joint structure trending roughly north-south. Bedrock beneath the site consists of the Ayer granite and the Berwick quartzite. Both rock types show the largest amount of fracturing near the top (5 to 10 feet), and become more competent with depth, consistent with a glacial erosion contact. Impacts to the bedrock competency as a result of blasting and excavation are unknown. Removal of the upper fractured zone may have decreased overall fracture permeability while mechanical fracturing due to blasting may have increased the local permeability.

AOC 32 Hydrogeology

There is no apparent overburden aquifer in the immediate vicinity of the former waste oil UST No.13. Overburden groundwater appears to be present; however, approximately 100 feet to the east and 300 feet to the west of the former UST location. East of UST No. 13, overburden groundwater flow has been interpreted to be to generally to the east with some variation between the northeast and southeast in the RI report (E & E, 1994) and the Monitored Natural Attenuation Report (SWETS, 2000b), both of which pre-date construction of the warehouse. West of the bedrock ridge, overburden groundwater flow is to the south and southwest.

Interpretation of the bedrock potentiometric surface also shows a groundwater divide bisecting Lot 10 in a north-northwest to south-southeast direction. It should be noted that this interpretation is based solely on groundwater elevation data which give an indication of the potential for flow in a certain direction. Actual bedrock groundwater flow directions are determined by both hydraulic gradients and fracture orientation. Historical water level data are interpreted to show that the potential for bedrock groundwater flow in the vicinity of the AOC 32 waste oil UST is to the east.

A second groundwater divide, which trends roughly west to east, exists northwest of the warehouse in the vicinity of 32M-92-01X. Groundwater north of this divide (i.e., in the vicinity of SHL-15 flows to the northeast, while groundwater south of this divide flows to the south. The exact location of this divide relative to monitoring well 32M-92-01X is uncertain, and groundwater flow at 32M-92-01X may change direction seasonally and in response to precipitation events.

Evaluation of vertical hydraulic gradients between the overburden and bedrock aquifers for the one monitoring well pair at AOC 32, 32M-01-14XOB/-14XBR, shows consistent upward gradients.

AOC 43A Hydrogeology

The RI report (E & E, 1994) and the Monitored Natural Attenuation Report (SWETS, 2000c), both of which pre-date construction of the warehouse, have historically interpreted overburden groundwater flow in the vicinity of the AOC 43A to be to the southwest. The mapped distribution of total petroleum hydrocarbons in soil shown in Figure 5-1 of Volume III of the RI report (E & E, 1994) (see Figure 1-2 of this report) and is interpreted in the RI report to be indicative of the southwest groundwater flow direction.

Bedrock groundwater flow potential is interpreted to be to the southwest. It should be noted that this interpretation is based solely on groundwater elevation data which give an indication of the potential for flow in a certain direction. Actual bedrock groundwater flow directions are determined by both hydraulic gradients and fracture orientation.

Evaluation of data shows vertical hydraulic gradients between the overburden and bedrock aquifers for the monitoring well pairs 43M-01-16XOB/-16XBR and 43M-01-17XOB/-17XBR have historically been upward or neutral. Vertical hydraulic gradients at 43M-01-20XOB/-20XBR, located approximately 300 feet to the southwest of the AOC 43A source area USTs, have been primarily upward or neutral, but with occasional downward gradients across the bedrock/overburden interface. An examination of the data shows no relationship to seasonality in general; however, vertical gradients may be influenced by larger scale precipitation events.

2.3 CONTAMINANT NATURE AND DISTRIBUTION

The following contaminant migration pathway discussions are based on the geology and hydrogeology interpretations and the above contaminant distributions.

AOC 32 Contaminant Migration Pathways

Potential contaminant migration pathways from release to projected distribution for AOC 32 are as follows:

- Contaminants released via surficial spills/releases or leaks in piping to surface or subsurface soils.
- Vertical migration via gravity flow and infiltration of recharge water to bedrock overburden interface.
- Further vertical migration in fractures to bedrock aquifer.
- Based on historic contaminant distributions in bedrock wells, the shallow fracture network does not have a high degree of connectivity – the actual amount of fracture connectivity is unknown.
- Horizontal hydraulic gradients in the bedrock aquifer indicate potential for dissolved contaminant flow to the east-northeast.
- Upward hydraulic gradients measured across the bedrock/overburden interface suggest dissolved contaminants would tend to migrate from bedrock to overburden aquifers at areas where overburden aquifer is present.
- Overburden groundwater flow paths are to the east-northeast toward Shepley's Hill Landfill.

AOC 43A Contaminant Migration Pathways

Potential contaminant migration pathways from release to projected distribution for AOC 43A are as follows:

- Contaminants released via surficial spills/releases or leaks in tanks or piping to surface and subsurface soils.
- Vertical migration of fuel and related contaminants via gravity flow and infiltration of recharge water through unsaturated overburden to overburden groundwater.

- Dissolved phase transport of contaminants in groundwater via advective flow to the southwest.
- The lack of detected contaminants to the southwest suggests that the bulk of contamination was removed during tank excavations or has attenuated. Remaining contaminants are likely sorbed to overburden soils.

2.4 POTENTIAL RECEPTOR ANALYSIS

The following items provide a potential receptor analysis for AOCs 32 and 43A.

AOC 32

- There is no groundwater use or exposure to site groundwater as Devens is served by Devens Commerce Commission water supplies.
- The closest delineated Zone II is 1,800 feet to the west of the site (McPherson Well Zone II); however, the lateral continuity of the aquifer over this distance is unknown.
- There is no use of or exposure to contaminated surface water at the site.
- Groundwater modeling for Shepley's Hill Landfill suggests that AOC 32 groundwater will not discharge to Plow Shop Pond.
- There is no current exposure to soil. Exposure potential is limited by the presence of the warehouse and associated paved parking lot.
- The lack of an overburden aquifer beneath much of the warehouse limits the potential for contaminant migration to indoor air. The estimated depth to the water table is 20 feet or greater, limiting the potential for vapor intrusion. Inspection of the building floor showed that it is well maintained, with no observed cracks or penetrations.

AOC 43A

- There is no groundwater use or exposure to site groundwater as Devens is served by Devens Commerce Commission water supplies.
- The closest delineated Zone II is 1,800 feet to the west of the site (McPherson Well Zone II).
- There is no use of or exposure to contaminated surface water at the site.
- There is no current exposure to soil. Exposure potential is limited by the presence of the warehouse and associated paved parking lot.
- The depth of the overburden aquifer beneath much of the warehouse limits the potential for contaminant migration to indoor air. The estimated depth to the water table is 20 feet or greater.

3.0 LONG-TERM MONITORING ACTIVITIES IN 2005

During 2005 USACE performed the following activities at AOCs 32 and 43A:

- Collected groundwater elevation data at 27 monitoring wells in June and 25 in December
- Collected groundwater samples for analysis from 18 monitoring wells and 9 in October
- Performed a monitoring well inspection to identify well maintenance needs and priorities in May, October, and December

Table 3-1 lists the monitoring wells used for groundwater elevation monitoring and sampling.

Appendix I contains well construction information, boring logs, and construction diagrams.

4.0 LONG-TERM MONITORING RESULTS AND DISCUSSION

4.1 GROUNDWATER ELEVATION MONITORING

The ROD requires groundwater modeling and monitoring to demonstrate that MNA is working. Modeling consists of plotting and contouring groundwater elevations and contaminant concentrations.

USACE measured water levels in 27 monitoring wells in June 2005 and in 25 monitoring wells in October 2005 when 32Z-01-04XBR could not be located and 43M-01-20XOB could not be opened. Interpretations of groundwater flow directions are based on the latest revised bedrock contours.

Weather records for the Fitchburg airport show indicate total precipitation of 9.89 inches during the 2-month period (April 13 – June 12) preceding the June sampling event. 2.03 inches fell during the period of June 6 through June 12, with the majority of that (1.57 inches) occurring on June 8, 2005. Precipitation totaled 15.07 inches during the 2-month period (September 3 – November 2) preceding the November sampling event, with 13.46 inches of that during October. Only 0.02 inches was recorded during the period from October 26 through November 2, 2005.

4.1.1 Groundwater Flow In Overburden

Figures 4-1 and 4-2 show interpreted overburden groundwater elevation contours at AOCs 32 and 43A based on data collected in 2005. These data, along with data from previous years, are contained in Table 4-1. The figures indicate that overburden groundwater is absent above the bedrock ridge that extends north-south beneath the eastern portion of the warehouse. Bedrock elevation decreases east and west of the bedrock ridge, thereby permitting an overburden aquifer. Overburden groundwater east of the bedrock ridge and the warehouse is interpreted to flow to the east and northeast before merging with the north to northeast regional flow.

The warehouse and associated pavement limit recharge above and immediately west of the bedrock ridge. Recharge west of the ridge occurs from runoff from Shepley's Hill to the northwest, infiltration in the area between the warehouse and the Shepley's Hill, and two infiltration basins located along Cook Street which receive runoff from the warehouse area. Groundwater flow is interpreted to be southerly near the northwest corner of the warehouse before turning to the southwest and west along a westward trending bedrock trough. Groundwater flow in the vicinity of the historical source area ASTs and USTs at AOC 43A is to the southwest. These interpretations are consistent with the CSM.

Groundwater flow patterns and the locations of monitoring wells SHL-15 and 32M-92-01X are such that SHL-15 and 32M-92-01X are unlikely to be influenced by contamination at either AOC 32 or 43A.

4.1.2 Groundwater Flow Through Bedrock

Figures 4-3 and 4-4 show interpreted bedrock groundwater elevation contours at AOCs 32 and 43A based on data collected in 2005. These data, along with groundwater elevation data from previous years, are contained in Table 4-1. Bedrock groundwater in the vicinity of UST No. 13 is interpreted to flow east to northeast June and east or slightly south of east in October. Overall, bedrock groundwater flow east of the bedrock ridge and warehouse is interpreted to be to the east

and northeast. Bedrock groundwater flow west of the bedrock ridge is interpreted to be to the southwest. These interpretations are consistent with the CSM.

It should be noted that actual bedrock groundwater flow directions are determined by both hydraulic gradients and fracture orientation. The warehouse and associated pavement limit recharge to the bedrock ridge and the rate of flow through the rock is expected to be low.

4.1.3 Vertical Hydraulic Gradients

There are four monitoring well pairs (32M-01-14XOB/-14XBR, 43M-01-16XOB/-16XBR, 43M-01-17XOB/-17XBR, and 43A-01-20XOB/-20XBR) at AOCs 32 and 43A available for assessing vertical hydraulic gradients between bedrock and overburden. As shown in the following table, vertical gradients were generally upward or neutral at all well pairs for which data were available. Well pair 43M-01-16XOB/-16XBR showed a neutral (possibly upward gradient) in June.

Assessment of Vertical Hydraulic Gradients						
Monitoring Well	Elevation June 2005	Gradient	Elevation October 2005	Gradient		
32M-01-14XOB	234.49	upward	231.53	upward		
32M-01-14XBR	236.18		232.56	-		
43M-01-16XOB	235.20	neutral	231.77	upward		
43M-01-16XBR	235.29		231.92	·· F · · · · · · · · ·		
43M-01-17XOB	234.95	upward	231.81	upward		
43M-01-17XBR	235.55	F	231.92	о р		
43M-01-20XOB	234.29	upward	Not collected	Not calculated		
43M-01-20XBR	234.42		231.43			

Notes:

Elevations in feet

Elevation differences less than 0.1 feet are considered to represent neutral gradients.

This pattern is consistent with historical data which show upward or neutral vertical hydraulic gradients at well pairs 32M-01-14XOB/-14XBR, 43M-01-16XOB/-16XBR, and 43M-01-17XOB/-17XBR. Although monitoring well pair 43A-01-20XOB/-20XBR has shown upward or neutral gradients on nine of 12 occasions, it has shown downward gradients on three occasions. The historical distribution of upward, downward, and neutral hydraulic gradients does not show a seasonal influence. Figures 4-5, 4-6, 4-7, and 4-8 show plots of water levels in these wells.

These upward, neutral, and vertical hydraulic gradients will tend to keep dissolved phase contaminants from migrating from overburden into bedrock and to wash any dissolved phase contaminants already in bedrock out into overburden.

4.2 GROUNDWATER SAMPLING

Groundwater at AOCs 32 and 43A was sampled in June and October 2005 by USACE using low-flow groundwater sampling procedures as detailed in Appendix A. Table 3-1 lists the monitoring

wells included in 2005 sampling, and Figure 4-1 shows the location of the monitoring wells. Samples were analyzed by Severn Trent Laboratories (STL) in Colchester, VT. AMRO Environmental Laboratories Corporation (AMRO) of Merrimack, New Hampshire analyzed the quality assurance (QA) split samples. Groundwater sampling log sheets are contained in Appendices B and C. A USACE chemist performed the data evaluation and data evaluation reports and Quality Assurance comparison reports are contained in Appendices D, E, and F.

4.2.1 Analytical Methods

Water samples were analyzed for VOCs, VPH, EPH, PCBs, dissolved gases, alkalinity, nitrate, nitrite, sulfate, sulfide, ammonia, chemical oxygen demand (COD), total organic carbon (TOC), total phosphate, and total arsenic, lead, and manganese. VOCs were analyzed using EPA Methods 8260B. EPH and VPH were analyzed by the MADEP method, and PCBs were analyzed by EPA Method 8082.

Tables 4-2 and 4-3 present groundwater analytical data obtained in 2005. The tables compare contaminant concentrations to applicable cleanup goals and Massachusetts Contingency Plan (MCP) standards for the parameters agreed to for monitoring and listed in Table 4-4. (It should be noted that the list of parameters in Table 4-4 differs from the list of cleanup goals in the ROD.) The MCP Method 1 GW-1 concentration is listed in the tables for compounds with no ROD established cleanup goal. Exceedances of cleanup goals are shaded in the tables, and exceedances of MCP criteria are shown in bold.

4.2.2 Results – AOC 32 Wells East of Warehouse

Review of the 2005 data for 32M-01-14XOB shows total arsenic (88.7 micrograms per liter [μ g/L]) and total manganese (6,010 μ g/L) concentrations exceeded cleanup goals in June, and arsenic in (41.9 μ g/L) exceeded the revised Maximum Contaminant Level (MCL) and GW-1 standard in October. Monitoring well 32M-01-14XOB also exceeded the manganese cleanup goal in 2003 and 2004, and has exceeded the revised arsenic MCL, but not the arsenic cleanup goal in the past. Arsenic (89.1 μ g/L) and lead (21.7 μ g/L) exceeded cleanup goals in 32M-01-14XBR in October. The 2005 data show the first cleanup goal exceedances at 32M-01-14XBR since 2002; however, total arsenic has exceeded the revised MCL in the past. The high historical total arsenic concentrations appear strongly associated with particulate matter, as concentrations in filtered samples were less than 10 μ g/L.

Arsenic, lead, and manganese have not been shown to be associated with UST No. 13. The reason(s) for their presence in 32M-01-14XOB/-14XBR are not clear, although arsenic and manganese are believed to represent naturally present material. High arsenic and manganese concentrations are often associated with reducing conditions created by degrading organic material, although field measurement of oxidation-reduction potential and dissolved oxygen do not indicate reducing conditions at 32M-01-14XOB/-14XBR. Comparison of historical total and dissolved arsenic data suggests a strong correlation with entrained solids in the samples. Continued sampling is recommended to see if the high concentrations persist or decline. Table 4-5 summarizes contaminant exceedances in all wells for the period from 2002 through 2005.

The data also show that exceedances of VOCs, VPH, and manganese persist in bedrock source well 32M-01-18XBR. The following VOCs were detected above their respective cleanup goals at well 32M-01-18XBR in June 2005: 1,2-dichlorobenzene (4,500 μ g/L vs. 375 μ g/L goal), and 1,4-dichlorobenzene (370 μ g/L vs.75 μ g/L goal). Aromatic hydrocarbons in the C9-C10 range exceeded their cleanup goal (260 vs. 200 μ g/L goal) and manganese exceeded its cleanup goal

(16,700 vs. 3,500 μ g/L goal). Total arsenic at 24.4 μ g/L did not exceed the established cleanup goal of 50 μ g/L, but did exceed the revised MCL and GW-1 standard of 10 μ g/L. The previous maximum detected concentration of arsenic was 11 μ g/L in May 2004. Chlorobenzene at 410 μ g/L exceeded the GW1 standard of 100 μ g/L.

In October, the following contaminants exceeded cleanup goals at 32M-01-18XBR: 1,2-dichlorobenzene (1,450 vs. 600 μ g/L goal), 1,4-dichlorobenzene (120 vs. 75 μ g/L goal), C₉-C₁₀ aromatic hydrocarbons (1,150 vs. 200 μ g/L goal), and manganese (11,600 vs. 3,500 μ g/L goal). 1,3-dichlorobenzene exceeded the GW-1 standard (209 vs. 40 μ g/L goal), but not its cleanup goal of 600 μ g/L. It is noteworthy that dichlorobenzene concentrations appear to be declining. Table 4-6 summarizes exceedances of cleanup goals at 32M-01-18XBR for the period 2002 through 2005.

There were no other exceedances of cleanup goals in AOC 32 monitoring wells north and east of the warehouse in 2005. Figure 4-9 shows the locations of cleanup goal exceedances in 2005.

Figures 4-10 through 17 show plots of contaminant trends over time for the following parameters at 32M-01-18XBR: TCE; 1,2-dichlorobenzene; 1,3-dichlorobenzene; 1,4-dichlorobenzene; chlorobenzene; C_9 - C_{10} aromatic hydrocarbons; C_9 - C_{12} aliphatic hydrocarbons; and C_9 - C_{18} aliphatic hydrocarbons. It should be noted that contaminant concentrations in October 2005 tended to be lower than in the past, particularly for the chlorinated benzenes and C_9 - C_{10} aromatics. Concentrations of TCE have decreased to less than 1 μ g/L. Manganese concentrations at 32M-01-18XBR remain well above the cleanup goal, although some decrease occurred in October 2005.

The decrease in contaminant concentrations at 32M-01-18XBR in October is encouraging; however, continued sampling is necessary to determine whether this is part of a trend or, alternately, reflective of groundwater and sampling/analysis variability. Although samples from 32M-01-18XBR show relatively low oxidation-reduction potential readings and high manganese concentrations, both of which are indicative of the reducing conditions necessary for reductive dechlorination, dissolved oxygen was too high in October to support reductive dechlorination processes. The 2004 Annual Report concluded that conditions at 32M-01-18XBR were not conducive to microbial reductive dechlorination of chlorinated compounds.

The Mann-Kendall test for trend (Kendall, 1975) was applied to the data for organic contaminants at 32M-01-18XBR with cleanup goal exceedances listed in Table 4-6.

A minimum of four data points is required for conducting a Mann-Kendall test for trend and be statistically significant at the 95-percent confidence level. For each set of data ordered in time, the Mann-Kendall statistic (S) is calculated by comparing each data value to subsequent data values. Starting with the first data point, each subsequent data point is compared to the baseline value, and each comparison is assigned a value of 1 (greater than the baseline point), 0 (equal to the baseline point), or 1 (less than the baseline data point), whereby a set of values is calculated for each individual data point. This evaluation is completed for each data point in turn, with the maximum possible contribution to the total S value consequently decreasing with each subsequent comparison. All calculated values are then summed, and the resulting value is the S value. The S value is either negative, positive, or possibly zero, and indicates the potential for a decreasing trend (negative S value) or increasing trend (positive S value). The Mann-Kendall test probability (p) is then obtained from published tables for the number of data points and the calculated S value. This p-value is the probability that the S value was calculated in the absence of a true trend (the null hypothesis of the test is no trend). For the S-statistic to indicate a statistically significant trend. some level of confidence must be selected, and the value of S must be sufficiently high that the null hypothesis of no trend is rejected.

For purposes of this evaluation, a confidence level of 90 percent or greater (p-value <0.1) is considered indicative of a high confidence level for trend. The probability of no trend, p, has been determined for the available data. Results of the statistical trend analysis do not result in rejection of the null hypothesis of no statistically significant trend for five of the six evaluated parameters (see Appendix G). That is to say, a significant trend, increasing or decreasing, was not identified for five of the six evaluated parameters.

Three dates had elevated detection limits for TCE, and analyses for these dates were reported as below detection limit. The Mann-Kendall test was performed on the five reported values (including one estimated value). TCE showed a significant downward trend.

4.2.3 Results - Monitoring Wells West and North of Warehouse

Monitoring wells SHL-15, 32M-92-01X, 32M-92-03X, 43M-01-16XOB/-16XBR, 43M-01-17XBR/-17XOB, and 43M-01-20XOB/-20XBR located west and northwest of the warehouse were sampled in June 2005, and 32M-92-01X was sampled in October 2005. Analytical results for VOCs, VPH, EPH, and PCBs were generally below reporting limits for organic analytes. There were no exceedances of cleanup goals for organic compounds.

The revised MCL for arsenic was exceeded in SHL-15 in June 2005 (14.4 vs. 10 μ g/L goal), but not in October (9.9 vs. 10 μ g/L goal). Arsenic concentrations in samples from SHL-15 have exceeded 10 μ g/L in 11 of 12 samples since January 1999, with values as great as 327 μ g/L in October 1999. The two lowest values were in 2005. A seasonal pattern is not evident, although a precipitation/infiltration influence is possible. Manganese exceeded its cleanup goal in SHL-15 in October 1999 (6,200 vs. 3,500 μ g/L goal) and April 2002 (4,100 vs. 3,500 μ g/L goal). Monitoring well SHL-15 is interpreted to be in a separate flow regime (i.e., hydraulically upgradient/crossgradient) from AOCs 32 and 43A and may be influenced by Shepley's Hill Landfill.

There were no other cleanup goal exceedances for inorganic analytes in monitoring wells north and west of the warehouse.

Groundwater flow patterns and the location of monitoring wells SHL-15 and 32M-92-01X are such that SHL-15 and 32M-92-01X are unlikely to be influenced by contamination at either AOC 32 or 43A.

4.3 MONITORING WELL INSPECTION

In addition to the monitoring well inspection performed during sample collection, USACE personnel inspected AOC 32 and 43A monitoring wells in December 2005 and January 2006 to identify maintenance needs and priorities. The inspection involved assessing well conditions more closely than typically done during monitoring activities. The inspection identified the need for several new road boxes and other maintenance items. Maintenance activities were performed in January 2006 and included replacing or resetting the road boxes and surface seal for 12 wells. In addition, the internal riser of one well was repaired and three wells were redeveloped. Assessment and repair activities are listed in Appendix H.

5.0 QUALITY CONTROL

Quality assurance/quality control (QA/QC) samples were collected to monitor the sample collection, transportation, and analysis procedures. USACE collected the samples and performed the data evaluation for both of the sampling events in 2005.

5.1 JUNE 2005 QA/QC AND DATA VALIDATION

STL of Colchester, VT analyzed eighteen groundwater samples including the appropriate quality control (QC) samples (i.e., duplicate, matrix spike/matrix spike duplicate). A duplicate QA sample was collected from the most contaminated well, 32M-01-18XBR. USACE's Chemical Data Evaluation examines acceptability of the primary lab's data (Appendix D). In addition, the QA laboratory, AMRO of Merrimack, NH, analyzed the groundwater duplicate sample. The Chemical Quality Assurance Report compares AMRO's results and STL's QA results (Appendix E).

5.1.1 Data Evaluation Summary

Eighteen groundwater samples collected from AOCs 32 and 43A on June 13, 15, and 17, 2005, were analyzed for VOCs, VPH, dissolved gases, EPH, PCB, alkalinity, nitrate, nitrite, sulfate, sulfide, ammonia, COD, TOC, total phosphate, and total and dissolved arsenic, lead and manganese. In addition, the laboratory analyzed one field duplicate (32M-01-DUP, a duplicate of sample 32M-01-18XBR), one matrix spike/matrix spike duplicate set (MS/MSD) (32M-01-17XBR-MS and 32M-01-17XBR-MSD), three trip blanks (dated 6/13/05, 6/15/05, and 6/17/05), and one rinsate blank (32-43A-EQB, dated 6/16/05).

The results were evaluated (Appendix E) for acceptability in accordance with the laboratory's defined acceptance limits, standard EPA SW846 guidance, guidelines provided in the "Interim Chemical Data Quality Management (CDQM) Policy for USACE Hazardous, Toxic and Radioactive Waste (HTRW) Projects", dated 23 November 1998, and/or EM 200-1-10 (DRAFT/Final), "Guidance for Evaluating Performance Based Chemical Data Packages".

All sample coolers were packed with sufficient quantities of ice in the field and were appropriately preserved. There were no shipment or receipt anomalies. All samples were appropriately preserved as stated in the two Tables 1 of Appendix D. Samples were extracted and analyzed in accordance with the methods and holding time requirements. Exceptions are noted in Appendix D. Based on the data evaluation elements reviewed (including holding times, blank sample results, surrogate recoveries, duplicate samples and MS/MSD recoveries), all data may be reported without qualification, except as summarized below.

Volatile Organic Compound Analysis

A peristaltic pump was used to collect the samples from wells 32Z-99-02X and 43M-01-20XBR. It was necessary to use the peristaltic pump instead of the submersible pump due to the small diameter of the well casing at 32Z-99-02X and the slow recharge rate at 43M-01-20XBR. The wells were identified on the data tables as being sampled with the peristaltic pump.

- As a result of equipment blank contamination, results for 1,2-dichlorobenzene in samples 32M-01-14XBR, 32M-01-15XBR, 32M-01-16XBR, and 32M-01-17XBR are qualified as tentatively not detected (UJ) at the reported concentration.
- Due to low matrix spike recovery, hexachlorobutadiene, bromobenzene, 2-chlorotoluene, and 4-chlorotoluene reporting limits were qualified as estimated (UJ) in sample 17XBR.
- All 2-chloroethyl-vinyl ether results were rejected (R) due to the inability to recover the compound from the MS and MSD samples.

Target Analyte List Metals Analysis

• Laboratory spike sample: Sample 32M-01-14XBR was spiked – the percent recoveries were acceptable for lead and manganese. The arsenic percent recovery was slightly high; outside QC limits 127 percent (limits 80 to 120 percent). Therefore the arsenic result for that sample was qualified as (J+), possibly biased high as a result of the high spike recovery.

General Analyses

- Phosphorous results for all samples was qualified as tentatively not detected at the reported concentration (UJ) due to the contamination found in the equipment blank sample.
- The reporting limit for TOC in sample 43M-01-20XOB was estimated (UJ) due to the low matrix spike recovery.
- COD and TOC results for sample 32M-01-17XBR were qualified as potentially biased low (J-) due to the low recovery of the matrix spike from that sample.

5.1.2 Laboratory Quality Assurance Summary

There were no sample shipping and chain-of-custody deficiencies. Data comparisons showed overall agreement for 111 of 119 analytical tests in total, and quantitative agreement in 29 of the 37 results for which the analyte was detected by at least one of the labs.

The complete report, including copies of the chain-of-custody documents and sample receipt checklists are in Appendix E.

5.2 OCTOBER 2005 DATA VALIDATION

STL analyzed nine groundwater samples including the appropriate QC (duplicate, matrix spike/matrix spike duplicate) samples. A duplicate QA sample was collected from the most contaminated well, 32M-01-18XBR. USACE's Chemical Data Evaluation examines acceptability of the primary lab's data (Appendix F). In addition, the QA laboratory, AMRO, analyzed the groundwater duplicate sample. The Chemical Quality Assurance Report compares AMRO's results and STL's QA results (Appendix F).

5.2.1 Data Evaluation Summary

Nine groundwater samples collected from AOCs 32 and 43A on October 3, 4, and 5, 2005 were analyzed for VOCs, VPH, EPH, and total arsenic, lead, and manganese. In addition, the laboratory analyzed one field duplicate (of sample 32M-01-18XBR), four trip blanks (dated 10/3/05, 10/4/05 (2), and 10/5/05), and one rinsate blank, 32-43A-EQB, dated 10/4/05).

The results were evaluated for acceptability in accordance with the laboratory's defined acceptance limits, with standard EPA SW846 guidance, guidelines provided in the "Interim Chemical Data Quality Management (CDQM) Policy for USACE Hazardous, Toxic and Radioactive Waste (HTRW) Projects", dated 23 November 1998, and/or EM 200-1-10 (DRAFT/Final), "Guidance for Evaluating Performance Based Chemical Data Packages".

All sample coolers were packed with sufficient quantities of ice in the field and were appropriately preserved. There were no shipment or receipt anomalies. Samples were extracted and analyzed in accordance with the methods and holding time requirements. Exceptions are noted in Appendix D. Based on the data evaluation elements reviewed (including holding times, blank sample results, surrogate recoveries, duplicate samples and MS/MSD recoveries), all data may be reported without qualification, except as summarized below. More complete details are in Appendix D.

Volatile Organic Compound Analysis

• The laboratory spiked sample 32M-01-13XBR in addition to the sample designated for matrix spike. 1,2,3-trichlorobenzene was under-recovered from this spike, consequently, the result for this compound in sample 32M-01-13XBR is qualified (UJ), tentatively not detected at the reporting limit value.

Extractable Petroleum Hydrocarbons Analysis

- Naphthalene was detected in the method blank associated with samples SHL-15, 32M-92-01X, 32M-01-18XBR, AND 32M-01-18XBR-DUP. As a result, naphthalene results in these samples are qualified (UJ).
- The results of the EPH analysis for sample 32M-01-18XBR and its duplicate sample showed greater than 25 percent relative percent difference for C₉-C₁₈ aliphatic hydrocarbon range. As a result, both results are qualified as (J) estimated.
- Target Analyte List Metals Analysis.
- Laboratory spike sample: Sample 32M-01-13XBR was spiked the percent recoveries
 were acceptable for arsenic and lead. The manganese percent recovery was low;
 outside QC limits 44 percent (limits 75 to 125 percent). Therefore, the manganese
 result for that sample was qualified as (J-), possibly biased low as a result of the low
 spike recovery.

5.2.2 Laboratory Quality Assurance Summary

There were no sample shipping and chain-of-custody deficiencies. Data comparisons showed overall agreement for 92 of 97 analytical tests in total, and quantitative agreement in 11 of the 16 results for which the analyte was detected by at least one of the labs.

The complete report, including copies of the chain-of-custody documents and sample receipt checklists are in Appendix F.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

- There were no exceedances of cleanup goals among AOC 43A monitoring wells sampled in June 2005. Further, there were no exceedances among these well in 2003 or 2004.
- Cleanup goal exceedances occurred at three (32M-01-14XOB, 32M-01-14XBR, 32M-01-18XBR) AOC 32 monitoring wells. No contaminant exceedances were noted in other AOC 32 monitoring wells.
- The AOC 32 monitoring well pair 32M-01-14XOB showed exceedances of arsenic and manganese and 32M-01-14XBR showed exceedances of arsenic and lead in 2005. Although 32M-01-14XOB has shown manganese exceedances in the past, this was the first exceedance for arsenic. These were the first exceedances at 32-01-14XBR since 2002. The reasons for these exceedances have not been identified.
- Monitoring well 32M-01-18XBR continues to show exceedances of VOCs (1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, and chlorobenzene), VPH (C₉-C₁₀ aromatic hydrocarbons), and manganese, although dichlorobenzene concentrations were generally lower in October 2005 than in several previous sampling rounds.
- With the exception of TCE, the Mann-Kendall test for trend does not identify significant decreasing trends in contaminant concentrations at 32M-01-18XBR.
- Several of wells (i.e., 32M-01-13XBR, 32M-01-14XOB/-14XBR, 32M-01-15XBR, 32M-01-16XBR, and 32M-01-17XBR) are located in the vicinity of 32M-01-18XBR and the former location of UST 13. These wells show no evidence of the migration of contaminants away from the UST 13 area at levels of concern.
- Neutral and upward vertical hydraulic gradients between bedrock and overburden tend
 to prevent migration of dissolved phase contaminants from overburden into bedrock
 and to wash any dissolved phase contaminants already in bedrock out into overburden.
- Arsenic in monitoring well SHL-15 exceeded the revised MCL in June 2005, as it has
 historically. A seasonal pattern is not evident, although a precipitation/infiltration
 influence is possible. Monitoring well SHL-15 is interpreted to be a separate flow
 regime (i.e., hydraulically upgradient/crossgradient) from AOCs 32 and 43A and may
 be influenced by Shepley's Hill Landfill.
- Groundwater flow patterns and the location of monitoring wells SHL-15 and 32M-92-01X are such that SHL-15 and 32M-92-01X are unlikely to be influenced by contamination at either AOC 32 or 43A.

- Groundwater flow directions interpreted from 2005 data appear consistent with historical interpretations in spite of recent construction at Transfer Lot 10 and use of a different array of monitoring wells from which to collect data.
- In the event that any wells are destroyed during construction at Lot 11, new wells could be installed, if necessary, on Lot 10 property to maintain coverage along the eastern side of the site.

6.2 RECOMMENDATIONS

- Discontinue sampling for chemical analysis at SHL-15 and 32M-92-01X, but retain for groundwater elevation measurements.
- With the exception of SHL-15 and 32M-92-01X, continue monitoring contaminant trends, seasonal effects, and geochemical trends (dissolved oxygen, oxidationreduction potential) in the same wells monitored in October 2005.
- With the exception of SHL-15 and 32M-92-01X, continue semiannual sampling frequency in the same wells monitored in October 2005.
- Complete preparation of an updated LTMP for the combined sites to reflect the warehouse post-construction conditions.
- Measure groundwater elevations at all AOC 32 and 43A wells for use in plotting groundwater contours and evaluating flow directions.

ABBREVIATIONS

AOC Areas of Contamination

AMRO Environmental Laboratories

AST aboveground storage tank

bgs below ground surface

BRAC Base Closure and Realignment ACT

COD chemical oxygen demand CSM conceptual site model

DRMO Defense Reutilization and Marketing Office

E & E Ecology and Environment, Inc.

EPH extractable petroleum hydrocarbons

FS feasibility study

HLA Harding Lawson Associates, Inc. Horne Horne Engineering Services, Inc.

LTMP Long-term Monitoring Plan

MACTEC Engineering and Consulting, Inc.

MCL maximum contaminant level
MCP Massachusetts Contingency Plan
MNA monitored natural attenuation
MS/MSD matrix spike/matrix spike duplicate

 μ g/L micrograms per liter

PCB polychlorinated biphenyl POL petroleum, oil, and lubricants

QA quality assurance QC quality control

QA/QC quality assurance/quality control

RFTA Reserve Forces Training Area

RI remedial investigation ROD Record of Decision

SI site investigation

STL Severn Trent Laboratories

SWETS Stone and Webster Environmental Technology and Services

TCE trichloroethene total organic carbon

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ABBREVIATIONS, continued

USACE

U.S. Army Corps of Engineers

UST

underground storage tank

VOC

volatile organic compound

VPH

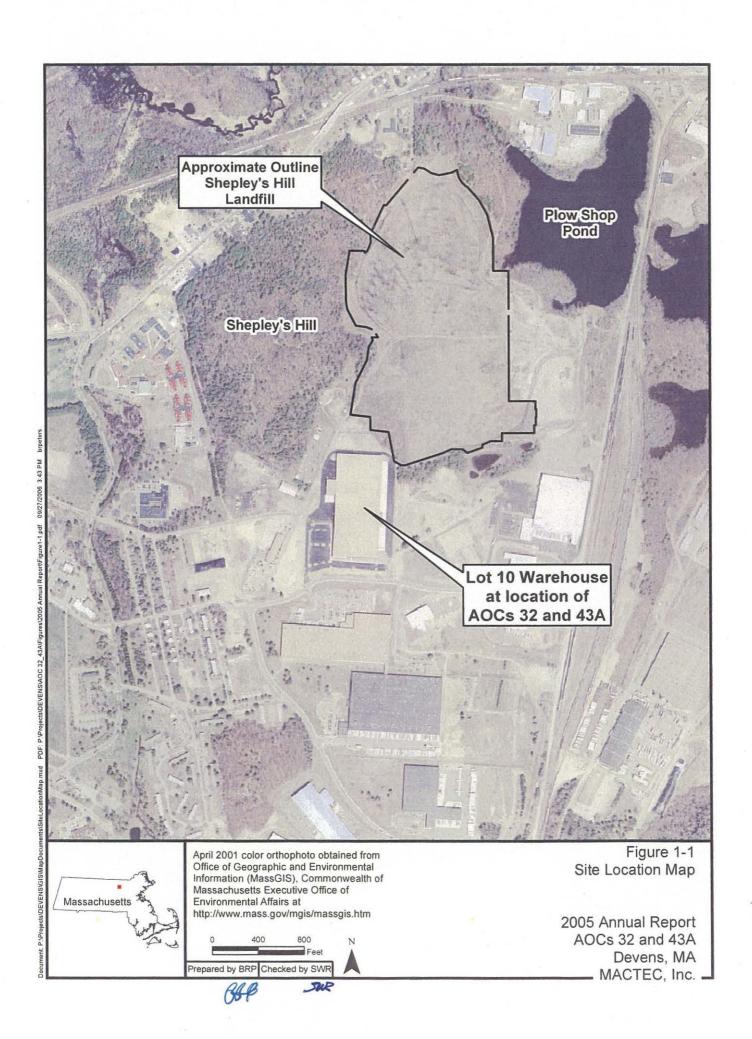
volatile petroleum hydrocarbons

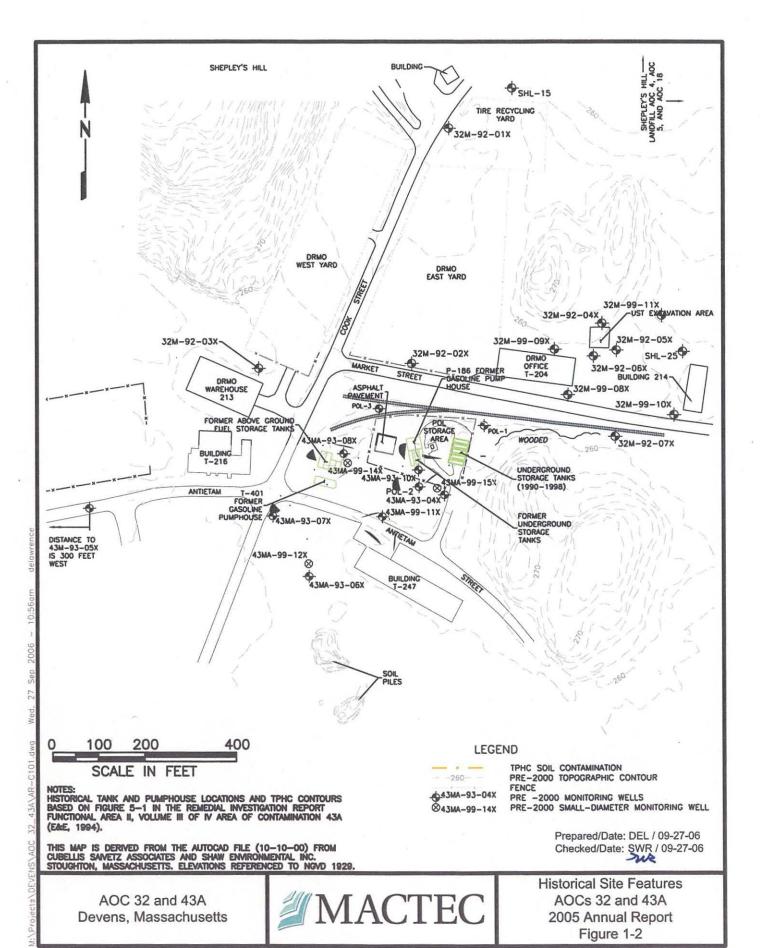
REFERENCES

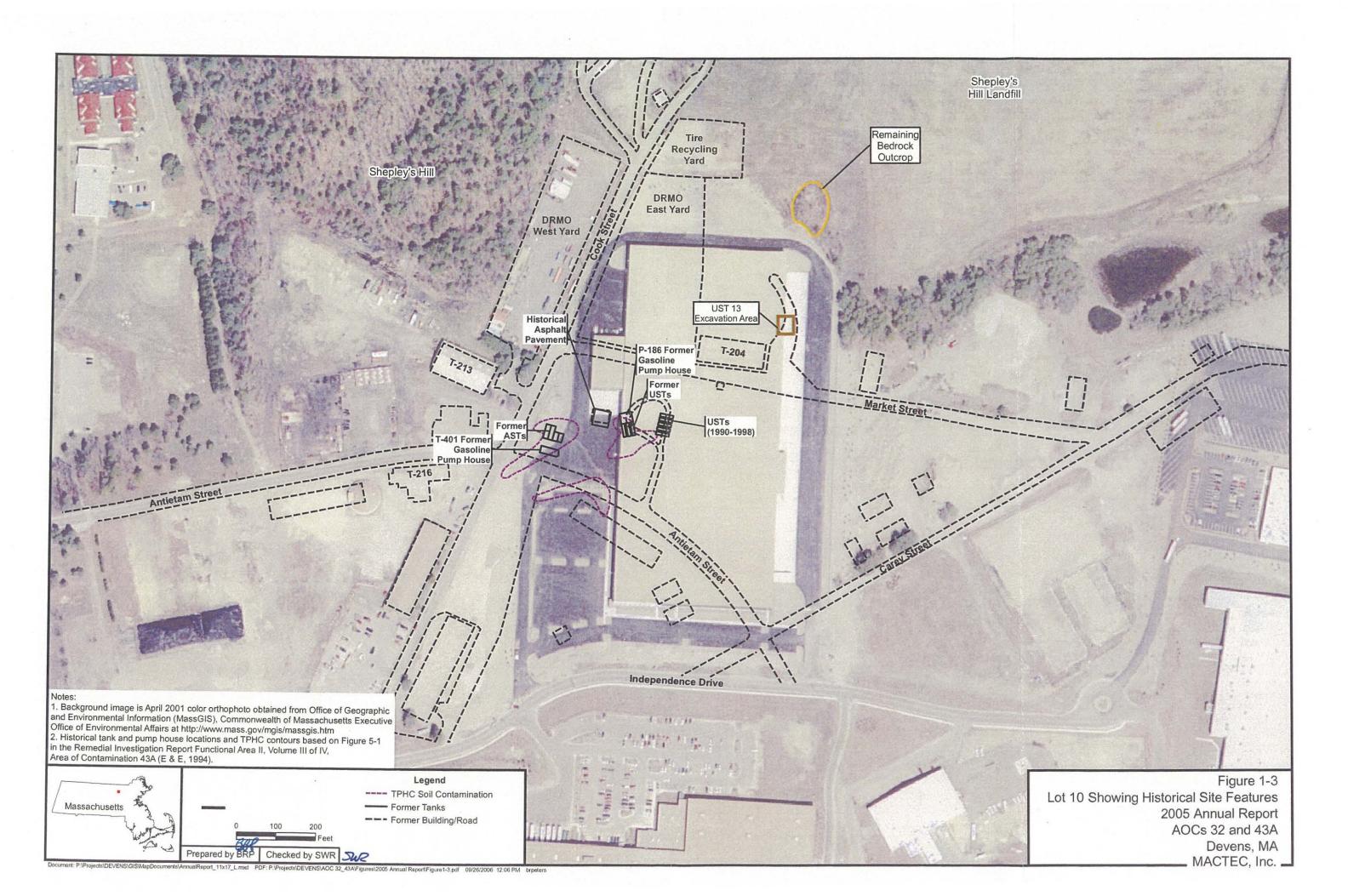
- ATEC Technical Associates, Inc. (ATEC), 1994. "Technical Report Volume 1, Underground Storage Tank Closure UST Nos. 0013 0015, Buildings 204, 219, 242, Fort Devens, Massachusetts." January.
- Dames & Moore, 1998a. "Underground Storage Tank Closure Report, MassDevelopment Operations Division, Devens Commerce Center, Devens, Massachusetts, UST No. 250(1); Dames & Moore, Inc., Salem, New Hampshire; December.
- Dames & Moore, 1998b. "Underground Storage Tank Closure Report, MassDevelopment Operations Division, Devens Commerce Center, Devens, Massachusetts, UST No. 250(2); Dames & Moore, Inc., Salem, New Hampshire; December.
- Dames & Moore, 1998c. "Underground Storage Tank Closure Report, MassDevelopment Operations Division, Devens Commerce Center, Devens, Massachusetts, UST No. 250(3); Dames & Moore, Inc., Salem, New Hampshire; December.
- Dames & Moore, 1998d. "Underground Storage Tank Closure Report, MassDevelopment Operations Division, Devens Commerce Center, Devens, Massachusetts, UST No. 250(4); Dames & Moore, Inc., Salem, New Hampshire; December.
- Dames & Moore, 1998e. "Underground Storage Tank Closure Report, MassDevelopment Operations Division, Devens Commerce Center, Devens, Massachusetts, UST No. 250(5); Dames & Moore, Inc., Salem, New Hampshire; December.
- Ecology and Environment (E&E), 1994. "Remedial Investigations Report Functional Area II Volumes I through IV, Fort Devens, Massachusetts;" prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland; Ecology and Environment, Arlington, Virginia. August.
- Harding Lawson Associates, Inc. (HLA), 2000. "Final First Five-Year Review Report for Devens Reserve Forces Training Area, Devens, Massachusetts;" prepared for U.S. Army Corps of Engineers, New England District, Concord, Massachusetts; Harding Lawson Associates, Portland, Maine. September.
- Horne Engineering Services, Inc., (Horne) (1998). "Final Record of Decision For The Defense Reutilization and Marketing Office Yard (AOC 32) and Petroleum, Oil and Lubricants Storage Area (AOC 43A), Devens, Massachusetts." Prepared for U.S. Army Corps of Engineers, New England District, Concord, Massachusetts. September.
- Kendall, M.G. (Kendall), 1975. "Rank Correlation Methods", 4th edition Charles Griffin, London.
- Nobis Engineering, Inc. (Nobis), (2005). "2005 Five-Year Review Report, Former Fort Devens, Devens, MA;" prepared for U.S. Army Corps of Engineers, New England District, Concord, Massachusetts; Nobis Engineering, Inc. Concord, Massachusetts. September.
- Ostrowski, Ron, 2006. Personal communication between Ron Ostrowski, Devens Commerce Commission, and Stan Reed, MACTEC Engineering and Consulting, Inc. September 22.

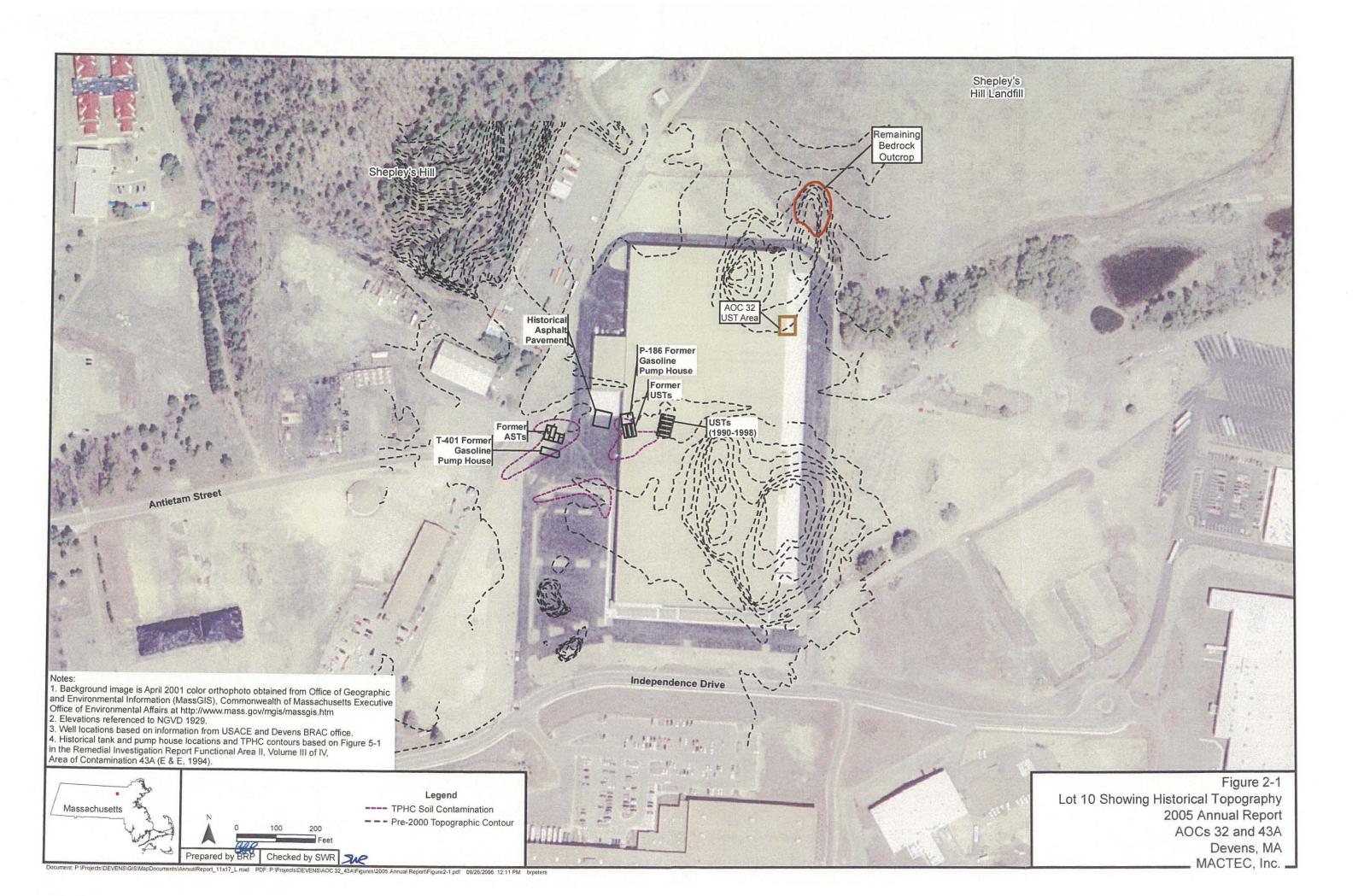
- Shaw Environmental, Inc. (Shaw), 2004. "Draft Work in Progress, Groundwater Sampling Summary Report January 2002 to December 2003". Prepared for U.S. Army Corps of Engineers, New England District, Concord, Massachusetts. February 2004.
- Stone and Webster Environmental Technology & Services (SWETS), 2000a. "Final Demonstration of Remedial Actions Operating Properly and Successfully, AOCs 32 and 43A, DRMO and POL, Devens, Massachusetts". Prepared for the U.S. Army Corps of Engineers, New England District, Concord, Massachusetts. February 2000.
- Stone and Webster Environmental Technology & Services (SWETS), 2000b. "Monitored Natural Attenuation Assessment Report, Volume I of II, AOC 32 DRMO, Devens, Massachusetts". Prepared for the U.S. Army Corps of Engineers, New England District, Concord, Massachusetts. December 2000.
- Stone and Webster Environmental Technology & Services (SWETS), 2000c. "Monitored Natural Attenuation Assessment Report, Volume I of II, AOC 43A POL, Devens, Massachusetts". Prepared for the U.S. Army Corps of Engineers, New England District, Concord, Massachusetts. December 2000.
- Stone and Webster Environmental Technology & Services (SWETS), 2001a. "Monitored Natural Attenuation Assessment Report" Volume II of II, Long Term Monitoring Plan, AOC 32 DRMO, Devens, Massachusetts". Prepared for the U.S. Army Corps of Engineers, New England District, Concord, Massachusetts. April 2001.
- Stone and Webster Environmental Technology & Services (SWETS), 2001b. "Monitored Natural Attenuation Assessment Report", Volume II of II, Long Term Monitoring Plan, AOC 43A POL, Devens, Massachusetts. Prepared for the U.S. Army Corps of Engineers, New England District, Concord, Massachusetts. April 2001.
- U.S. Army Corps of Engineers (USACE), 2004. "Draft 2003 Annual Report: Area of Contamination (AOC) 32 and 43A: Long Term Groundwater Monitoring: Devens, Massachusetts". Concord, Massachusetts. July 2004.
- U.S. Army Corps of Engineers (USACE), 2005a. "Spring 2004 Semi-Annual Report: Area of Contamination (AOC) 32 and 43A: Long Term Groundwater Monitoring: Devens, Massachusetts". Concord, Massachusetts. January 2005.
- U.S. Army Corps of Engineers (USACE), 2005b. "Draft 2004 Annual Report: Area of Contamination (AOC) 32 and 43A: Long Term Groundwater Monitoring: Devens, Massachusetts". Concord, Massachusetts. June 2005.

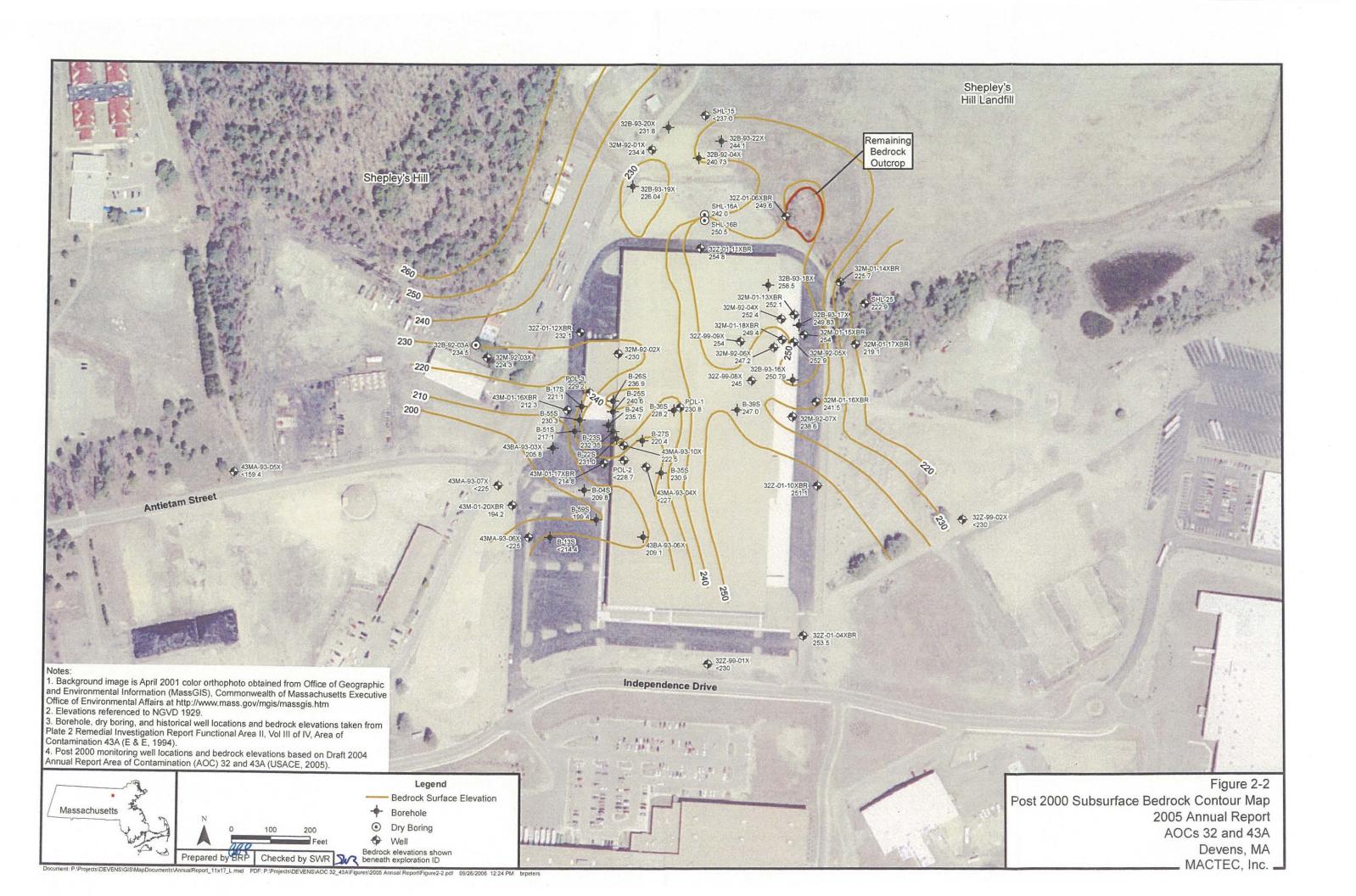
FIGURES

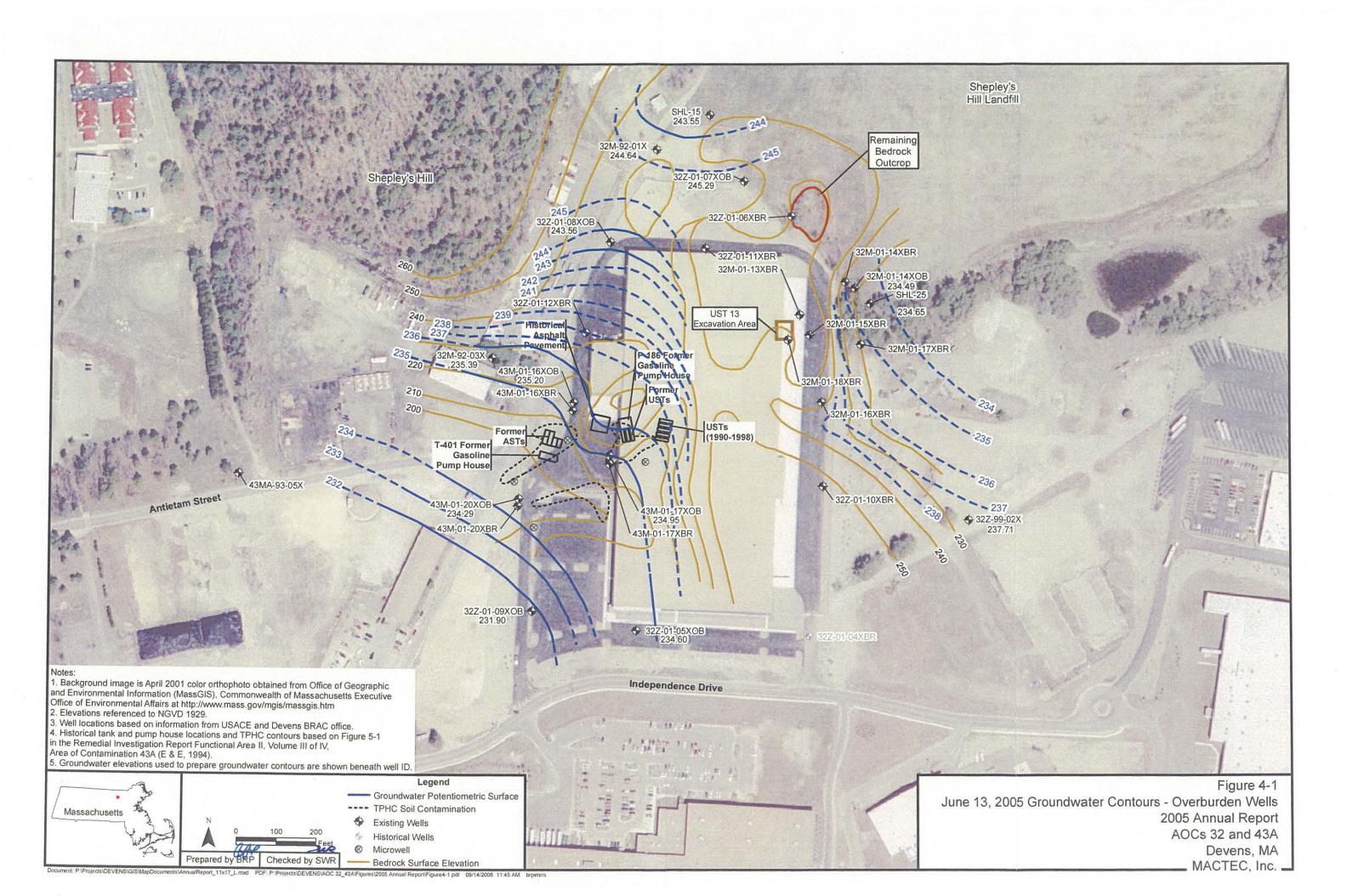


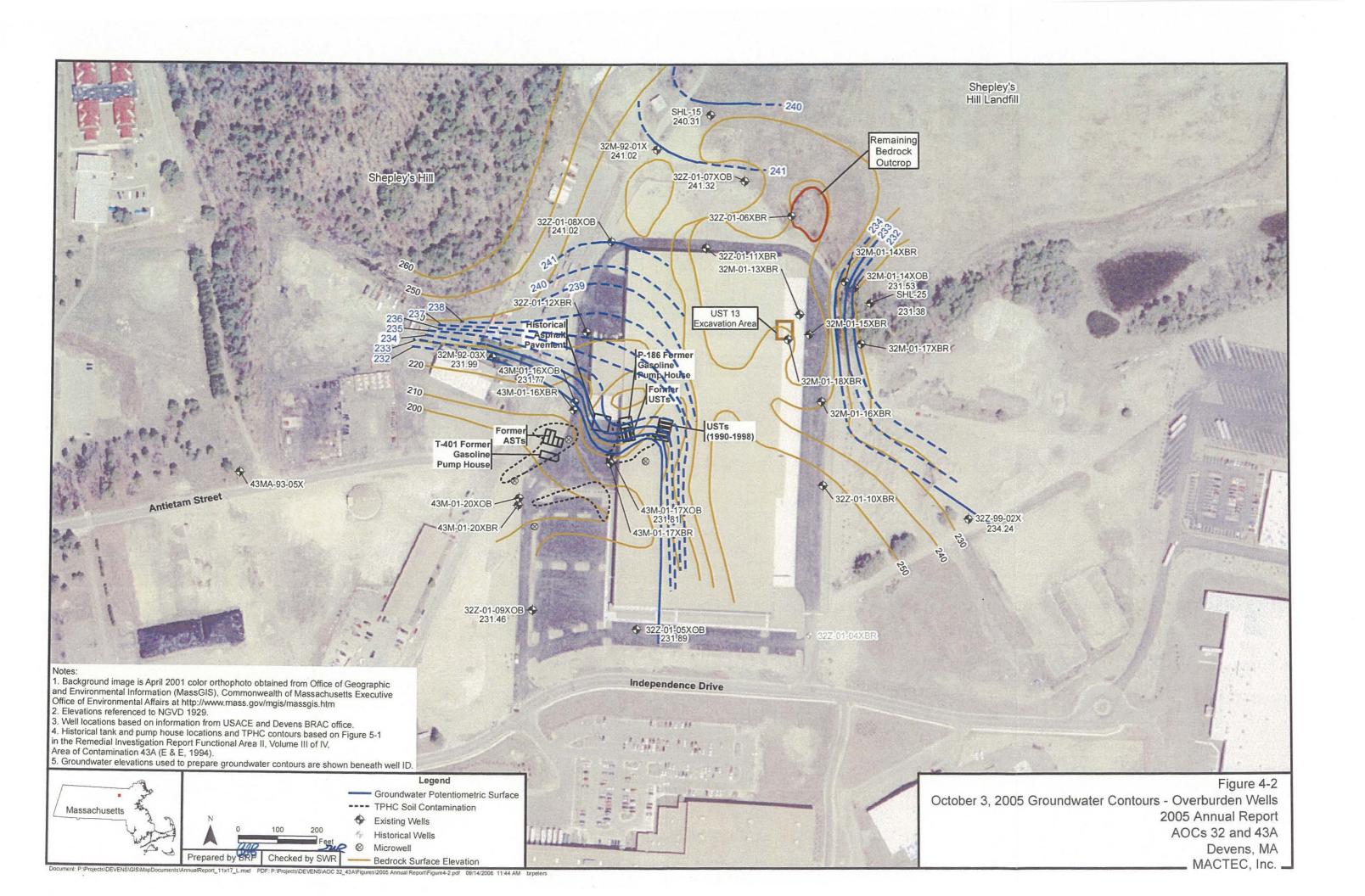


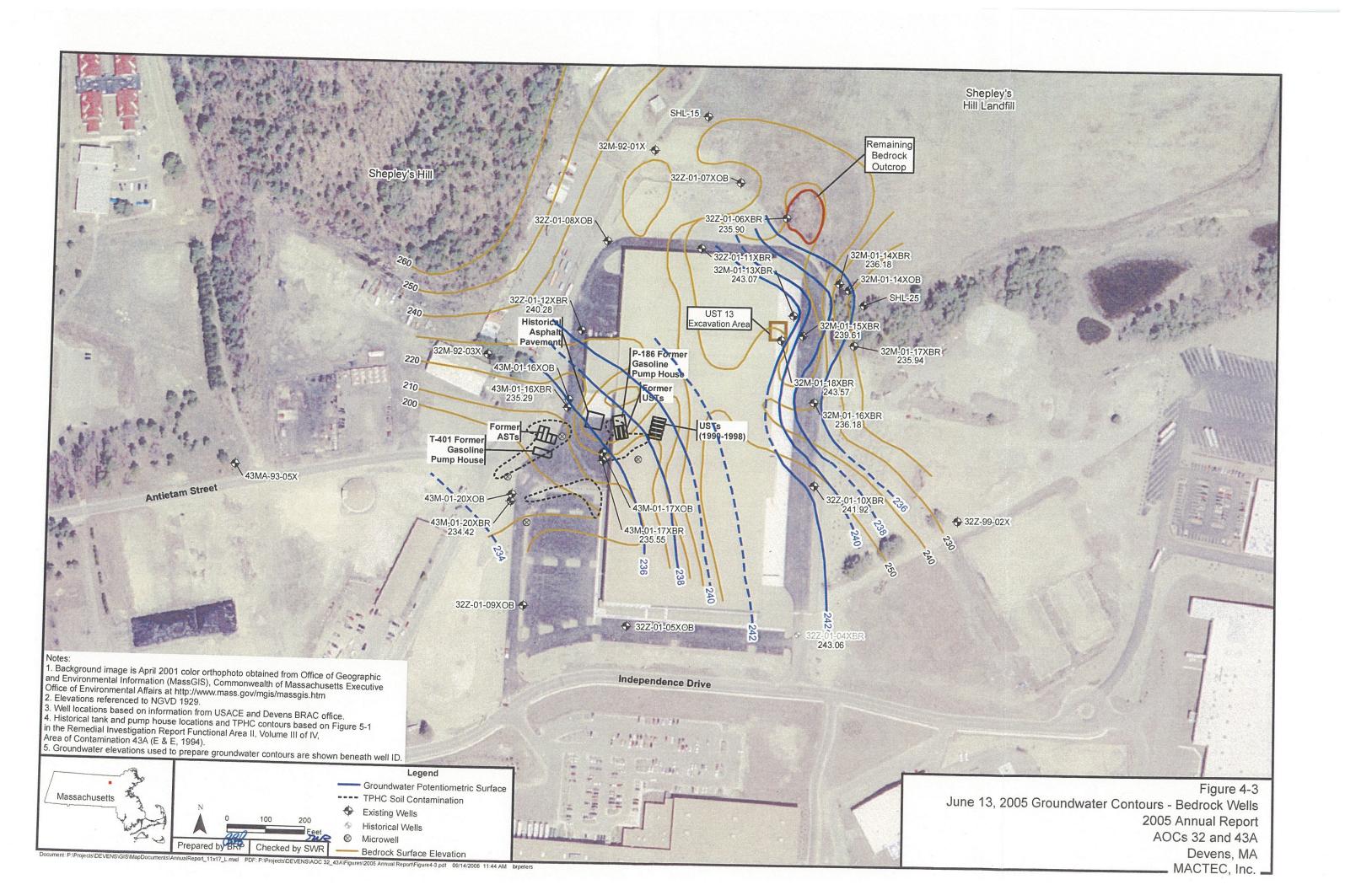


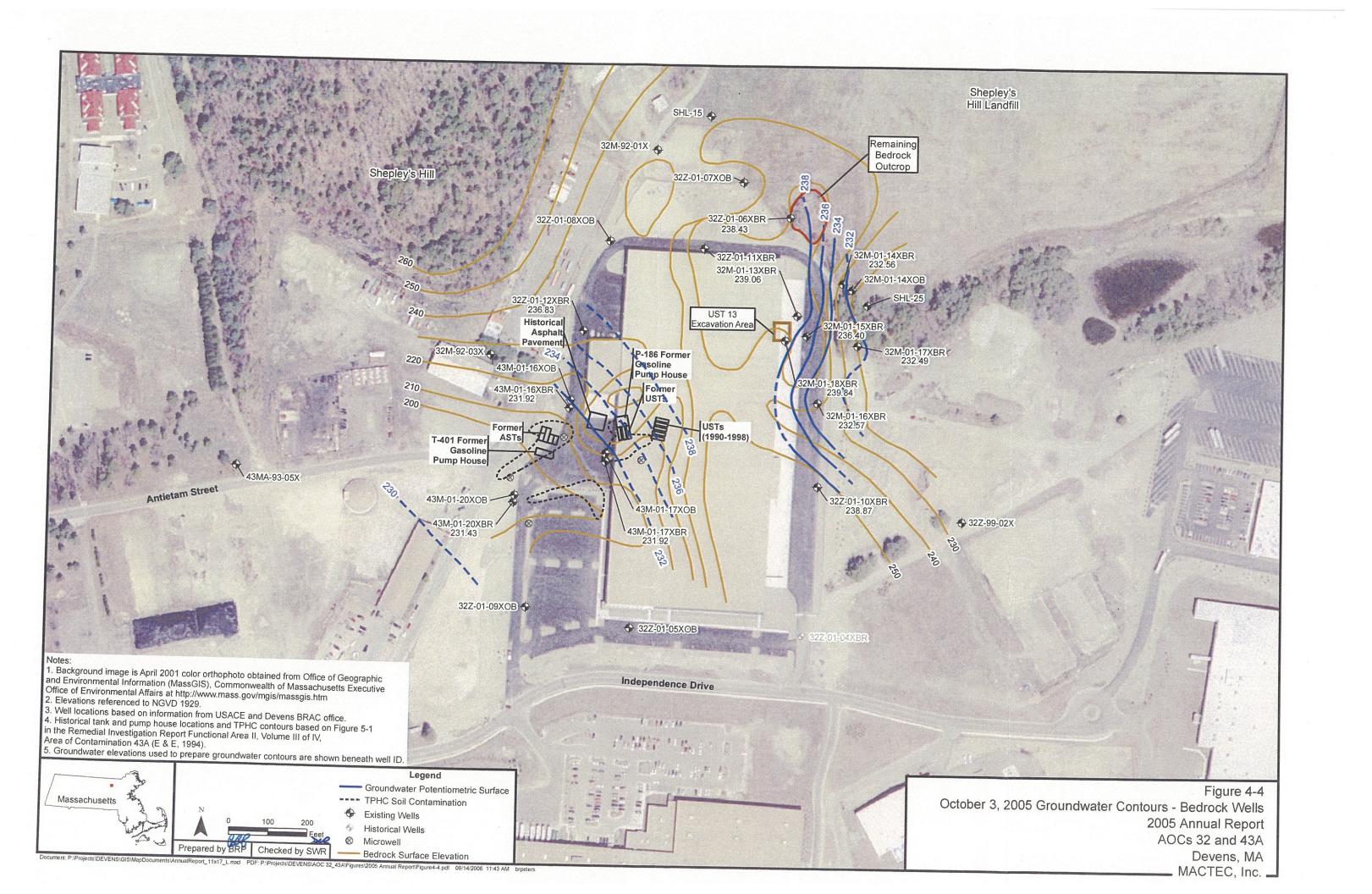


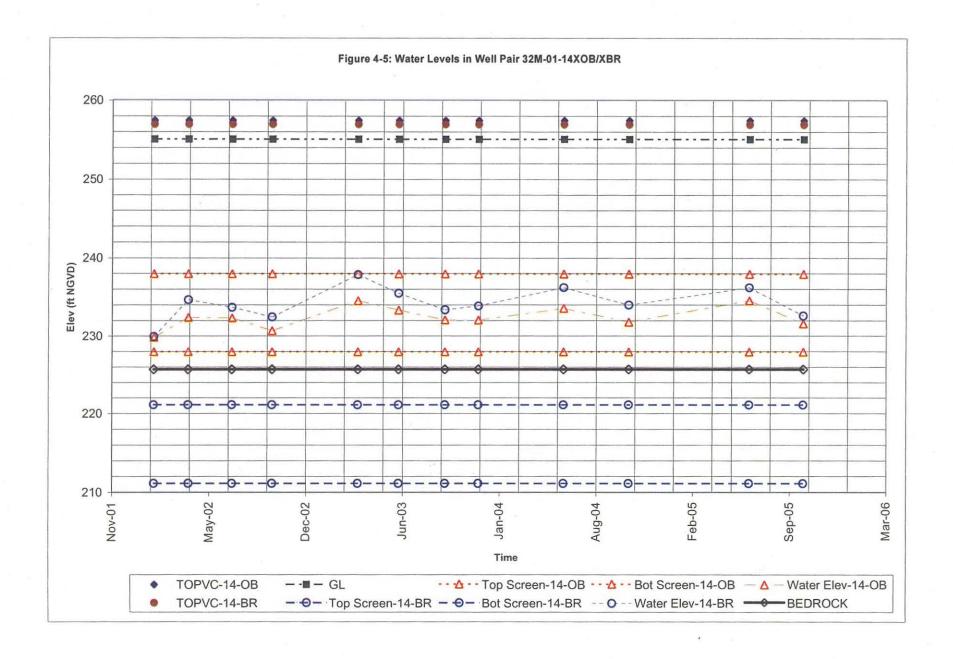


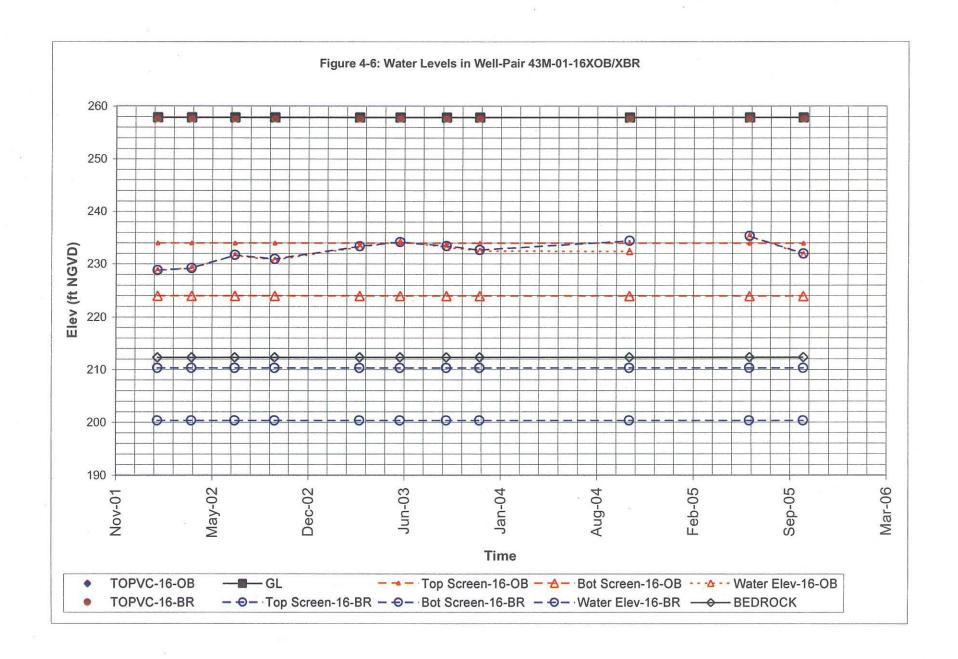


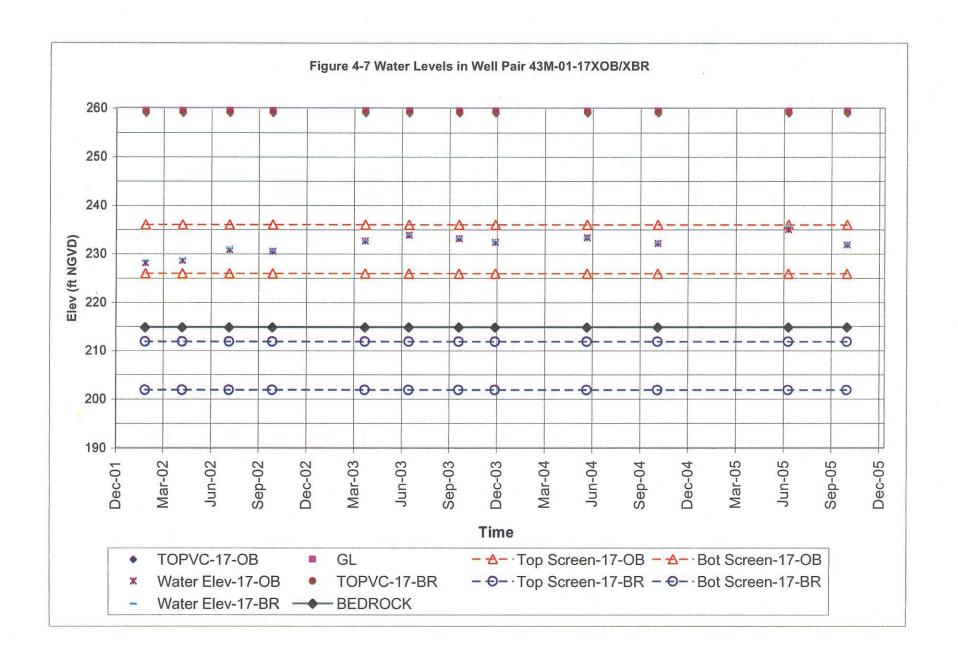


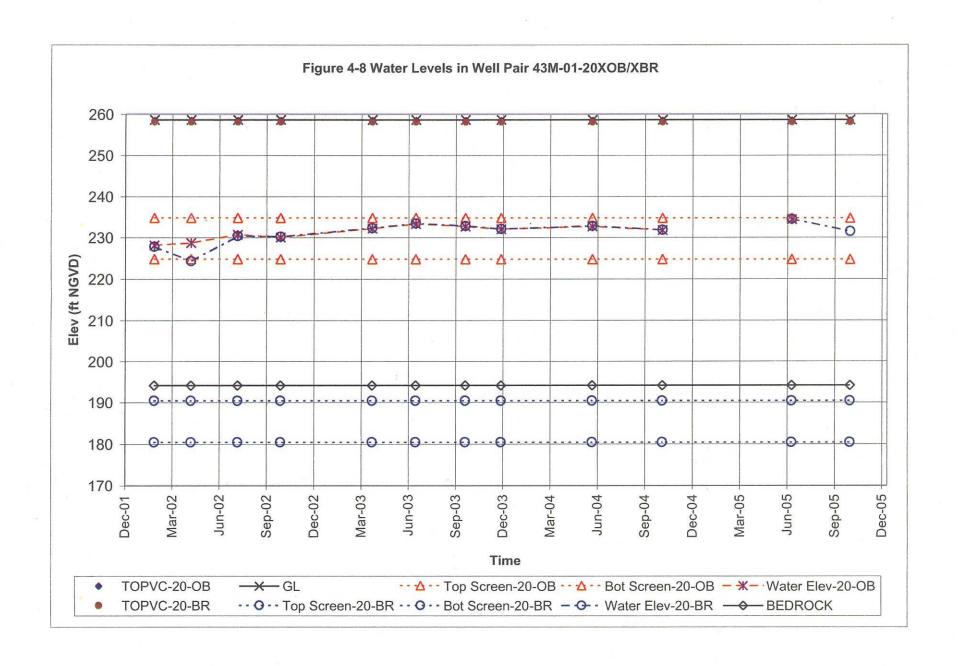


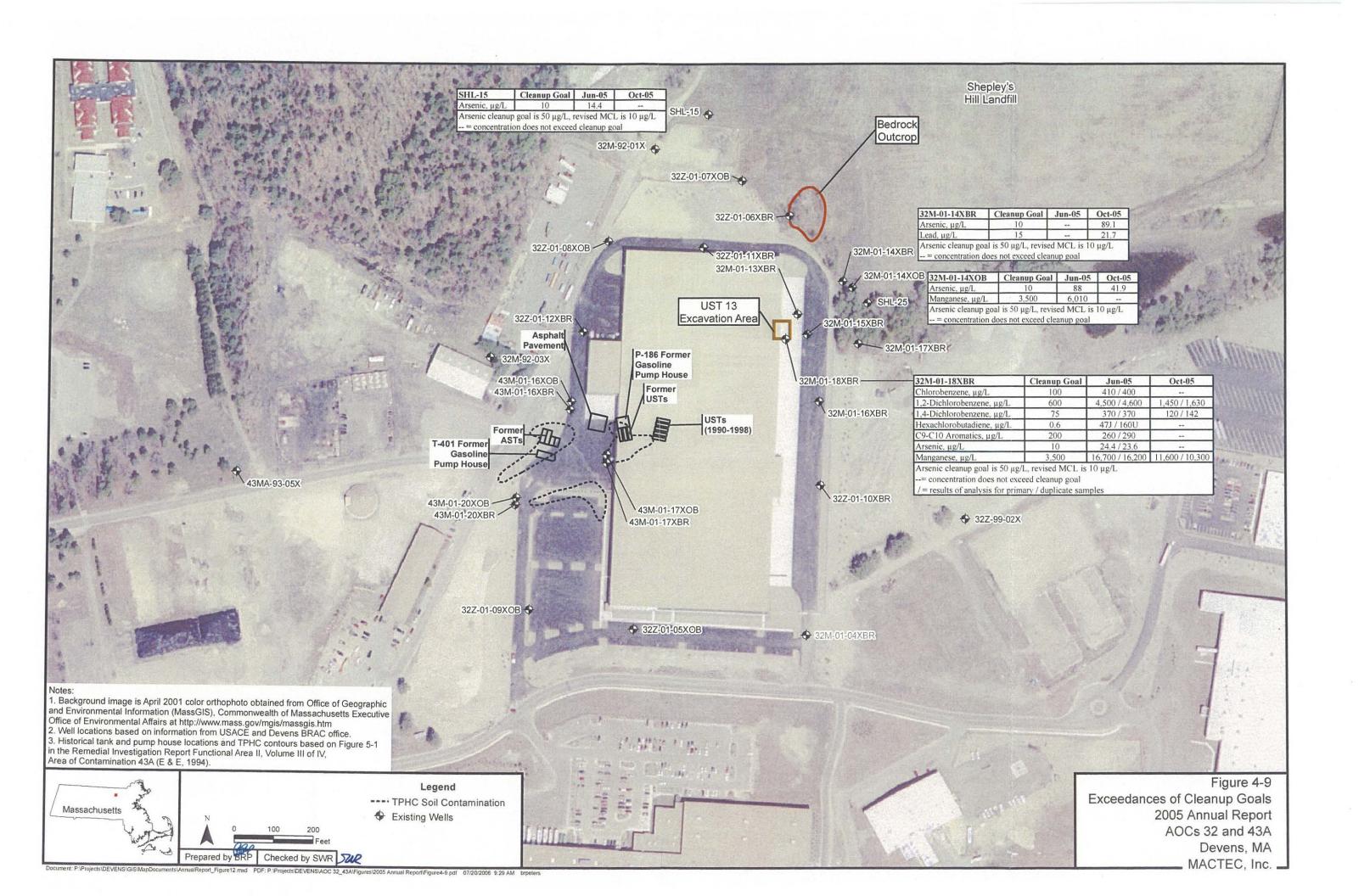


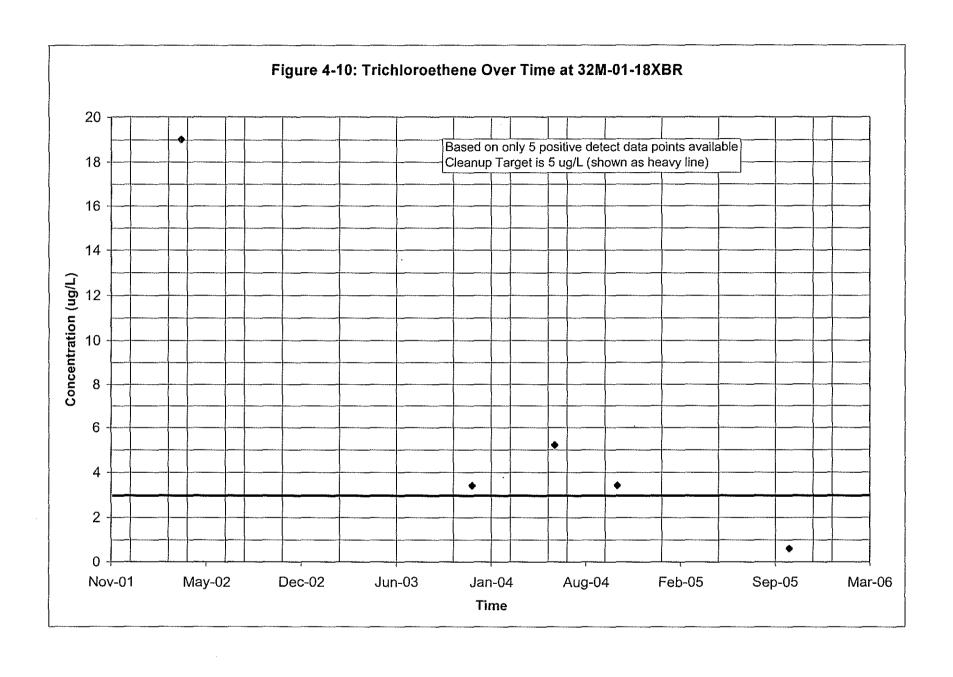


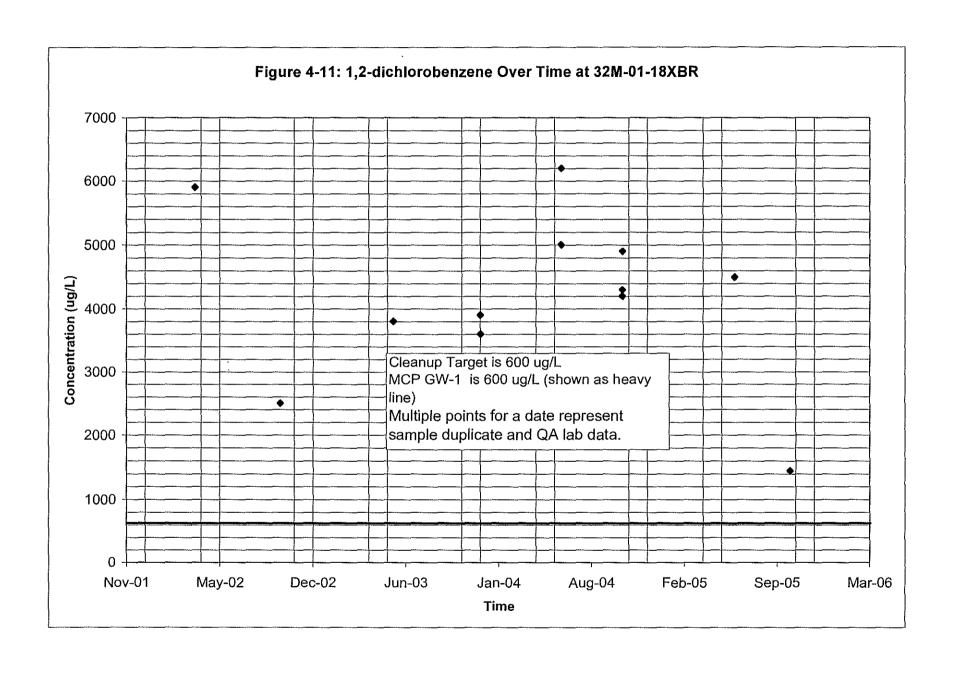


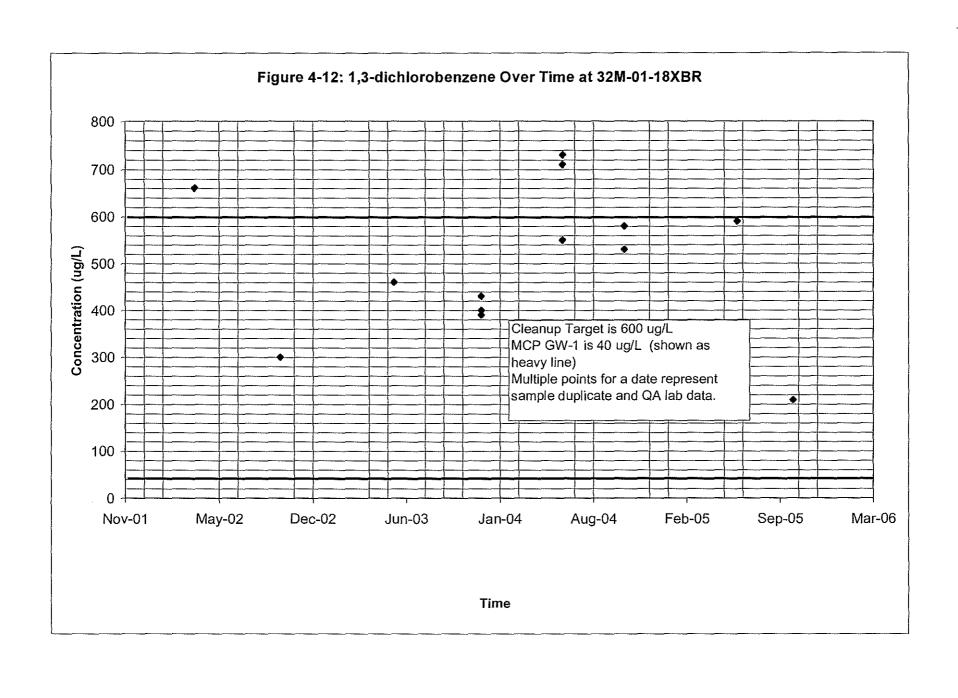


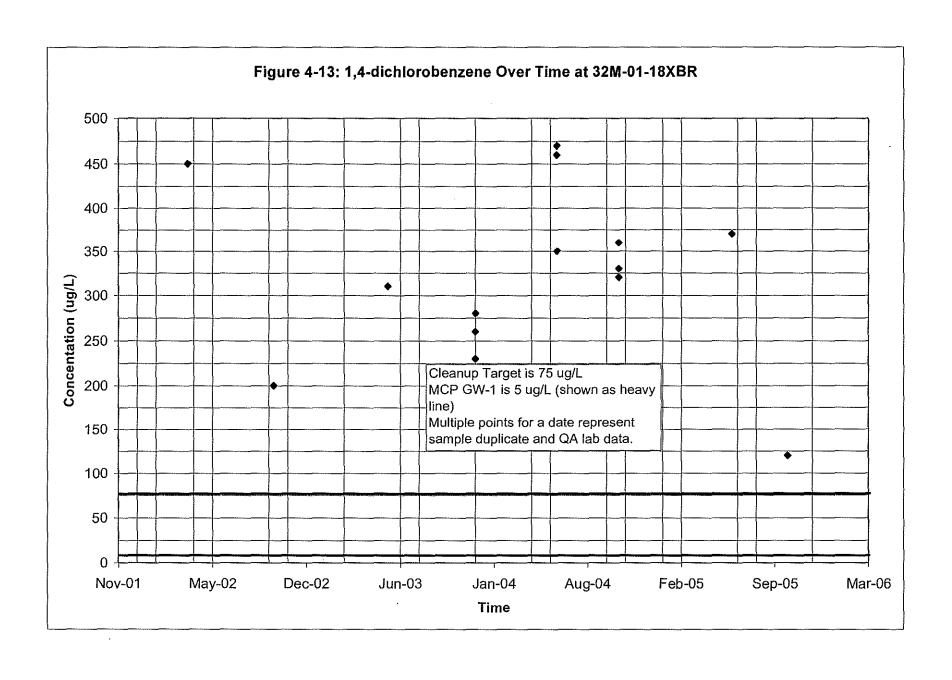


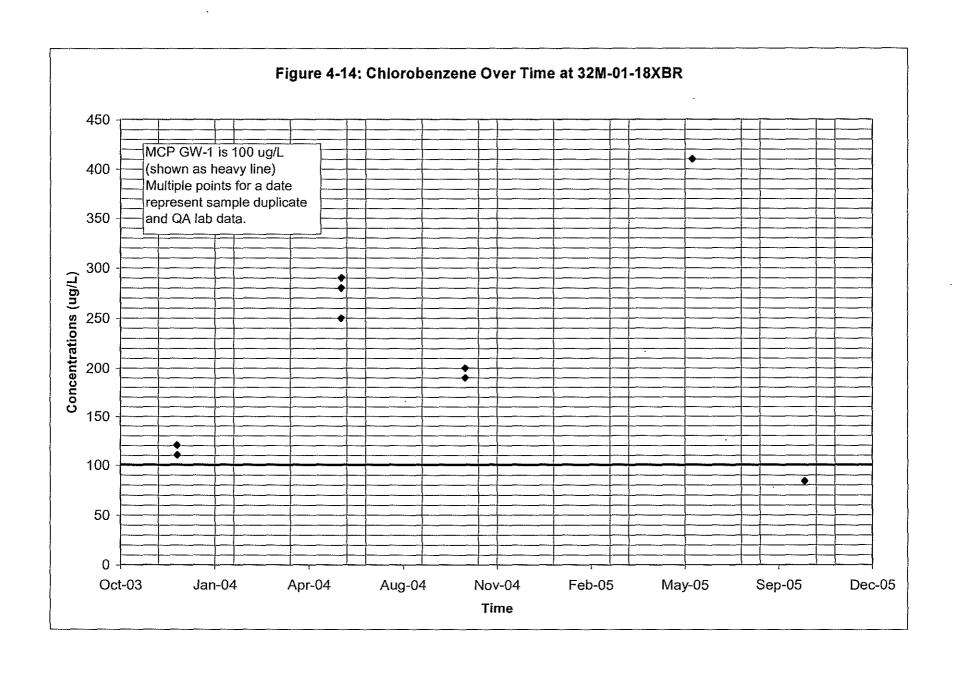


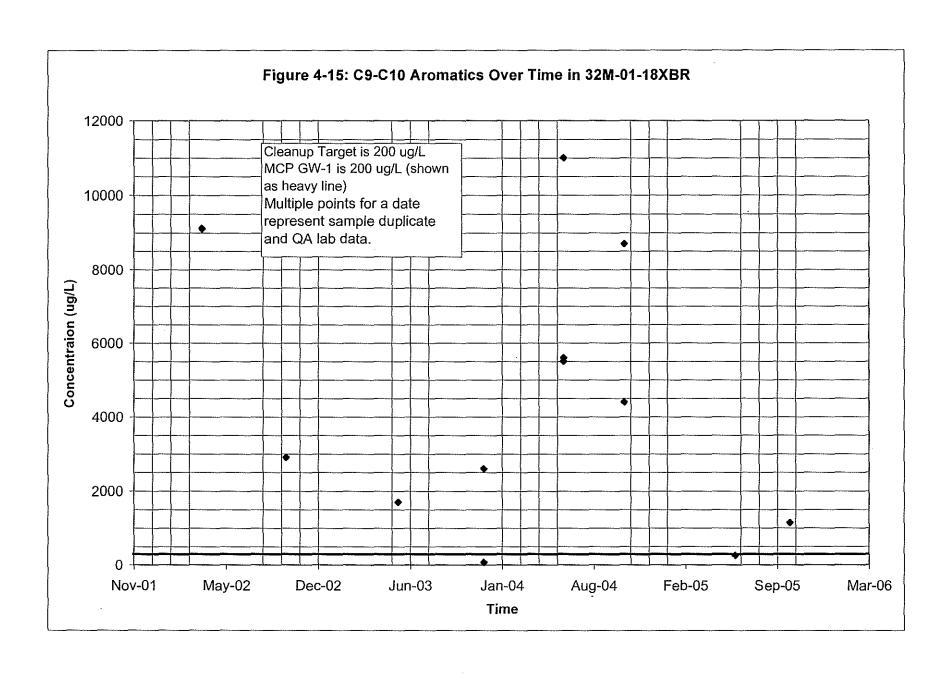


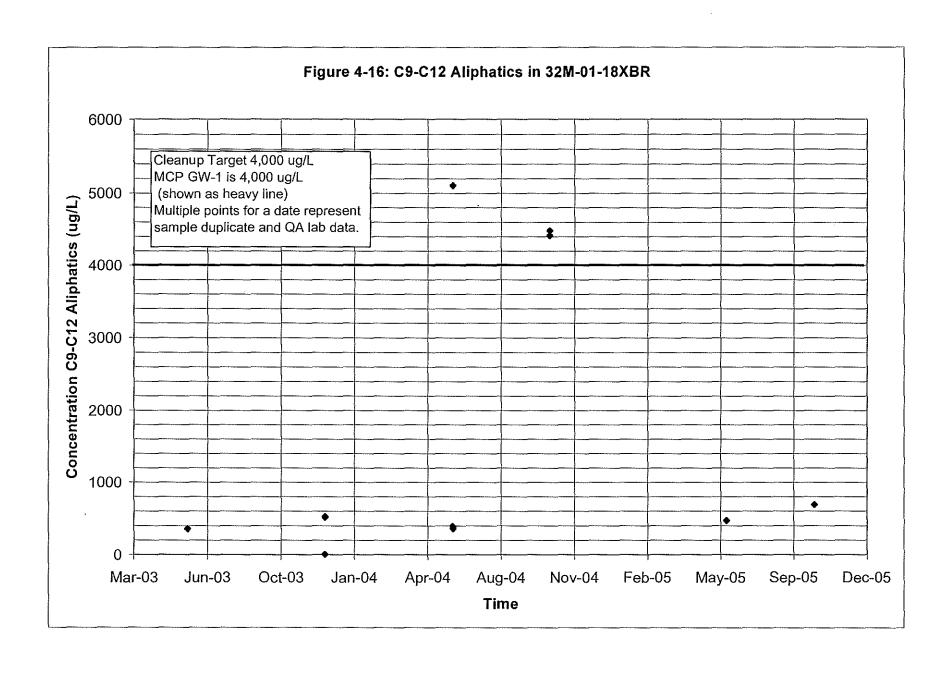


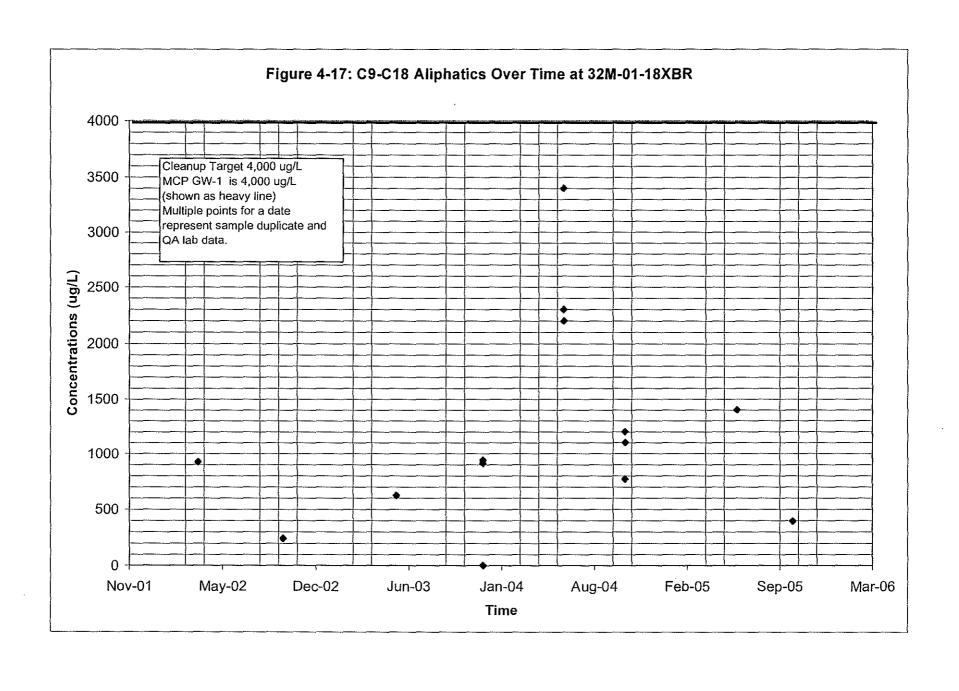












TABLES

TABLE 1-1 SUMMARY OF MODIFICATIONS TO LONG-TERM MONITORING ACTIVITIES

2005 ANNUAL REPORT AOCS 32 AND 43A DEVENS, MASSACHUSETTS

Date	Modification	Rationale
June 2005	Discontinued analysis for dissolved metals.	Analysis no longer necessary based on conclusion that only limited potential exists for bio-remediation/attenuation to occur at UST No. 13.
October 2005	Discontinued sampling at 43M-01- 16XOB, -16XBR, -17XOB, -17XBR, - 20XOB, and -20XBR.	No chemical of concern exceedances in these wells in 2003, 2004, June 2005.
	Discontinued sampling at 32M-01-04XBR	Absence of chemical of concern exceedances.
	Discontinued analysis for COD, TOC, NH3, dissolved gases, alkalinity, and anions.	Analysis no longer necessary based on conclusion that only limited potential exists for bio-remediation/attenuation to occur at UST No. 13.
	Discontinued analysis for PCBs.	No exceedances of cleanup goal.

Prepared by: JW, 10/5/06 Checked by: SWR, 10/5/06, SWR

TABLE 3-1 SUMMARY OF 2005 GROUNDWATER ELEVATION MONITORING AND SAMPLING PROGRAM

2005 ANNUAL REPORT AOCS 32 AND 43A DEVENS, MASSACHUSETTS

Monitoring	Well	Elevation	Sample Collection	Sample Collection
Well	Description 1,2	Monitoring	June	October
SHL-15	OB	√	✓	✓
SHL-25	OB, sentry	✓		
32M-92-01X	OB	✓	✓	✓
32M-92-03X	OB	✓	✓	
32Z-99-02X	OB	✓	√	
32M-01-04XBR	BR	. 🗸	✓	
32Z-01-05XOB	OB	✓		
32Z-01-06XBR	BR	✓		
32Z-01-07XOB	OB	~		
32Z-01-08XOB	OB	✓		
32Z-01-09XOB	OB	✓		
32Z-01-10XBR	BR	✓		
32Z-01-11XBR	BR	✓		
32Z-01-12XBR	BR	✓		
32M-01-13XBR	BR, source area	✓	✓	✓
32M-01-14XOB	OB, sentry	~	✓	✓
32M-01-14XBR	BR, sentry	✓	✓	✓
32M-01-15XBR	BR, source area	✓	✓	✓
32M-01-16XBR	BR, sentry	✓	✓	✓
32M-01-17XBR	BR, sentry	✓	✓	✓
32M-01-18XBR	BR, source area	√	✓	√

43M-01-16XOB	OB, source area	✓	✓	
43M-01-16XBR	BR, source area	√	✓	
43M-01-17XOB	OB, source area	✓	✓	
43M-01-17XBR	BR, source area	✓	✓	
43M-01-20XOB	OB, sentry	✓	✓	
43M-01-20XBR	BR, sentry	✓	√	

Notes:

OB = overburden

² BR = bedrock

TABLE 4-2 GROUNDWATER ANALYTICAL RESULTS - JUNE 13-16, 2005 SAMPLING EVENT

2005 ANNUAL REPORT AOCS 32 AND 43A DEVENS, MASSACHUSETTS

PARAMETER (METHOD) C (8260)	MCP GW-1	Site-Specific Cleanup Goals	Reporting Limit	SHL-15	32M-92-01X	32Z-99-02X	32M-92-03X	32M-01-04XBR	32M-01-13XBR	32M-01-14XOB	32M-01-14XBR	32M-01-15XRR	32M-01-16XBR	32M-01-17XBR	32M-01-18XBR	32M-01-18XBR DUP	- 32M-01-18XBR QA	43M-01-16XOB	4334 01 12275	4334 01	4334 AL 4		
	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	µg/L	μg/L	μg/L	ug/L	μg/L	μg/L	μg/L	μg/L	μg/L	μg/L	43M-01-16XOB μg/L	43M-01-16XBR	43M-01-17XBR 4	43M-01-17XOB ug/L	43M-01-20XOB μg/L	43M-01-202
ile Organic Compounds										-								P.E.	рус	рус.	дес	цуц	µg/L
chloride (chloroethene) ,2-Dichloroethene	2	2	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1011										
Dichloroethene	70	55	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0 t					
richloroethane	200	5	1.0	1.0 U	1.0 U	1.0 U	1.0 U	0.25 J	1.0 U	160 U	160 U	11	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
oethene	5 40	5	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U 0.41 J	160 U	160 U	2.0 U 2.0 J	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
lorobenzene	5	75	1.0	1.0 U	1.0 U	0.34 J	1.1	1.0 U	0.40 J	590	580	580	1.0 U	0.38 J	0.27 J 1.0 U	1.0 U	1.0 U	0.34					
lorobenzene	600	600	1.0	1.0 U	1.0 U	0.31 J 0.46 J	1.0 U 0.83 J	1.0 U	1.0 U	370	370	400	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
odifluoromethane (Freon 12) nethane	-		1.0	1.0 U	1.0 U	1.0 U	1.0 U	0.40 J 1.0 U	0.34 J 1.0 U	4500 160 U	4,600 160 U	5300 J+ 2.7 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
nethane	10		1.0	1.0 U	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	5.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0
rofluoromethane (Freon 11)	-		1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
n (Preon 11)	-		5.0	1.0 U 5.0 U	1.0 U 5.0 U	0.46 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	5.0 U 2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0
F			1.0	1.0 U	1.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	800 U	800 U	NR	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0
hloroethene	7	-	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
iodide	3,000	-	5.0	10 1.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	16	5.0 U	5.0 U	5.0 U	5.0 U	800 U	800 U	10 U	1.0 U 5.0 U	1.0 U 3.1 J	1.0 U 5.0 U	1.0 U 5.0 U	1.0 U 5.0 U	1.0 5.0
disulfide	-		1.0	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	NR	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0
loride ne chloride		1960 P	1.0	1,0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U NR	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0				
itrile	-	-	1.0	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0
oroethene (total)		-	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U 0.26 J	1.0 U 0.36 J	160 U	160 U	NR	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1,0					
butyl ether oroethane	70	2	1.0	1.0 U	1.0 U	1.0 U	1.0 U	0.26 J 1.0 U	0.36 J 1.0 U	160 U	160 U	NR 2.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
ate	- 70		1.0	1.0 U	1.0 U 1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1,0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0
e	- 250		1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	NR	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.					
e ile	350	-	5.0 4.0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	1.0 U 5.0 U	160 U 800 U	160 U 800 U	NR 10 U	1.0 U 5.0 U	1.0 U 5.0 U	1.0 U 5.0 U	1.0 U 5.0 U	1.0 U	1.0					
onitrile	-		1.0	4.0 U 1.0 U	4.0 U	4.0 U 1.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	640 U	640 U	NR	4.0 U	4.0 U	4.0 U	4.0 U	5.0 U 4.0 U	5.0
oromethane ofuran	-		1.0	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U 160 U	160 U	NR 2011	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
n	5	-	14	14 U	14 U	14 U	14 U	14 U	1.0 U	2200 U	2200 U	2.0 U	1.0 U 14 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
trachloride	5		1.0	1.0 U	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	14 U 1.0 U	14 U 1.0 U	14
cohol (butanol)	-	-	50	50 U	50 U	5.0 U	50 U	1.0 U 50 U	1.0 U	1.0 U 50 U	1.0 U 50 U	1.0 U 50 U	1.0 U 50 U	1.0 U 50 U	160 U 8000 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0
roethane	5	· ·	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	8000 U 160 U	2.0 U 0.86 J	50 U	50 U	50 U 1.0 U	50 U 1.0 U	50 U	50					
ropropane	5	-	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
thacrylate ethane		-	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0
e		-	1.0	1.0 U 50 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0
loromethane	3		1.0	1.0 U	50 U	5.0 U 1.0 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	50 U	8000 U	8000 U	50 U	50 U	50 U	50 U	50 U	50 U	1.0
nyl Vinyl Ether hloropropene	0.5 *		1.0	1.0 U R	1.0 U 1.0 U R	1.0 U 1.0 U R	1.0 U 1.0 U R	1.0 U 1.0 U R	1.0 U 1.0 U R	1.0 U 1.0 U R	160 U 160 U R	160 U R	2.0 U NR	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0				
-pentanone	350	- : -	5.0	1.0 U 5.0 U	1.0 U 5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U K	160 U R	1.0 U	1.0 U R	1.0 U R	1.0 U R	1.0 U R	. 1.0 U R	1.0
The state of the s	1,000	-	1.0	1.0 U	1.0 U	5.0 U 1.0 U	5.0 U 1.0 U	5.0 U 1.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	800 U	800 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0
Dichloropropene thacrylate	0.5 *	-	1,0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
loroethane	5		1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	1.0 U NR	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
oethene .	5		1.0	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0
ne hloromethane	-		5.0	5.0 U	5.0 U	1.0 U 5.0 U	1.0 U 5.0 U	1.0 U 5.0 U	0.41 J 5.0 U	160 U 800 U	160 U 800 U	0.53 J 10 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
nzene	100	- :	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	5.0 U	5.0 U 1.0 U	5.0 U 1.0 U	5.0 U	5.0 U	5.0					
trachloroethane	5		1.0	1.0 U	1.0 U	1.0 U 1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.2	1.0 U	1.0 U	1.0 U	410	400	400	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0
ene & p-Xylene	700 10000 *	-	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
al)	10000 *	:	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	1.1 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0					
	10000 *		1.0	1,0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	NR	1.0 U	1,0 U	1.0 U	1.0 U	1.0 U	1.0
	100	-	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	0.76 J 2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
enzene		-	1.0	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0
chloro-2-butene	-	-	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	3.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
rachloroethane loropropane	2	-	1.0	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	160 U	160 U	NR 2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
ichloro-2-butene			1.0	1.0 U	1.0 U	1.0 U	1.0 U	1,0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0					
no-3-chloropropane (DBCP)	-		1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	NR	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
orobenzene butadiene	70		1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U 49 J	160 U	5.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
	140		1.0	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	47 J	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0
opropane		-	1.0	1.0 U	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	79 J	160 U	2.6 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0
opropene opropane			1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U 2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
ene		-	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0					
zene	-		1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	160 U	160 U	1.5 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
ene ene	-	-	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	1.9 J 2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
hylbenzene			1.0	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0
izene	-		1.0	1.0 U	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	0.51 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0
hylbenzene zene			1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
oluene		- :	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	1.9 J 1.2 J	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
		-	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U	160 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					
zene Iorobenzene	-		1,0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	160 U 65 J	160 U	2.0 U 2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0					

TABLE 4-1 GROUNDWATER ELEVATION DATA SUMMARY YEARS 2002 THROUGH 2005

2005 ANNUAL REPORT AOCS 32 AND 43A DEVENS, MASSACHUSETTS

Appreciation of the		2002 Wat	er Levels			2003 Wa	ter Levels		2004 Wa	ter Levels	2005 Wa	ter Levels
WELL	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	GROUNDWATER	CPOLINDWATER	CDOUNDWATER	CROUNDWATER	GROUNDWATER	CROVAINALATER	CD CYTUTE YOU I THE	
DESIGNATION	ELEVATIONS	ELEVATIONS	ELEVATIONS	ELEVATIONS	ELEVATIONS	ELEVATIONS	ELEVATIONS	ELEVATIONS	ELEVATIONS	GROUNDWATER ELEVATIONS	GROUNDWATER	
Measuring Dates	1/30/2002	4/11/2002	7/10/2002	10/1/2002	3/27/2003	6/19/2003	9/23/2003		AND CONTRACTOR OF THE PROPERTY		ELEVATIONS	ELEVATIONS
32M-92-01X	240.29	243.98	243.35	241.33	245.89	244.14	241.89	12/1/2003 242.05	5/25/2004	10/7/2004	6/13/2005	10/3/2005
32M-92-03X	NM	231.77	231.64	231.05	234.11	234.43	233.08	232.42	244.47 233.88	242.83	244.64	241.02
			351101	231.03	2,34.11	2,4,4,5	233.08	232.42	233.88	232.79	235.39	231.99
32Z-99-02X	232.77	235.42	235.6	233.70	237.59	230.63	234.97	235.40	236.79	234.69	227.71	224.24
					237.37	250.05	234.91	233.40	230.79	234.09	237.71	234.24
SHL-15	239.71	242.45	242.52	240.20	NA	242.15	240.90	241.11	244.11	· 242.25	243.55	240.31
SHL-25	NM*	230.55	232.74	230.38	232.88	233.38	231.97	231.68	#N/A	231.42	234.65	231.38
						200.00	251.77	231.06	#19/74	231.42	234.03	231.38
32Z-01-04XBR	240.86	244.15	241.05	243.37	247.09	242.60	244.28	240.65	241.28	244.23	243.06	not located
32Z-01-05XOB	231.36	228.73	230.64	230.20	232.21	233.42	232.97	232.32	#N/A	232.00	234.60	231.89
32Z-01-06XBR	241.66	245.65	244.18	240.54	249.60	245.99	240.94	243.37	#N/A	244.15	235.90	238.43
32Z-01-07XOB	241.49	244.51	244.05	241.49	247.37	245.02	242.38	242.94	#N/A	243.65	245.29	241.32
										2 10100	1 (3.2)	211.52
32Z-01-08XOB	239.89	244.33	242.98	241.35	245.07	243.78	241.77	241.93	#N/A	242.51	243.56	241.02
32Z-01-09XOB	227.95	228.64	230.47	230.03	232.10	233.24	232.71	232.05	#N/A	231.73	231.90	231.46
32Z-01-10XBR	240.27	242.91	241.33	242.10	246.11	241.32	241.48	239.73	#N/A	241.54	241.92	238.87
32Z-01-11XBR	NO WATER	NO WATER	245.92	NO WATER	245.45	DRY	DRY	DRY	#N/A	below 245.84	below 245.84	below 245.84
32Z-01-12XBR	234.55	236.84	238.87	236.82	239.98	239.77	238.10	237.63	#N/A	237.73	240.28	236.83
32M-01-13XBR	238.74	240.8	240.79	241.87	247.87	243.58	241.63	240.89	242.01	242.24	243.07	239.06
32M-01-14XOB	229.75	232.3	232.24	230.62	234.47	233.26	232.01	232.00	233.49	231.74	234.49	231.53
32M-01-14XBR	229.89	234.6	233.62	232.41	237.84	235.44	233.31	233.82	236.17	233.94	236.18	232.56
22) (01 15)(DD	225.06											
32M-01-15XBR	235.86	238.05	237.66	237.61	242.46	239.18	237.58	237.17	238.36	237.97	239.61	236.40
32M-01-16XBR 32M-01-17XBR	231.47	234.36	234.7	232.87	237.34	235.10	233.89	233.59	234.87	233.64	236.16	232.57
32M-01-17XBR 32M-01-18XBR	231.08 238.99	233.33	230.04	232.64	236.37	234.80	233.62	233.36	234.69	233.39	235.94	232.49
J2M-01-10ADR	230.99	241.14	241.63	241.08	246.72	243.61	241.65	241.13	242.52	242.14	243.57	239.84
43M-01-16XOB	228.71	229.13	231.53	220.67	222.17	22 4 22						
43M-01-16XBR	228.77	229.15	231.65	230.67	233.17	234.20	233.15	232.42	233.75	232.34	235.20	231.77
12M-01-10VDK	220.11	227.13	231.03	230.89	233.29	234.15	233.37	232.62	#N/A	234.37	235.29	231.92
43M-01-17XOB	228.08	228.57	230.8	230.47	232.62	222.01	222.00	000.07				
43M-01-17XBR	228.56	228.97	231.07	230.47	232.69	233.81	233.09	232.37	233.27	232.18	234.95	231.81
		220.71	231.07	45.0.54	232.09	233.84	233.16	232.50	233.25	232.24	235.55	231.92
43M-01-20XOB	228.06	228.61	230.62	229.98	232.12	233.20	222.62	221.07	222.61	001.51		
43M-01-20XBR	227.73	224.25	230.33	230.18	232.12	233.20	232.63 232.72	231.97	232.61	231.71	234.29	#N/A
	227772	46T.67	430.33	01،10 ك	<u> </u>	433.34	232.72	232.04	232.72	231.83	234.42	231.43

NOTES:

Reference point for 2002 and 2003 elevations is ground surface.

Reference point for 2004 and 2005 elevations is top of PVC.

Groundwater elevations were collected on dates indicated.

Elevation datum is National Geodetic Vertical Datum NGVD, 1929 in feet.

NM* = Not measured, could not open

2004 Notes

For SHL-15 and SHL-25, the reference point for water level calculations is taken as the top of the metal casing. #N/A: NO READING TAKEN.

#N/A for Well 43M-01-16XBR May 2004: Actual depth reading was 47.4 feet. Reading seems systematically offset (unlike previous events.)

2005 Notes:

Well 43M-01-20XOB could not be opened in October 2005

Well 32M-01-04XBR could not be located in October 2005. (Possibly covered by new pavement, electric gate, or landscaping).

TABLE 4-2 GROUNDWATER ANALYTICAL RESULTS - JUNE 13-16, 2005 SAMPLING EVENT

2005 ANNUAL REPORT AOCS 32 AND 43A DEVENS, MASSACHUSETTS

	7	Well- CIE- Cl	~		V			V.	1	1		0	V			II 32M-01-18XBR-						1
	MCP GW-1	Goals	Reporting Limit	SHL-15	32M-92-01X	32Z-99-02X	32M-92-03X	32M-01-04XBR	32M-01-13XBR	32M-01-14XOB	32M-01-14XBR	32M-01-15XBR	32M-01-16XBR	32M-01-17XBR	32M-01-18XBR	DUP	43M-01-16XOB	43M-01-16XBR	43M-01-17XBR	43M-01-17XOB	43M-01-20XOB	43M-01-20XBR
PARAMETER (METHOD)	µg/L	μg/L	µg/L	µg/L	μg/L.	μg/L	µg/L	μg/L	µg/L	μg/L.	μg/L	μg/1.	μg/L	ид/1.	μg/L	µg/L	μg/L	μg/L	μg/1.	μg/L	μg/L	μg/L
VOLATILES PETROLEUM HYDROCARBONS (MA DEP) Ranges																						
C5-C8 Aliphatic Hydrocarbons	400	400	3.00	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	4.6	5.4	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
C9-C12 Aliphatic Hydrocarbons	4,000	4,000	2.00	2.0 U	2.0 U	2.0 U	2.0 U	2,0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	470	550	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
C9-C10 Aromatic Hydrocarbons VPH (MA DEP) Target VPH Analytes	200	200	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	260	290	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl tert-butyl ether	70		1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Benzene	5		1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene Ethylbenzene	1,000 700	500	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U 45	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
m,p-Xylene *	10,000	500	1.0	1.0 U 2.0 U	1.0 U 2.0 U	1.0 U 2.0 U	1.0 U 2.0 U	1.0 U 2.0 U	1.0 U 2.0 U	1.0 U 2.0 U	1.0 U 2 0 U	1.0 U 2.0 U	1.0 U	2.0 U	40 2.0 U	2.0 U	1.0 U 2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
o-Xylene *	10,000		1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Naphthalene	140	-	1.0	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Extractable Petroleum Hydrocarbon Ranges C9 - C18 Aliphatic Hydrocarbons	4.000	4.000	60	0.0	40.11					41.77			62 11	61 U	1400	1100	62 U	61 U	61 U	61 U	61.11	61.U
C19 - C16 Aliphatic Hydrocarbons C19 - C36 Aliphatic Hydrocarbons	5,000	5,000	80	61 U 82 U	62 U 82 U	62 U 82 U	61 U 82 U	61 U	61 U 82 U	61 U 82 U	62 U 82 U	61 U 82 U	62 U 82 U	82 U	1400 42 U	400 U	83 U	82 U	82 U	81 U	81 U	81 U
C11-C22 Aromatic Hydrocarbons	200	200	170	170 U	180 U	180 U	170 U	170 U	170 U	170 U	170 U	170 U	180 U	170 U	180 U	170 U	180 U	170 U	170 U	170 U	170 U	170 U
Target PAH Analytes							162.0	113.5														
Naphthalene	140		10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-Methylnaphthalene Acenaphthylene	300	1	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Acenaphthene	20		10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Fluorene	300		10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Phenanthrene	300 2000		10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Anthracene Fluoranthene	2000		10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Pyrene	80	-	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)anthracene	1		10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Chrysene	2		10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(b)fluoranthene Benzo(k)fluoranthene	1 1	-	10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(a)pyrene	0.2	- :-	10	10 U	10 U	10 U	10 U	10 U	10 U	10.13	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Indeno(1,2,3-cd)pyrene	0.5		10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Dibenzo(a,h)anthracene	0.5		10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzo(g,h,l)perylene TOTAL DISSOLVED GASES (method RSK175)	300		10	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Methane	-		2.0	9.0	2011	2.0 U	2.0 U	2.0 U	2011	110	2.0 U	2.0 U	2.0 U	2.0 U	32	29	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Ethane		-	4.0	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U	4.0 U
Ethene	-		3.0	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U	3.0 U
PCBs by EPA8082 Aroctor 1016	0.5	0.5	0.50	0.21.11	0.0011	6444			0.53 U	0.55.11	6 21 11	67111	0.51.11	0.53 U	0.52 U	0.52 U	0.52 U	0.51 U	0.51 U	0.51.11	0.50 []	0.531/
Aroclor 1221	0.5	0.5	0.50	0.51 U 0.51 H	0.52 U 0.52 U	0.54 U 0.54 U	0.53 U 0.53 U	0.51 U 0.51 U	0.53 U	0.52 U 0.52 U	0.51 U 0.51 U	0.51 U	0.51 U 0.51 U	0.53 U	0.52 U	0.52 U	0.52 U	0.51 U	0.51 U	0.51 U	0.50 U	0.53 U
Aroclor 1232	0.5	0.5	0.50	0.51 U	0.52 U	0.54 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.51 U	0.51 U	0.53 U	0,52 U	0.52 U	0.52 U	0.51 U	0.51 U	0.51 U	0.50 U	0.53 U
Aroclor 1242	0.5	0.5	0.50	0.51 U	0.52 U	0.54 U	0.53 U	0.51 U	0.53 U	0.52 U	0.51 U	0.51 U	0.51 U	0.53 U	0.52 U	0.52 U	0.52 U	0.51 U	0.51 U	0.51 U	0.50 U	0.53 U
Aroclor 1248 Aroclor 1254	0.5	0.5	0.50	0.51 U 0.51 U	0.52 U 0.52 U	0.54 U	0.53 U 0.53 U	0.51 U	0.53 U 0.53 U	0.52 U	0.51 U	0.51 U	0.51 U 0.51 U	0.53 U 0.53 U	0.52 U	0.52 U 0.52 U	0.52 U 0.52 U	0.51 U 0.51 U	0.51 U 0.51 U	0.51 U	0.50 U	0.53 U 0.53 U
Aroclor 1260	0.5	0.5	0.50	0.51 U	0.52 U	0.54 U	0.53 U	0.51 U	0.53 U	0.52 U 0.52 U	0.51 U	0.51 U	0.51 Ü	0.53 U	0.52 U 0.52 U	0.52 U	0.52 U	0.51 U	0.51 U	0.51 U	0.50 U	0.53 U
ICP METALS 3010/6010B (Total metals)						0.01.0	0,02 0	9,510	0.55.0													
Arsenic	10	50	4.5	14.4	4.5 U	4.5 U	4.5 U	4.5 U	4.5 U	88.7	5.0 J+	4.5 U	4.5 U	4.5 U	24.4	23.6	4,5 U	4.5 U	4.5 U	7.1 J	4.5 U	4.5 U
Lead Manganese	15	15 3,500	2.7 0.7	2.7 U 90.5	2.7 U 26.1	3.6 9.1 J	2.7 U 22.5	2,7 U 17.0	3.4 51.8	3.2	5.7	2,7 J 124	2.9 U	2.7 U	6.6	2.9 16.200	2.7 U 5.0 J	3.4 40.9	2.7 U 20.7	2.7 U 266	2.7 U	2,9 U 985
UNIT CHA	NGE	5,500	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
TOC by SW846:9060					unig/ Li		Mg/L	riter.	sale/ Li	g/Li		sale to										
Total Organic Carbon			1.0	2.5	1.9	1.0 U	1.0 U	1.6	2.1	3.1	2.1	1.6	2.7	1.6 J-	4.6	5.2	1.0 U	1.2	1.0 U	1.6	1.0 UJ	1.0 U
AMMONIA (350.1) Ammonia as N	-		0.024	0.16	0.024 U	0.024 U	0.024 U	0.024 U	0.024 U	0.33	0.024 U	0.024 U	0.024 U	0.024 U	0.038	0.060	0.024 U	0.082	0.024 U	0.024 U	0.024 U	0.024 U
ALKALINITY, TOTAL	1		0.024	0.10	0.024 U	0.024 0	0.024 U	0.024 U	0,024 U	0.33	0.024 U	0.024 U	0.024 U	0.024 U	0.038	0.000	0.024 0	0.062	V.024 U	V.024 U	0.024 0	U P20.5
as CaCO3	-		1.0	50.3	52.9	27.5	8.1	132	91.5	119	362	241	96.1	186	199	197	18.7	44,4	26.3	117	1,690	84.9
ANIONS (300)	-	-											La line						202	1.4	2.0	0.14
Nitrate/nitrite (as N) by 353.2 Nitrite (as N) by 354.1	-		0.010	0.49	0.80 0.0050 U	2.2 0.0050 U	0.20 0.0050 U	1.3 0.0050 U	4.1 0.0050 U	0.42	0.11 0.0050 U	0.012	3.6 0.0050 U	2.9 0.011	2,9 0.036	0.036	1.5 0.0050 U	0.77 0.0050 U	0.96	1.3 0.0050 U	2.0 0.0050 U	0.14 0.0050 U
Phosphorus (as P) by 365.2		1	0.010	0.0061 0.072 UJ	0.0050 U 0.026 UJ	0.0050 U 0.054 UJ	0.0050 U 0.053 UJ	0.0050 U 0.05 UJ	0.0050 U 0.056 UJ	0.027 0.18 UJ	0.0050 U 0.24 UJ	0.012 0.13 UJ	0.0050 U 0.066 UJ	0.011 0.048 UJ	0.089 UJ	0.036 0.09 UJ	0.0050 UJ	0.0050 U	0.017 0.061 UJ	0.037 UJ	0.043 UJ	0.063 UJ
Sulfate by 375.4			5.0	14,2	20.2	73.5	13.9	30.0	19.0	6.3	10.8	24.6	29.3	37.5	25.1	23.0	33.4	14,4 -	25.3	28.9	84.5	15.1
Sulfide by 376.2	*		0.020	0.19	0.020 U	0.0020 U	0.020 U	0.020 U	0.020 U	0.052	0.064	0.029	0.020 U	0.020 U	0.020 U	0.020 U	0.020 U	0.023	0.020 U	0.020	0.020 U	0.056
Nitrate (as N) by cale COD (410.4)	31		0.010	0.48	0.80	2.2	0.20	1.3	4.1	0.39	0.11	2.4	3.6	2.8	2.8	2.7	1.5	0.77	0.95	1.3	2.0	0.14
Chemical Oxygen Demand		-	20.0	20.0 U	20.0 U	36.9	20.0 U	20.0 U	20.0 U	38.8	40.8	20.0 U	20.0 U	25.1 J-	34.9	36.9	20.0 U	20.0 U	32.9	20.0 U	20.0 U	20.0 U
			80.0	20.0.0	20.00	30.7	20.0 0	20.0.0	20.0 0	20.0	40.0	40.00	20,00	A. 1.1.2	10.415		20,00	20.00	5.6(5)			
FIELD PARAMETERS																						
Temperature(deg C) initial				10.69	10.13	11.76	9.24	12.18	14.63	10.77	10.91	14.63	13.14	12.49	13.66	13.66	16.2	18.3	17.53	16.63	15.86	14.11
Temperature (deg C) final ORP/Eh (mV)	1	-	-	12.66 64.2	397.3	11.44	12.80	14.99	19.19	-50.3	14.72	15.14 85.0	16.10	15.30	14.43	14.43	14.45	17.88	553.9	249.6	544.0	15.70
pH (std units)			1	5.75	6.02	4.54	5.11	6.19	6.03	6.35	6.67	7.04	6.03	6.78	6.29	6.29	5.40	6.51	4.55	5.28	3.95	6.74
Specific Conductance	(4)			149	175	212	68	262	295	519	645	596	358	492	481	481	136	76	357	103	153	2227.00
Dissolved Oxygen		*		0.61	5.36	9.62	9.90	5.11	3.97	2,49	2.92 2.73	5.15	3.54	1.53	0.50	0.50	6.99	5.53	1.60	5.26 1.17	8.85	0.33.
Turbidity				0.96	4.24	2.26	0.11	0.15	1.64	31.9			4.42	0.25	0.51	0.51	3.5	5.12	2.35		0.78	

Notes:

Bold numbers indicate exceedance of MCP GW-1 standard

Numbers in shaded areas indicate exceedance of site-specific cleanup goals. In the case of arsenic, the revised MCL and MCP standard of 10 ug/L has been used for comparison in lieu of the established cleanup goal of 50 ug/L

U = Compound not detected at a concentration above the reporting limit.

UJ = Compound tentatively not detected at reported concentration due to blank contamination or detection limit estimated due to low spike recoveries

J = Estimated value less than the reporting limit or an estimated value resulting from data evaluation

J+ = Value may be biased high based on data evaluation of laboratory results.

TABLE 4-3 GROUNDWATER ANALYTICAL RESULTS - OCTOBER 3-5, 2005 SAMPLING EVENT

2005 ANNUAL REPORT AOCS 32 AND 43A DEVENS, MASSACHUSETTS

Volatile Organic Compounds 1,1,1,2-Tertachloroethane 1,1,1,1-Trichloroethane 1,1,2,2-Tertachloroethane 1,1,2,2-Tertachloroethane 1,1,2-Trichloroethane 1,1,2-Trichloroethane 1,1,2-Trichloroethane 1,1-Dichloroethane 1,1-Dichloroethane 1,1-Dichloroethane 1,1-Dichloroethane 1,2,3-Trichloroethane 1,2,3-Trichloroethane 1,2,3-Trichloroethane 1,2,3-Trichloroethane 1,2,4-Trimethybenzene 1,2,2-Trichloroethane 1,2,2-Trichloroethane 1,2,2-Trichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,3-Dichloroptopane	2 200 2 5 5 70 70 7 7	με/L	1.0 U	1.0 U	1.0 U	1.0 U	32M-01-14XBR pg/L 1.0 U 1.0 U 0.5 U 1.0 U	32M-01-15XBR µg/L 1.0 U 1.0 U	32M-01-16XBR pg/L	1.0 U	32M-01-18XBR µg/L 1.0 U 1.0 U 1.0 U 0.5 U 1.3 1.0 U	DUP µg/L 1.0 U
1,1,1,2-Tertachloroethane 1,1,2-Trichloroethane 1,1,2-Trichloroethane 1,1,2-Trichloroethane 1,1,2-Trichloroethane 1,1,2-Trichloroethane 1,1-Dichloroethane 1,1-Dichloroethane 1,1-Dichloroethane 1,1-Dichloroethane 1,1-Dichloroethane 1,2,3-Trichloroethane 1,2,3-Trichloroethane 1,2,3-Trichloroethane 1,2,4-Trichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,3-Dichloroethane 1,3-Dichloroethan	200 2 - 5 5 70 7 - - - - - - - - - - - - -		1.0 U 0.5 U 1.0 U	1.0 U 0.5 U 1.0 U	1.0 U 0.5 U 1.0 U	1.0 U 0.5 U 1.0 U	1.0 U 1.0 U 0.5 U 1.0 U	1.0 U 1.0 U 0.5 U 1.0 U	1.0 U	1.0 U 1.0 U 0.5 U 1.0 U	1.0 U 1.0 U 0.5 U 1.3 1.0 U 1.2 0.6 J 5.0 U 1.0 U 1.0 U	1.0 U 1.0 U 0.5 U 1.4 1.0 U 1.2 0.7 J 5.0 U 1.0 U 1.0 U 1.0 U
1,1,1-Trichloroethane 1,1,2-Trichloroethane 1,1,2-Trichloroethane 1,1,2-Trichloroethane 1,1,2-Trichloroethane 1,1,2-Trichloroethane 1,1-Dichloroethane 1,1-Dichloroethane 1,1-Dichloroptehane 1,1-Dichloroptehane 1,2,3-Trichloroptopane 1,2,3-Trichloroptopane 1,2,3-Trichloroptopane 1,2,4-Trichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroethane 1,2-Dichloroptopane 1,3-Trimethylbenzene 1,3-Dichloroethane 1,3-Dichloroe	200 2 - 5 5 70 7 - - - - - - - - - - - - -		1.0 U 0.5 U 1.0 U	1.0 U 0.5 U 1.0 U	1.0 U 0.5 U 1.0 U	1.0 U 0.5 U 1.0 U	1.0 U 0.5 U 1.0 U	1.0 U 0.5 U 1.0 U	1.0 U 0.5 U 1.0 U	1.0 U 0.5 U 1.0 U	1.0 U 0.5 U 1.3 1.0 U 1.2 0.6 i 5.0 U 1.0 U 1.0 U	1.0 U 0.5 U 1.4 1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.2 U 1.2 U 1.2 U 1.2 U 1.2 U 1.3 U 1.4 U 1.5 U 1.5 U 1.6 U 1.
1.1.2.2-Tertachloroethane 1.1.2-Trichloro-1.2.2-trifluoroethane 1.1.2-Trichloro-1.2.2-trifluoroethane 1.1.2-Trichloroethane 1.1-Dichloroethane 1.1-Dichloroethene 1.1-Dichloropropene 2.3-Trichloropropene 2.3-Trichloropropane 2.4-Trimethylonzene 2.4-Trimethylonzene 2.2-Dirbromo-3-chloropropane 2.Dichloroethane 2.Dichloroethane 2.Dichloroethane 3.Dichloropropane 3.5-Trimethylonzene 2.Dichloropropane 3.5-Trimethylonzene 3.5-Dichloropropane 3.Dichloropropane 3.Dichloroethane 2.Dichloropropane 3.Dichloroethane 3.Dichloropropane 3.Dichloropropane 3.Dichloropropane 4.Dichlorobenzene 3.Dichloropropane 4.Dichlorobenzene 3.Dichloropropane 4.Dichlorobenzene 3.Dichloropropane 4.Dichlorobenzene 3.Dichloropropane 4.Dichlorobenzene 3.Dichloropropane 4.Dichlorobenzene 5.Dichloropropane 4.Dichlorobenzene 5.Dichloropropane 4.Dichlorobenzene 5.Dichloropropane 4.Dichlorobenzene 5.Dichloropropane 4.Dichlorobenzene 5.Dichloropropane 4.Dichlorobenzene 5.Dichloropropane 4.Dichloropropane 5.Dichloropropane 5.Dichloropropane 5.Dichloropropane 5.Dichloropropane 5.Dichloropropane 6.Dichloropropane 6.Dich	2 -5 5 70 7 		1.0 U	0.5 U 1.0 U	0.5 U 1.0 U	0.5 U 1.0 U 1.0 U 1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	0.5 U 1.0 U	0.5 U 1.0 U 1.0 U 1.0 U 1.0 U 2.0 U 1.0 U	0.5 U 1.0 U	0.5 U 1.0 U 2.0 U 1.0 U 2.0 U 1.0 U 2.0 U	0.5 U 1.3 1.0 U 1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.2 0.6 J 5.0 U 1.0 U 1.450 1.0 U	0.5 U 1.4 1.0 U 1.0 U
1.1,2-Trichloro-1,2,2-trifluoroethane 1.1,2-Trichloroethane 1.1-Dichloroethane 1.1-Dichloroethane 1.1-Dichloropene 1.2,3-Trichloroethane 1.2,3-Trichloroethane 1.2,3-Trichloroethane 1.2,3-Trichloroethane 1.2,4-Trichloroethane 1.2,4-Trichloroethane 1.2-Dichloroethane 1.2-Dichloroethane 1.2-Dichloroethane 1.2-Dichloroethane 1.2-Dichloroethane 1.3-Dichloroethane	70 70 7 7 7 70 	600	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U 1.0 U 1.0 U 2.0 U 1.0 U	1.0 U	1.0 U	1.0 U	1.0 U 1.0 U 1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 2.3 U 1.0 U	1.3 1.0 U 1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.2 0.6 J 5.0 U 1.0 U 1.0 U	1.4 1.0 U 1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.2 0.7 J 5.0 U 1.6 U
1.1.2-Trichloroethane 1.1.Dichloroethane 1.1-Dichloroethene 1.1-Dichloroethene 1.1-Dichloroethene 1.2.3-Trichloropropene 1.2.3-Trichloropropane 1.2.3-Trichloropropane 1.2.4-Trimethyloenzene 1.2-Dichloroethane 1.2-Dichloroethane 1.2-Dichloroethane 1.2-Dichloroethane 1.2-Dichloroethane 1.2-Dichloroethane 1.2-Dichloroethane 1.3-Dichloroethane 1.3-Dichloromethane 1.3-Dichloromethane 1.3-Dichloromethane 1.3-Dichloroethene	5 70 7 	600	1.0 U 1.0 U 1.0 U 1.0 U 2.0 U 1.0 U	1.0 U 1.0 U 1.0 U 2.0 U 1.0 U	1.0 U 1.0 U 1.0 U 2.0 U 1.0 U	1.0 U 1.0 U 1.0 U 2.0 U 1.0 U	1.0 U 1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 5.0 U 1.0 U	1.0 U 1.0 U 1.0 U 2.0 U 1.0 U	1,0 U 1,0 U 1,0 U 2,0 U 1,0 U 1,0 U 1,0 U 1,0 U 1,0 U 1,0 U 2,0 U 1,0 U 2,0 U 1,0 U 1,0 U	1.0 U 1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.2 0.6 J 5.0 U 1.0 U 1.450 1.0 U	1.0 U 1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.2 U 1.2 U 1.2 U 1.0 U 1.2 U 1.0 U 1.0 U
	70 7 	600	1.0 U 1.0 U 2.0 U 1.0 U	1.0 U 1.0 U 2.0 U 1.0 U	1.0 U	1.0 U 1.0 U 2.0 U 1.0 U	1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 5.0 U 1.0 U 0.7 J 1.0 U	1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 2.0 U 1.0 U 2.0 U 1.0 U 1.0 U	1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.2 0.6 J 5.0 U 1.0 U 1.450 1.0 U	1.0 U 1.0 U 2.0 U 1.0 U 1.0 U 1.2 0.7 J 5.0 U 1.0 U 1.10 U
1, 1-Dichloroenthene 1, 1, 1-Dichloroenthene 1, 2, 3-Trichloroepropene 1, 2, 3-Trichloroepropane 1, 2, 3-Trichloroepropane 1, 2, 4-Trichloroepropane 1, 2, 4-Trichloroepropane 1, 2, 4-Trichloroepropane 1, 2-Dibromo-3-chloropropane 1, 2-Dichloroethane 1, 2-Dichloroethane 1, 2-Dichloroepropane 1, 3-Dichloroepropane 1, 3-Dichloroepr	7 	600	1.0 U 2.0 U 1.0 U	1.0 U 2.0 U 1.0 U	1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 2.2 1.0 U 1.0 U 1.0 U 2.9 I 1.0 U	1.0 U 2.0 U 1.0 U	1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 0.7 J 1.0 U	1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 1.0 U	1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 2.3 1.0 U	1.0 U 2.0 U 1.0 U 1.0 U 1.2 0.6 J 5.0 U 1.0 U 1450 1.0 U	1.0 U 2.0 U 1.0 U 1.0 U 1.2 0.7 J 5.0 U 1.0 U 1630 1.0 U
	70 	600 	2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U	2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 2.2 1.0 U 1.0 U	2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 1.0 U 1.0 U 1.0 U	2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 0.7 J 1.0 U	2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 19.3	2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 1.0 U 1.0 U	2.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 2.3	2.0 U 1.0 U 1.0 U 1.2 0.6 J 5.0 U 1.0 U 1450	2.0 U 1.0 U 1.0 U 1.2 0.7 J 5.0 U 1.0 U 1630 1.0 U
1,2,3-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2,4-Trichlorobenzene 1,2-Dibriorobenzene 1,2-Dibriorobenzene 1,2-Dibriorobenzene 1,2-Dibriorobenzene 1,2-Dibriorobenzene 1,2-Dibriorobenzene 1,3-Dibriorobenzene 1,3-Dibrior		600	1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U	1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 UJ 1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 2.2 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 0.7 J 1.0 U	1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 19.3	1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 2.3	1.0 U 1.0 U 1.2 0.6 J 5.0 U 1.0 U 1450	1.0 U 1.0 U 1.2 0.7 J 5.0 U 1.0 U 1630 1.0 U
1,2.4-Trichlorobenzene	0.02 600 5 5 5 - 40 - 5 5 - 350 - 350 3,000	- 600 600 75 	1.0 U 1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 2.0 U 25.0 U	1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 2.2 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 0.7 J 1.0 U	1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 19.3 1.0 U	1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 1.0 U 5.0 U 1.0 U 2.3 1.0 U	1.0 U 1.2 0.6 J 5.0 U 1.0 U 1450 1.0 U	1.0 U 1.2 0.7 J 5.0 U 1.0 U 1630 1.0 U
1,2.4-Trichlorobenzene	0.02 600 5 5 5 - 40 - 5 5 - 350 - 350 3,000	- 600 600 75 	1.0 U 5.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 2.0 U	1.0 U 5.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 5.0 U 1.0 U 2.2 1.0 U 1.0 U 1.0 U	1.0 U 5.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 5.0 U 1.0 U 0.7 J 1.0 U	1.0 U 1.0 U 5.0 U 1.0 U 19.3 1.0 U	1.0 U 1.0 U 5.0 U 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 5.0 U 1.0 U 2.3 1.0 U	1.2 0.6 J 5.0 U 1.0 U 1450 1.0 U	1.2 0.7 J 5.0 U 1.0 U 1630 1.0 U
	0.02 600 5 5 40 - 350 - 350 - 350 3,000	- 600 600 75 	5.0 U 1.0 U 2.0 U 25.0 U	5.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	5.0 U 1.0 U 2.2 1.0 U 1.0 U 1.0 U 0.9 J	5.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	5.0 U 1.0 U 0.7 J 1.0 U 1.0 U	1.0 U 5.0 U 1.0 U 19.3 1.0 U	1.0 U 5.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 5.0 U 1.0 U 2.3 1.0 U	0.6 J 5.0 U 1.0 U 1450 1.0 U	0.7 J 5.0 U 1.0 U 1630 1.0 U
	600 5 5 - 40 - - 350 - - - 350 3,000	- 600 600 75 	1,0 U 2,0 U 25,0 U	1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 2.2 1.0 U 1.0 U 1.0 U 0.9 J	1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 0.7 J 1.0 U 1.0 U	1.0 U 19.3 1.0 U	5.0 U 1.0 U 1.0 U 1.0 U 1.0 U	5.0 U 1.0 U 2.3 1.0 U	5.0 U 1.0 U 1450 1.0 U	5.0 U 1.0 U 1630 1.0 U
1,2-Dichloroebenzene (2.2-Dichloroebenzene (3.2-Dichloroepthane (3.2-Dichloroepthane (3.3-Dichloropropane (3.3-Dichloromethane (3.3-Dichloromethane (3.3-Dichloromethane (3.3-Dichloropropane (3.3-Dic	600 5 5 - 40 - - 350 - - - 350 3,000	600	1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 2.0 U 25.0 U	1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	2.2 1.0 U 1.0 U 1.0 U 0.9 J	1.0 U 1.0 U 1.0 U 1.0 U	0.7 J 1.0 U 1.0 U	19.3 1.0 U	1.0 U 1.0 U 1.0 U	2.3 1.0 U	1450 1.0 U	1.0 U 1630 1.0 U
2Dichloroethane	5 5 5 - 40 - 5 5 - - - 3350 - - 3350 - - 3350 - 350 - 30 - 3	600	1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 2.0 U	1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 1.0 U 0.9 J	1.0 U 1.0 U 1.0 U	1.0 U	19.3 1.0 U	1.0 U 1.0 U 1.0 U	2.3 1.0 U	1450 1.0 U	1630 1.0 U
1,2-Dichloropropane	5 - 40 - 5 - - 350 - - - 350 8,000	600	1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 2.0 U	1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 1.0 U 1.0 U 0.9 J	1.0 U 1.0 U 1.0 U	1.0 U	1.0 U	1.0 U 1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene	40 - 5 - - 350 - - - 350 - - - 350 - - - - - - - - - - - - - - - - - - -	- 600 - 75 	1.0 U 1.0 U 1.0 U 1.0 U 1.0 U 2.0 U 25.0 U	1.0 U 1.0 U 1.0 U 1.0 U 1.0 U	1.0 U 0.9 J	1.0 U 1.0 U	1.0 U		1.0 U			
1.3. Dichlorobenzene	350 - - - - 350 3,000	75	1.0 U 1.0 U 1.0 U 1.0 U 2.0 U 25.0 U	1.0 U 1.0 U 1.0 U	1.0 U 0.9 J	1.0 U						
3-Dichloropropane	350 - - - - 350 3,000	75	1.0 U 1.0 U 1.0 U 2.0 U 25.0 U	1.0 U 1.0 U		1.0.11	1.00	1,0 U	1.0 U	1.0 U	1.0 U	1.0 U
1.4-Dichlorobenzene	350 - - - 350 3,000		1.0 U 1.0 U 2.0 U 25.0 U	1.0 U 1.0 U			0.5 J	3.8	1.0 U	3.8	209	232
A-Dichlorobenzene	350 - - - 350 3,000		1.0 U 2.0 U 25.0 U			1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
2.2-Dichloropropane Buranone 3 -Buranone 3 -Chlorotoluene -Hexanone -Chlorotoluene -Hexanone -Chlorotoluene -Hexanone -Chlorotoluene -Hexanone -Ghorotoluene -Hexanone -Ghorotoluene -Hexanone 3, denzene -Ghorotoluene -Hexanone -Ghorotoluene -Ghorotolue	350 - - - 350 3,000	-	2.0 U 25.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.6	1.0 U	0.5 J	120	142
32-Butanone	350	-	25.0 U		1,0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
C-Chlorotoluene -Chlorotoluene -Chlorotoluene -Isopropyltoluene -Isopropyltolue	350	:		2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
-Hexanone -Chlorotoluene -Isopropyloluene -Isopropyloluene	350	-		25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
-Chlorotoluene -Isopropyltoluene -Isopropyltolue	350 3,000		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1-Isopropyltoluene	350 3,000		10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
	3,000	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Acetone	3,000		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.7 J	0.7 J
Senzene Promobenzene Promobenze			25.0 U 25.0 U	25.0 U 25.0 U	25.0 U 25.0 U	25.0 U 25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
Fromobenzene Fromobenzene Fromobenzene Fromobenormethane Fromodichloromethane Fromodichloromethane Fromoform Fromobene Fromoform Fromobene			1.0 U	25.0 U	1.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U	25.0 U
	-		2.0 U	2.0 U	2.0 U	2.0 U	1.0 U 2.0 U	1.0 U 2.0 U	1.0 U	1.0 U	1.0 U	1.0 U
			1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.0 U	2.0 U 1.0 U	2.0 U	2.0 U
3 cmoform 3 cm	3		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
3 comment	4		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Carbon tetrachloride	10	-	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Chlorobenzene	-		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	5	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Theoretical	100		1.0 U	1.0 U	1.0 U	1.0 U	1.5	1.8	1.0 U	1.0 U	83.9	82.1
	4	*	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
ris-1,2-Dichloroethene 77 ris-1,3-Dichloropropene 0. Vyelohexane Dibromochloromethane	5		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
ris-1,3-Dichloropropene 0. Vyclohexane blbromochloromethane blbromochloromethane	£		1.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cyclohexane Dibromochloromethane Dibromomethane	70	55	0.5 U	0.5 U	1.0 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.2
Dibromochloromethane Dibromomethane).5 *		0.5 U	0.5 U	0,5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
Dibromomethane		-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.9	1.9
	2	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Jichiorodiffuoromethane (Freon 12)	-		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	700	-	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
	700 0.6		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	0,0	-	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U
sopropylbenzene fethyl acetate	0E-1		1,0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1,0 U	1.0	1.0
	70		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	-		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U
	5		5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	1.2 5.0 U	1.1 5.0 U
aphthalene I	140	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	-		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Propylbenzene			1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.8 J	0.7 J
c-Butylbenzene	-		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.5 J	0.7 J
	100		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
rt-Butylbenzene -	-	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
etrachloroethene	5		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
etrahydrofuran -	127	-	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5,0 U	5.0 U	5.0 U	5.0 U
	,000		1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
	100	55	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
ans-1,3-Dichloropropene 0.5	.5 *		0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
ionio contento	5	5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.6 J	0.6 J
richlorofluoromethane (Freon 11)	144		2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
inyl acetate -	*	-	5.0 U	5.0 U	5.0 U -	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
invl chloride 2	40	-	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
ylene M,P 1000 ylene O 1000	2		2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U

TABLE 4-3 GROUNDWATER ANALYTICAL RESULTS - OCTOBER 3-5, 2005 SAMPLING EVENT

2005 ANNUAL REPORT AOCS 32 AND 43A DEVENS, MASSACHUSETTS

	MCP GW-1	Site-Specific Cleanup Goals	SHL-15	32M-92-01X	32M-01-13XBR	32M-01-14XOB	32M-01-14XBR	32M-01-15XBR	32M-01-16XBR	32M-01-17XBR	32M-01-18XBR	32M-01-18XBI
PARAMETER (METHOD)	μg/L	пе/Г	µg/L	пе/L	ug/L	ue/L	ug/L	пе/L	μg/L	µg/L		
VOLATILES PETROLEUM HYDROCARBONS MA DEP) Ranges					,	PP 5	Apr	pigit	рус	рус .	µg/L	μg/L.
C5-C8 Aliphatic Hydrocarbons	400	400	162 U	162 U	162 U	162 U	162 U	162 U	162.11	1/2.11	12011	
C9-C12 Aliphatic Hydrocarbons	4,000	4,000	220 U	220 U	220 U				162 U	162 U	162 U	162 U
C9-C10 Aromatic Hydrocarbons	200	200	100 U			220 U	686	633				
VPH (MA DEP) Target VPH Analytes	200	200	100 U	100 U	100 U	100 U	100 U	100 U	100 U	100 U	1,150	1,090
Methyl tert-butyl ether	70		1.5 U	1.5 U						4		
Benzene	5	5	5.0 U	5.0 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
Toluene	1,000		5.0 U	5.0 U	5.0 U 5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Ethylbenzene	700	500	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
m.p-Xylene *	10,000	300	10.0 U	10.0 U		5.0 U	114	107				
o-Xylene *	10,000	 	5.0 U	5.0 U	10,0 U 5,0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U	10.0 U
Naphthalene	140		5.0 U	5.0 U		5.0 U						
tvapninaiene	140	-	3.0 0	5.0 0	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Extractable Petroleum Hydrocarbon Ranges												
C9 - C18 Aliphatic Hydrocarbons	4,000	4,000	200 U	200 U	200 U	200 U	200 U	222 U	200 U	200 U	228 J	395 J
C19 - C36 Aliphatic Hydrocarbons	5,000	5,000	200 U	200 U	200 U	200 U	200 U	222 U	200 U	200 U	200 U	200 U
C11-C22 unadj Aromatics I	200	200	150 U	150 U	150 U	150 U	150 U	167 U	150 U	150 U	150 U	150 U
C11-C22 Aromatics 1,2	200	200	154 U	154 U	154 U	154 U	154 U	171 U	154 U	154 U	154 U	154 U
Target PAH Analytes											1540	1,54 0
Naphthalene	140	929	0.2 UJ	0.3 UJ	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.6 UJ	0.4 UJ
2-Methylnaphthalene	10	-	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.5	0.4 03
Acenaphthylene	300		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Acenaphthene	20	-	0.2 U	0.3	0.3	0.2 U						
Fluorene	300		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2	0.2 U
Phenanthrene	300	-	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.4	0.4 U
Anthracene	2000		0.2 U	0.2 U	0.2 U	0,2 U	0.2 U					
Fluoranthene	90	-	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2	0.2
Pyrene	80	-	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Benzo(a)anthracene	1	-	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Chrysene	2	-	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Benzo(b)fluoranthene	1	747	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Benzo(k)fluoranthene	1	4	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Benzo(a)pyrene	0.2		0.2 U	0.2 U	0.2 U	0.2 U	0,2 U	0.2 U				
Indeno(1,2,3-cd)pyrene	0.5		0.3 U	0.3 Ü	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Dibenzo(a,h)anthracene	0.5		0.2 U	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Benzo(g,h,i)perylene	300		0.2 U	0.2	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
CP METALS 3010/6010B (Total metals)												
Arsenic	10	50	9.9	2.5 U	2.5 U	41.9	89.1	2.5 U				
Lead	15	15	2.5 U	2.5 U	3.7	2.5 U	21.7	2.5 U				
Manganese	-	3,500	82	34	2410 J-	3,070	694	139	170.0	10 U	11,600	10,300
IELD PARAMETERS												
Temperature(deg C) initial	-		15.65	15.38	17.17	20.44	12.68	19.77	14.93	15.09	17.63	17.63
Temperature (deg C) final		-	15.65	16.62	17.47	16.36	13.94	20.22	18.93	15.64	22.49	22.49
ORP/Eh (mV)	-		540	589.5	-26.9	102	316.3	348.6	16	627.3	35.4	35.4
pH (std units)	-		3.09	4.42	6.24	5.97	6.26	6.94	5.81	3.87	5.77	5.77
Specific Conductance	-		182	186	535	321	697	613	482	558	653	653
Dissolved Oxygen	-	- 1	0.97	2.75	4.80	3.97	7.52	5.03	4.58	1.45	4.32	4.32
Turbidity				4.9	2.10	23.1	266	18.3	0.75	0.33	0.68	0.68

Notes:

Bold numbers indicate exceedance of MCP GW-1 standard

Numbers in shaded areas indicate exceedance of site-specific cleanup goals. In the case of arsenic, the revised MCL and MCP standard of 10 ug/L has been used for comparison in lieu of the established cleanup goal of 50 ug/L.

U = Compound not detected at a concentration above the reporting limit.

UJ = Compound tentatively not detected at reported concentration due to blank contamination or detection limit estimated due to low spike recoveries

J = Estimated value less than the reporting limit or an estimated value resulting from data evaluation

J+ = Value may be biased high based on evaluation of data.

J- = Value may be biased high based on evaluation of data.

NR = Compound not reported by the QA laboratory

* Regulatory standard is for total 1,3-dichloropropene and total xylenes

Note: No sample was obtained from well 32Z-99-02X in October 2005 because the water in the well was too deep for a peristaltic pump and the well was too narrow for a Grundfos pump.

TABLE 4-4 CLEAN UP GOALS AND REGULATORY STANDARDS FOR MONITORED GROUNDWATER PARAMETERS

2005 ANNUAL REPORT AOCS 32 AND 43A DEVENS, MASSACHUSETTS

	Cleanup Goal or
Parameter	Standard (µg/L)
VOCs	
Benzene *	5
Vinyl chloride	2
1,2-dichloroethene (trans)**	55
1,2-dichloroethene (cis)**	55
1,1,1-trichloroethane	5
Trichloroethene *	5
1,1,2-trichloroethane	5
1,2-dichlorobenzene *	600
1,3-dichlorobenzene *	600
1,4-dichlorobenzene *	75
VPH	***************************************
Ethylbenzene	500
m-, p-xylene	***
o-xylene	
Foluene	
C5-C8 Aliphatics	400
C9-C12 Aliphatics	4,000
C9-C10 Aromatics	200
EPH	
C9-C18 Aliphatics	4,000
C19-C36 Aliphatics	5,000
C11-C22 Aromatics	200
PCBs	
PCB-1016	0.5
PCB-1221	0.5
PCB-1232	0.5
PCB-1242	0.5
PCB-1248	0.5
PCB-1254	0.5
PCB-1260 *	0.5
NORGANICS	
Arsenic – Total *	50
Lead - Total	15
Manganese - Total *	3,500
Arsenic - Dissolved	50
Lead - Dissolved	15
Manganese - Dissolved	3,500

Notes: *Cleanup goal established in the Record of Decision (Horne, 1998).

Prepared by: JW, 10/5/06 Checked by: SWR, 10/5/06

^{**}The Record of Decision lists a cleanup goal of 55 μ g/L for total 1,2-dichloroethene. Other parameters added to list as part of long-term monitoring program development.

TABLE 4-5 HISTORY OF CLEANUP GOAL EXCEEDANCES - 2002 to 2005

2005 ANNUAL REPORT AOCS 32 AND 43A DEVENS, MASSACHUSETTS

Well	April 2002	October 2002	June 2003	D 2002	3004	0.41 3004	, ,,,,,,	
AOC 32 WELLS - E		October 2002	June 2005	December 2003	May 2004	October 2004	June 2005	October 2005
32M-01-18XBR (Source well)	VOCs and Manganese	VOCs and Manganese	VOCs and Manganese	VOCs and Manganese	VOCs, VPH*, Manganese	VOCs, VPH*, Manganese	VOCs, VPH*, Manganese, Arsenic**	VOCs, VPH*, Manganese
32M-01-14XBR (Sentry well)	No exceedances	Arsenic and Lead	No exceedances	No exceedances	No exceedances	No exceedances	No exceedances	Arsenic** and Lead*
32M-01-14XOB (Sentry well)	No exceedances	No exceedances	Manganese .	Manganese	No exceedances	Manganese	Arsenic** and Manganese	Arsenic** and Lead*
32Z-99-02X (Distant sentry well)	Not sampled	Lead	No exceedances	No exceedances	No exceedances	No exceedances	No exceedances	Not Sampled
SHL-15	Arsenic, manganese	No exceedances	No exceedances	Arsenic	No exceedances	Arsenic	Arsenic	No exceedances
AOC 43A - EXCEE	DANCES							
43M-01-17XOB (Source well)	VOCs and Arsenic	Arsenic	No exceedances	No exceedances	No exceedances	No exceedances	No exceedances	Not Sampled
43M-01-20XBR (Sentry well)	Manganese	Manganese	No exceedances	No exceedances	No exceedances	No exceedances	No exceedances	Not Sampled

Notes:

- * Cleanup goals were not established for VPH fractions or lead in the Record of Decision. VPH is compared to Massachusetts Contingency Plan GW-1 Standards. Lead is compared to drinking water action level.
- ** The Record of Decision established a cleanup goal of 50 ug/L for arsenic based on the then current MCL of 50 ug/L. A revised MCL of 10 ug/L became effective in January 2006. This table uses the 50 ug/L standard for evaluation of 2002 through 2004 data and the 10 ug/L standard for subsequent data.

TABLE 4-6 SUMMARY OF CLEANUP GOAL AND REGULATORY STANDARD EXCEEDANCES AT WELL 32M-01-18XBR

2005 ANNUAL REPORT AOCS 32 AND 43A DEVENS, MASSACHUSETTS

Parameter	Cleanup Goal	April 2002	October 2002	June 2003	December 2003	May 2004	October 2004	June 2005	October 2005
Trichloroethene (ug/L)	5	19 J	20U	50 U	3.4 OA	5.2 OA	3.4 QA	160 U	0.6J
1,3-dichlorobenzene (ug/L)	600	660 J	300 J	460	430	730	530	590	209
1,4-dichlorobenzene (ug/L)	75	450 J	200	310	280	470	320	370	120
1,2-dichlorobenzene (ug/L)	600	5,900 J	2,500	3,800	3,900	6,200	4,200	4,500	1,450
C9-C12 Aliphatics (ug/L) *	4,000	5000 UJ	200 U	350 J	511 EJ	5,100 QA	4,480	470	686
C9-C10 Aromatics (ug/L) *	200	9,100 J	2,900	1,700 J	2,600 EJ	11,000	4,400	260	1150
Manganese, Total (ug/L)	3,500	7,730	9,260	14,100	11,000	17,400	13,400	16,700	11,600
Manganese, Diss. (ug/L)	3,500	7,500	8,960	14,200	13,900	18,100	12,500	ND	ND

Notes:

U = Compound not detected at concentration above the reporting limit.

J = Estimated value based on data evaluation of laboratory results.

R = Results were rejected based on zero percent recovery in the MS/MSD.

E = Compound concentration exceeds the upper limit of the calibration range of the instrument for specific analysis.

QA= Result is reported from the QA lab analysis. The primary lab result has an elevated reporting limit due to the dilution of the sample or the primary lab result was outside the calibration range.

ug/L = micrograms per liter

ND = No Data

^{*} Cleanup goals were not established for EPH fractions in the Record of Decision. Listed values are Massachusetts Contingency Plan GW-1 Standards.

Appendix A

Groundwater Sampling Procedure and IDW

Devens AOCs 32 and 43A Groundwater Sampling Procedure and IDW

1. Groundwater Sampling

USACE collected groundwater samples at AOCs 32 and 43A on June 13, 15, and 16, and October 3, 4, and 5, 2005, as part of the semiannual long-term groundwater monitoring program. The following is a summary of USACE sampling procedures.

1.1 Preparation for Sampling

Sampling activities were coordinated with the Devens BRAC office and the laboratories. The contract laboratory prepared and delivered sampling bottles, quality assurance bottles and coolers to USACE approximately 1 week prior to the sampling event. Sample bottles were checked to ensure that they complied with the requirements of the sampling program. Sampling equipment (including the YSI water quality meters, generators, and the Teflon-lined polyethylene tubing) was rented/purchased from U.S. Environmental in Waltham, MA. USACE used its own Grundfos Rediflow II pumps and controllers, and DRT-15CE turbidity meters. All equipment was inventoried and tested prior to sampling. The well logs were reviewed to verify tubing requirements and copies were brought to the site for reference.

1.2 Sampling

Monitoring wells were purged and sampled in accordance with U. S. EPA's Low Stress (low flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells (July 1996, revision 2) using an adjustable rate, low flow submersible pump. Teflon-lined polyethylene tubing was used for sample collection and was disposed of after each well was sampled. Before sampling activities commenced, groundwater elevations were measured at each well location to be sampled. YSI water quality meters, turbidity meters, and the PID were calibrated at the beginning of each day of use and a calibration check was performed on the equipment at the end of each day. During sampling, the generator used to power the pumps was located upwind, at least 30 feet away from the well being sampled, in order to minimize potential contamination from the exhaust. The submersible pump was then lowered to the middle of the well screen intake 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.

Before each well was sampled, water quality parameters, including temperature (o Celsius), specific conductance, pH, oxidation-reduction potential (ORP), turbidity, and dissolved oxygen (DO) were collected every 3 to 5 minutes until the readings stabilized to ensure proper purging of the wells before each well was sampled. The field results for AOCs 32 and 43A are listed in Appendix C. All water quality parameters, except turbidity, were monitored using a flow-through cell and a YSI 600 XL water quality meter. Turbidity samples were not collected from the flow-through cell due to the silt buildup, which can occur in the base of the cell and give erroneous readings. A Y-connector with a shutoff valve was set up before the flow-through cell to take the turbidity readings. Sampling was conducted when parameters became stabilized for three consecutive readings. The sample tubing was disconnected from the flow-through cell and samples were collected directly from the discharge tubing. In cases where the water level was lower than

the top of the screen, the pumps were lowered to the approximate midpoint between the water level and the bottom of the screen. This procedure occurred at several wells during each event.

1.3 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, it was submersed in a 4-inch diameter PVC pipe containing potable water and detergent (Alconox) solution. At least 1 to 2 gallons of the detergent solution was pumped through, starting at a low flow rate, as in sampling, and increasing to a higher speed.
- The pump was removed and sprayed with potable water to minimize the transfer of soap to the rinse water and then submersed in a PVC pipe filled with potable water with at least 1 to 2 gallons pumped through.
- Then it was submersed in a PVC pipe filled with deionized water and at least 1 to 2 gallons were pumped through.
- It was then sprayed with isopropyl alcohol (reagent grade) using a hand held spray bottle, over a tub and submersed in a final deionized water rinse with at least 1 to 2 gallons pumped through.
- Finally, the pump was air dried and wrapped in clean aluminum foil.

Appendix B

Groundwater Sampling Log Sheets June 2005

SHL-15 √I well #: US Army Corps of Engineers SCREENED INTERVAL DEPTH: 15.0 to 25.0 ft below top of PVC Groundwater Sampling Log Sheet H20 LEVEL: PRE-PUMP INSERTION 16,751 Project Name: Devens Areas 32/43A SAMPLE METHOD: EPA LOW STRESS METHOD POST-PUMP INSERTION /6,74' PCBs: 2 x 1 L amber, ice Ammonia: 1 liter hdpe, H,SO, EPH: 2 x 1 L glass amber, HCI COD: 250 ml hdpe, H,SO4 DATE: 6/15/25 TIME: 10.45 SAMPLE DEPTH 201 VOC: 3x40ml vial HCl Total Metals: 1 x 500 ml hdpe HNO, SAMPLED BY: 14 SIGNATURE: My Com-VPH: 3x40ml vial HCl Sulfate, Alkalinity:500ml hdpe, ice TOC: 2 x 40 ml vial, H2SO4 Sulfide: IL hdpe, zinc acetate/NaOH RECORDED BY: 16 SIGNATURE: Aly Co Dislyd Gas: 3 x 40 ml vial, HCl NO,, NO, T. Phos: 1 liter hdpe, H.SO. (15 glass) (6 hdpe) Time Wtr Doth Pump Purge Rate Cumulative Water Specific pН ORP/Eh D.O. Turbidity COMMENTS (24 hr) below MP Setting (mil/min) Volume Conductance Temp (mY) NTUs mg/L feet (Hz) Purged (Celsius) 16.85 1046 93.2 550 10,69 150 5.74 110 215,7 1.05 1019 12.8 16.89 500 11.27 147 5171 212.3 0.74 1,00 195 2 16.89 92.8 2/600 500 11.72 147 205, 2 5772 0,7 0,79 1055 16.87 92.8 5.73 146.4 500 12.12 148 0.66 0.77 1058 12.8 11.88 5-3 2 201L 12.24 148 5:73 122.0 0.64 0,70 1101 16.88 72.8 500 12.40 148 5.73 106.3 0.69 0.63 1101 12.88 92.8 500 12.51 118 96.2 5.72 0.69 0.69 1107 16.89 12.8 500 73612 12.54 149 5.71 88.8 0,63 0.74 16.89 1110 12.8 500 149 17,50 5.72 80.6 0.62 0.72 1113 16.89 12,8 12.56 5-119 5.73 76.2 0.62 0.18 1116 16.85 72,8 5-3 2 AGAL 12.59 119 5.79 70.2 0,75 0.61 500 1119 16.89 128 12.65 149 67.5 0.98 5.75 0.61 1122 16.85 17.8 12.66 119 5.75 64.7 571 0.61 0.96 SAMPLE TAKEN AT: //25 +/- 3% +/-3% +/- 0.1 unit +/- 10 mV +/-10% +/-10%

YSI#: PSGOSOS

TURBIDITY#:3%76

PUMP - Grundfos Rediflow II

NOTES: CENETH OF TUBING FOUND LEFT IN WELL; LOCK WAS NOT FASTENED.

SAMPLER: ALEX GARNEAU

C /I well #: 32M-92-01X US Army Corps of Engineers SCREENED INTERVAL DEPTH: 13.7 - 23.7 ft below top of PVC Groundwater Sampling Log Sheet Devens Areas 32/43A 16,29 Ft Top of Project Name: H20 LEVEL: PRE-PUMP INSERTION SAMPLE METHOD: EPA LOW STRESS METHOD POST-PUMP INSERTION 16.26 PCBs: 2 x 1 L amber, ice Ammonia: 1 liter hdpe, H,SO, DATE: 6/15/2005 TIME: 18:03 AM SAMPLE DEPTH 21 Pro EPH: 2 x I L glass amber, HCl COD: 250 ml hdpe, H.SO. VOC: 3x40ml vial HCl Total Metals: 1 x 500 ml hdpe HNO. VPH: 3x40ml vial HCl Sulfate, Alkalinity:500ml hdpe, ice SAMPLED BY: 54 0B SIGNATURE: LANGE PBL TOC: 2 x 40 ml vial, H2SO4 Sulfide: 1L hdpe, zinc acetate/NaOH Dislyd Gas: 3 x 40ml vial, HCl NO, NO, T. Phos: I liter hdpe, HLSO, RECORDED BY: 3W SIGNATURE: 1 Will. (15 glass) (6 hdpe) Time Wtr Dpth Pump Purge Rate Cumulative Water Specific pH D.O. ORP/Eh Turbidity COMMENTS (24 hr) below MP Setting (ml/min) Volume Temp Conductance (mV) mg/L NTUs Molom feet (Hz) Purged 98 (Celsius) 92.5 17-16 3636 1100 7.35 (000) 10.13 172 6-12 0.91 92.5 17.62 1103 n-2-a 10.57 400 177 6.06 376.6 6.67 2,40 91.3 17.65 ~2.5 1107 600 6.01 386.9 173 11,51 5.71 2.50 17 65 91.3 1110 600 ~ 3 a 11.18 17-5 392.3 6.02 557 34 1113 17.65 91.3 ~3.5a 11,15 ~650 175 397.5 5.36 4.24 6.02 1130 S AMPLE TIME SAMPLE TAKEN AT: 1 130 +1-3% +1-3% +/- 0.1 unit +/- 10 mV +/-10% +/-10%

YSI#: 01J0851-AC

TURBIDITY# 910 290

PUMP - Grundfos Rediflow II

S'AMPLERS: SCAN WALSH PATRICK BLUMERS

NOTES:

C M well #: 32Z-99-02X PIEZOMETER US Army Corps of Engineers well is the furthest east in the SCREENED INTERVAL DEPTH: 14.5-29.5 ft below top of PVC Groundwater Sampling Log Sheet A32/43A study Devens Areas 32/43A 23,08' Project Name: H20 LEVEL: PRE-PUMP INSERTION SAMPLE METHOD: EPA LOW STRESS METHOD POST-PUMP INSERTION 25,08 Ammonia: 1 liter hdpe, H,SO, PCBs: 2 x 1 L amber, ice EPH: 2 x I L glass amber, HCl COD: 250 ml hdpe, H,SO, DATE: 6/13/05 TIME: 1325 SAMPLE DEPTH 28' VOC: 3x40ml vial HCI Total Metals: 1 x 500 ml hdpe HNO, SAMPLED BY: PG SIGNATURE: Paul Governg VPH: 3x40ml vial HCl Sulfate, Alkalinity:500ml hdpe, ice TOC: 2 x 40 ml vial, H2SO4 Sulfide: 1L hdpe, zinc acetate/NaOH NO, NO, T. Phos: 1 liter hdpe, H.SO, Dislyd Gas: 3 x 40ml vial, HCl RECORDED BY: 14 SIGNATURE: Party (6 hdpe) (15 glass) Time D.O. COMMENTS Wtr Doth Pump Purge Rate Cumulative Water Specific рĦ ORP/Eh Turbidity (24 hr)below MP Setting (ml/min) Volume Temp Conductance (mV)mg/L NTUs feet (Hz) Purged (Celsius) PERISTRITIE 1355 400 24,41 152 5112 350,0 6.77 46,6 11.75 stightly cloudy peny usar 419,0 1100 300 11.75 169 4.71 9,14 24,22-1.5 gel 279 1405 10.03 350 11.71 447.1 6.44 24119 177 4,57 <u> 2 anst</u> 468:800 1410 4,28 24,29 11.58 185 4,50 350 10.04 350 1415 24.20 11.66 193 4,47 42.3 9,97 3,66 350 24117 1420 197 4.33 498,1 9,82 4.31 11.78 1425 24/18 4,37 501,1 9.82 350 11.70 200 3,40 Hagel 1430 24,25 350 11,69 203 4,40 506,5 9,74 3,6-1 4,51 511.9 1435 24,25 350 11.40 211 7.69 3.28 514,3 4.51 9,66 1440 24,25 350 11,38 2.83 212 1445 11.44 212 4,54 5/8,0 9,62 2,26 24.28 350 SAMPLE TAKEN AT: 1450 +/-3% 4/- 3% +/- 0.1 unit +/- 10 mV +/-10% +/-10%

YSI#: OO POG98

TURBIDITY #:410350

PUMP - PERISTALTIC GeoTech Model II

NOTES:

(AGUTHI UNIT)

SAMPLER; PAUL YOUNG

EXCESSIVE HUMIDITY CAUSING MOISTURE BUILDUP ON TURBIDAY VIII! DIFFICULT TO KEEP Clear.

	well #: 32					-7-		JS Army			
SCREENE	D INTERVAL	L DEPTH: 2	23.0-33.0 ft	below top	of PVC			roundwate			
H20 LEVE	L: PRE-PUM	P INSERTI	ON <u>25-</u> 6	(n/)		Project Nar		Deven	s Areas 3	2/43A	
			•			SAMPLE M	ETHOD:	EPA LOW S	TRESS ME	THOD	*
	POST-PU	MP INSERT	TION <u>35.</u>	<u> 59</u>		PCBs: 2 x 1				a: I liter hd	
rsame to	<u> 15-05</u> TIN	1120			afr	EPH: 2 x I L	glass amb	er, HCl	COD: 25	0 ml hdpe, 1	H,SO,
						VOC: 3x40r					ml hdpe HNO,
SAMPLED	BY: TIM	SIGNAT	TIRE TL	and 1 Ma	a entitle	VPH: 3x40n					00ml hdpe, ice
	BY: <u>TJM</u> DBY: <u>TJM</u>	_ 5.010111	~A	PARI	. /	TOC: 2 x 40					c acetate/NaOH
RECORDE	DBY: IIM	_ SIGNAT	URE: LLON	raci Illa	with	Distvd Gas:	3 X 40mi v	iai, HCi		, T. Phos: I	liter hdpe, H ₂ SO ₄
Time	Wtr Doth	Pump	Purge Rate	Cumulative	Water	(15 glass) Specific	pHq	ORP/Eli	(6 hdpe) D.O.	1 0 1 1	0.03.63.670.60079
(24 hr)	below MP	Setting	(ml/min)	Volume	Temp	Conductance	Hi	(mV)	mg/L	Turbidity NTUs	COMMENTS
	feet	(Hz)		Purged	(Celsius)						
1040	25.62	109	600		9.24	67	5.17	211.9	10.43	0.40	
1044	25.62	109	440	/ Att	10.94	67	4.97	253.1	10.02	0.42	
1048	35.68	109_	480	3 L	1693	69	4.95	274.5	10.00	0.14	
1052	15.62	109	480	5	12.54	68	5.11	284.3	9.98	0.11	
1056	25.62	109	500	7	12.34	64	5.11	292.8	10.03	0:10	
1100	25.62	109	520	9	12.77	68	5.12	301.9	9.97	0.11	
1104	25.62	109	520	1	12.67	67	5.11	305.0	9.98	0.12	
1108	25.62	109	520	13	12.84	67	5.11	3/2.9	9.94	0.10	· · · · · · · · · · · · · · · · · · ·
1112	25.62	109	520	15	12.60	67	5.11	316.9	9.92	0.09	
1116	25.62	169	520	17	12.80	68	5.1	319.8	9.90		
			7		*	<u> </u>	2711	21 100	1:10	0-11	
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3 A B # 17 17		113 A	<u> </u>		d think				<u></u>		*
MIVITLE I	ALEN AI:_	11 × U	······		+/- 3% co.31	4-3%	+/- 0.1 unit	+/- 10 mV	+/-10条 ± 1.0	+1-10% 45	
	DOGG F	I A	TYT 777	IDITY#: 6		PUMP – Gr		11.74		4	·

	Well #: 3.					·	U	S Army	corps o	t Engine	ers
SCREENE	ED INTERVA	L DEPTH: 2	25.0 – 35.0	ft below top	o of PVC		G	roundwate	r Sampli	ng Log Sh	eet
H20 I EVI	EL: PRE-PUM	P INCEPTIC	nar 17-	<u>.97</u> _		Project Nan	ne:	Deven	s Areas 3.	2/43A	
(Live som v)	on reduce of	a monaciic	/LY					EPA LOW S			
	POST-PU	IMP INSERT	ION <u>17</u>	94		PCBs: 2 x 1				a: 1 liter hdp	
	11-				″) ⊾	EPH: 2 x I L				i0 ml hdpe, E	
	15 2005 FI				10	VOC: 3x40n					ml hdpe HNO,
SAMPLET	ову: <u>5%</u>	SIGNAT	11RE - X	m/ala		VPH: 3x40n					Oml hdpe, ice
CV, 27471 17171		G.K.J.1.42.K.L		- F 6 - W		TOC: 2 x 40					acetate/NaOH
RECORD	ED BY: <u>沙</u> 椒	_ SIGNATI	URE: 🏒 🛋	Will		Dislyd Gas: (15 glass)	э х 40ш ү	iai, nci	(6 hdpe)	, i. filos: i	liter hdpe, H ₂ SO ₄
Time	Wtr Dpth	Pump	Purge Rate		Water	Specific Specific	Hg	ORP/Eh	D,O,	Turbidity	COMMENTS
(24 hr)	below MP	Setting	(ml/min)	Volume	Temp	Conductance	pri	(mV)	mg/L	NTUs	COMMISSION
	feet	(Hz)		Purged	(Celsius)				ļ		······································
1410	19-65	101	800	~0.59	12-18	366	6.io	216.5	5.95	1.94	
1413	PB-11.89	101	800	2/9	14.00	363	6.26	2-06-6	4.68	D. 55	
1416	19.95	101	800	~1, <u>Sa</u>	14-79	364	6.24	202.6	5,02	0.25	
1419	19.99	101	800	12.259	4:91	363	6_21	202.3	5.03	0,2	
1422	19.99	loi	2750	~3 g	14.99	262	6.19	203_2	5.11	0.15	
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SAMPLE	TAKEN AT:_	1430	<u> </u>	<u> </u>	+/- 3%	+1-3%	<u>1</u> -⊬- 0.1 unit	+/- 10 mV	/ +/-10%	+/-10%	· · · · · · · · · · · · · · · · · · ·
Manager Indiana (Indiana)											
YSI#:	4	45.000000000000000000000000000000000000	TURI	BIDITY#:	2001	PUMP - Gr	undfos Rec	liflow Il			Chemical American Samurana and Printing Control Samura (American American A

NOTES:

SAMPLER: SEAN WALSH

SCREENE H20 LEVE DATE: 6 SAMPLED RECORDE		L DEPTH: 1. P INSERTIC IMP INSERT ME: //or SIGNATI	3.7 - 23.7 f ON _/5. CION _/5.	57₹ 34 E DEPTH_ <	27	PCBs: 2 x 1 EPH: 2 x I L VOC: 3x40n VPH: 3x40n TOC: 2 x 40 Dislvd Gas: 1 (15 glass)	G ETHOD: L amber, ividinglass ambout the properties of the proper	EPA LOW ST ce er, HCl l l 2SO4 ial, HCl	Sampling Areas 32 RESS ME Ammoni COD: 25 Total Me Sulfate, A Sulfide: NO,,NO, (6 hdpe)	ng Log SI 2/43A THOD a: 1 liter hdp 0 ml hdpe, I stals: 1 x 500 Alkalinity:50 1L hdpe, zin , T. Phos: 1	pe, H ₂ S H ₂ SO ₄ ml ho Ooml h	dpe HNO dpe, ice ite/NaOH dpe, H ₂ SO	etween /s 33 and
feet (Hz) Purged (Celsius)										Turbidity NTUs		COMMEN	13
											lay.		
1372	71.25	196.7	122		14163	304	607	281.1	4.71	1.39			
1325	Z1.50	1-46,2	45.5		14.70	324	6.05	298.2	4.23	Z. 00	205	T FL - wil	
1329	446	151.7	crist.		14.91	304	604	318,6	3.97				
1332	21,22	1-18.0	12 71	خ جرجهم الحدود عمر	19.79	275	6.03	323.7	7.51		1	P CAUIT	
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SAMPLE	TAKEN AT:	/228		<u></u>	+/- 3%	+/- 3%	+/- 0.1 unit	+/- 10 mV	+/-10%	+/-10%	-tt		

YSI#: 01JOSS/ NOTES: WELL DRAWN DOWN / BULLET

TURBIDITY # 375 76

PUMP - Grundfos Rediflow II

SAMPLER: ALEX GARNEAU

G A well #: 32M-01-14XBR US Army Corps of Engineers vell is located outside SCREENED INTERVAL DEPTH: 34.0 - 44.0 ft below top of PVC Groundwater Sampling Log Sheet the facility fence Devens Areas 32/43A Project Name: H20 LEVEL: PRE-PUMP INSERTION SAMPLE METHOD: EPA LOW STRESS METHOD POST-PUMP INSERTION 13.55 PCBs: 2 x 1 L amber, ice Ammonia: I liter hdpe, HSO, EPH: 2 x I L glass amber, HCl COD: 250 ml hdpe, H.SO. DATE: 6/15/25 TIME: 12:2- SAMPLE DEPTH 40' VOC: 3x40ml vial HCl Total Metals: 1 x 500 ml hdpe HNO, SAMPLED BY: AL SIGNATURE: All VPH: 3x40ml vial HCl Sulfate, Alkalinity:500ml hdpe, ice TOC: 2 x 40 ml vial, H2SO4 Sulfide: 1L hdpe, zinc acetate/NaOH Dislyd Gas: 3 x 40ml vial, HCI NO, NO, T. Phos: I liter hdpe, H.SO. RECORDED BY: AL SIGNATURE: My (15 glass) (6 hdpe) Expect to draw the well down about 10 ft and wait for recharge, Time Wir Doth Pump Purge Rate Cumulative Specific ORP/Eh D.O. COMMENTS Water pH Turbidity (24 hr) below MP (mi/min) Setting Volume Temp Conductance (mV) mg/L **NTUs** feet (Hz) Purged (Celsius) 23.70 14:11 106.0 10.91 637 6.57 160,7 5,45 677 COST FLOW MIN IMAL 109,3 14.14 25.12 11.02 (4) 152.1 3.50 662 4.04 NATES 62.02 Cost Front 112.00 1418 25.91 12.32 137 6.65 136.3 2250 2/616 3,36 3,76 11 12.93 11 28167 116 4 龙冠四四 612 6.65 351 2.64 1921 129.6 1124 30,15 115,0 27-0 696 3.14 5,10 13.16 6-67 126.8 37 10 1427 31.95 1732 13,58 646 117.5 3,01 9.68 11 6.67 1430 32.28 33.90 129,5 285 1. Z. 5 CAL 13.99 641 105.8 3,61 1433 6.67 2.94 1436 37,50 132,6 14.97 675 6.67 109,3 2,92 2.73 24CM. SAMPLE TAKEN AT: 1940

YSI#: 00 D0698

TURBIDITY #: 39576

+/- 3%

PUMP - Grundfos Rediflow II

+/- 0.1 unit +/- 10 mV

+/- 3%

NOTES:

SAMPLER: ALEX GARNEAU

+/-10%

+/-10%

SCREENE	well #: 32 ID INTERVA	L DEPTH: I	9 – 29 ft bel	. •	PVC	Project Mon	G	JS Army croundwate	_	ng Log S	Legantes de protoveica
H20 LEVE	L: PRE-PUM	IP INSERTIC	N <u>22.</u>	95		Project Nan		EPA LOW S			
DATE: <u>(</u>	POST-PL / <i> 5 05</i> _ TII		TON <u>22</u>		28'	PCBs: 2 x 1 EPH: 2 x I L VOC: 3x40r	L amber, i glass amb	ce per, HCl	Ammoni COD: 25	a: I liter hd 0 ml hdpe,	
) BY:					VPH: 3x40n TOC: 2 x 40 Dislvd Gas:	ml vial, F	I2SO4	Sulfide:	1L hdpe, zir	00ml hdpe, ice nc acetate/NaOH liter hdpe, H _s SO ₄
RECORDE	ED BY: TIL	4 SIGNATI	URE:			(15 glass)		, ,	(6 hdpe)	3, 44 2 3 3 4 4 4 4	3333 334
		well down		and wait fo	or recharg						
Time (24 hr)	below MP Setting (ml/min) Volume Fact (Hz) Purged 24.07 106.3 200				Water Temp (Celsius)	Specific Conductance	pН	ORP/Eh (mV)	D.O. mg/L	Turbidity NTUs	COMMENTS
1410	24.07 166.3 200 16					518 520	6.24	31.0	4.10	31-8	
1414		24.38 118.1 NA stopped 10.3					6.33	-42.0	2.60		
1418	24.55 149.8 160" 11.7					519	6.35	-50, 3	2-49	31.9	
1422		reacting				, As		ļ			Flow STABERS HOLE
	- Deny	red 13	5-gal buch	et out;	vell dre	what out				1	
	- Prior	16 stare	1 1 2 2 - 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ed 2/3 5	Jellen b	uset out	<u> </u>	ļ			
<u></u>											- DEPENIE DOWN
											WELL TO SAMPLE
											TOMOREA
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SAMPLE'	 TAKEN AT:_	<u> 0845</u>	6/16/25	<u> </u>	+/- 3%	+/- 3%	/- 0.1 uni	l t +/- 10 mV	+/-10%	+/-10%	
					,						
YSI#: 0	13022	AC	TURE	BIDITY#:6	08146	PUMP – Gr	undfos Re	diflow II			And the state of t
NOTES:	0/16/25.	WATTE AT		Ť	. (*			SAMPL	er: 70N	MARCOT	TE
	~ ~/	ATPROX	23' PEC:	SAM PLE							

\overline{G} \overline{M}	vell #: 33	2M-01-15	XRR	······································	·		1	S Army (Orne o	f Engine	ere	l vell is		
				t below top	of PVC	1960		roundwater	, e	~		located opposite		
				^		Project Man			: Areas 32		icer	Bay #30		
H20 LEVE	L: PRE-PUM	IP INSERTIO	N 18.	25		1		EPA LOW ST						
	POST-PI	JMP INSERT	ION 17.	57		PCBs: 2 x 1				a: I liter hdt	e, H.S	0.		
_				<i>x</i>	10 /	EPH: 2 x I L				0 ml hdpe, Î		-3		
DATE: /6	June 05 TI	ME: <u>103 5</u>	SAMPL	E DEPTH_#	200	VOC: 3x40n				tals: 1 x 500				
SAMDIEL	DV. TAIL	ORCINI AT	THE The	us of Mara	4	VPH: 3x40m				Alkalinity:50				
PRESIDE PREST	, p.i. <u>1510(</u>	SIGNAT	OKIS, <u>UZYII</u>	<u> any inorga</u>	MO	TOC: 2 x 40				Sulfide: 1L hdpe, zinc acetate/NaOF NO,,NO,, T. Phos: 1 liter hdpe, H,S0				
RECORDE	ED BY:	_ SIGNATI	JRE:	·		Dislyd Gas: (15 glass)	3 X 4Umi V	iai, HCi	(6 hdpe)	ipe, H ₂ SO ₂				
Well bas	history of	noar rache	rge Ther	oforor roce	nnahla ta r	lraw down to	0 = 40 ft l	velous TOPV		compline				
Time	Wtr Dpth	Pump	Purge Rate	Cumulative	Water	Specific	pH	ORP/Eh	D.O.	Turbidity		COMMENTS		
(24 hr)	r) below MP Setting (ml/min) Vo.				Temp	Conductance		(mV)	mg/L	NTUs		- 11.5.1.1 (P. 11.5.1.1)		
: ***				Purged	(Celsius)		//	1 /						
1325	39,70	139.1	200		14.63	5 99	6.76	152.1	5.98	17.25	ļ			
1328	40.60	139.3	200		14.69	595	6.80	123.3	4.95	25.2				
<u> /33/</u>	40,82	142.3	80		15.03		6.84	£3,3	5.09	24.1				
1334	40,90	190.0	./00	0.50 900-	15.14	59£	7.04	85.0	5,15	22.3	Flou	istpped afti leading		
											1334	reading		
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SAMPLE 1	AKEN AT:_	Q15		! I	+/- 3%	+/- 3%	+/- 0.1 unit	4/- 10 mV	+/-10%	+/-10%	L	<u> </u>		

YSI#: DOPOGTE AA

TURBIDITY #: 608146

PUMP - Grundfos Rediflow II

NOTES: Pumped well dry; pump settings 110 to 150; silty water withbown, 38,8ft find water level-pump unable to remove #5 gallon buckets: 1 t gallons.

*Well re-charged to 36.00 by 1215

SCREENE H20 LEVE DATE: SAMPLEI	vell #: 32 ED INTERVA EL: PRE-PUM POST-PU POST-PU DBY: 46 ED BY: 46-	L DEPTH: 2 IP INSERTIO IMP INSERT ME:SIGNAT	1.0 – 31.0 f on <u>22.</u> ion <u>22.</u> 3 sampl ure: <u>/</u>	/3' /2' E DEPTH_3		Project Nan SAMPLE M PCBs: 2 x 1 L EPH: 2 x 1 L VOC: 3x40n VPH: 3x40n TOC: 2 x 40 Dislvd Gas: (15 glass)	Ge: ETHOD: L amber, i glass amb il vial HC l vial HC ml vial, H	EPA LOW ST ce er, HCl Il I 2SO4 ial, HCl	Sampling Areas 32 RESS ME Ammonic COD: 25 Total Me Sulfate, A Sulfide:	ng Log Sh 2/43A THOD a: 1 liter hdp 0 ml hdpe, F tals: 1 x 500 Alkalinity: 50 (L hdpe, zine , T. Phos: 1	e, H ₂ S L ₂ SO, ml h	dpe HNO, dpe. ice ite/NaOH
Time (24 hr)	Wur Dpth below MP feet	Pump Setting (Hz)	Purge Rate (ml/min)	Cumulative Volume Purged	Water Temp (Celsius)	Specific Conductance	pН	ORP/Eh (mV)	D.O. mg/L	Turbidity NTUs	2947	COMMENTS
1430	ZZ. ZZ	105.6	400		13.14	109	6.18	99.0	136	70.1		
1433	72.23	105.6	400		13:65	/7/	6.07	117.2	1.75	24.7		.*
1436	ZZ.Z3	105.6	400		14.87	235	6.04	130.5	2.56	15.4		; ±
1439	ZZ. Z3	105,6	400	=/GAL	15.64	アタフ	6,04	136,1	2.95	11,08		
1112	22.23	105.6	400		15.97	374	6.09	139,7	3,12	7.65		
1445	22.23	105.5	400		16,06	396	6.04	140,8	3,32	4.71		
14+8	27,23	195.6	400		16.06	350	6.04	1388	3,38	4.73		
1451	22.24	105,6	400	225692	16.06	355	6.03	137.9	3.47	4,18		
1454	22.24	105,6	400		16.10	358	6.03	142,2	3.54	4.42		
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						.co.c./A.						
		ļ										
A 1.3 Arch		/ / / / /			<u></u>							
SAMPLE	TAKEN AT:_	1454			+/- 3%	+/- 3%	+/- 0.1 unit	+/- 10 mV	+1-10%	+/-10%		

YSI#: 00D0698 NOTES:

TURBIDITY#: 608/46 PUMP - Grundfos Rediflow II

GvvM well #: 32M-01-17XBR US Army Corps of Engineers s located inside the facility SCREENED INTERVAL DEPTH: 41.4 - 51.4 ft below top of PVC Groundwater Sampling Log Sheet fence, near Project Name: Devens Areas 32/43A 23,55 @ 1115hrs H20 LEVEL: PRE-PUMP INSERTION SHL-25. SAMPLE METHOD: EPA LOW STRESS METHOD POST-PUMP INSERTION 23.55 @ 1/25 PCBs: 2 x 1 L amber, ice Ammonia: 1 liter hdpe, H.SO. EPH: 2 x I L glass amber, HCl COD: 250 ml hdpe, H,SO, DATE: 6/16/05 TIME: _____SAMPLE DEPTH_ 4 Sfeet. VOC: 3x40ml vial HCl Total Metals: 1 x 500 ml hdpe HNO, SAMPLED BY: P.BLUMERSIGNATURE: P.BL. VPH: 3x40ml vial HCl Sulfate, Alkalinity:500ml hdpe, ice TOC: 2 x 40 ml vial, H2SO4 Sulfide: 1L hdpe, zinc acetate/NaOH RECORDED BY: 1.6 SIGNATURE: 1.86 . Dislyd Gas: 3 x 40ml vial, HCl NO, NO, T. Phos: 1 liter hdpe, H.SO. (15 glass) (6 hdpe) Time Specific Wtr Dpth Pump Purge Rate Cumulative. Water pН ORP/Eh D.O. COMMENTS Turbidity (24 hr)below MP Setting (ml/min) Volume Temp Conductance (mV) mg/L **NTUs** Feet (Hz)Purged (Celsius) 24.45 1302 120 2000 Adjusting rote 110 1305 12,49 7.15 447 162.2 0.73 8.5 1050 1308 23.95 110 ~122 13.68 AA7 1040 7.18 164,5 0.53 36 1314 24.10 113 2,3 452 161.6 0.55 1400 13,52 18+ AL 7.09 1317 23,85 107 680 18+8 153 7.02 0.63 0,61 13,41 162,0 23,82 1320 [08 660 18+ 11 14.61 465 6.96 156,1 0,81 0.33 23.82 1325 167 107 640 18+12 14.85 6.92 0.65 117,4 0,95 23.82 1329 480 471 108 0,47 184 16 10,93 (39 144, 1 1 13 1339 23.78 520 36+2 107 139.1 15.19 6.82 483 1.41 0.20 23.78 500 36+5 13 43 108 15,28 489 134.4 0.20 6 80 1,47 1347 23.78 36+6 107 500 15.30 492 130,8 6.78 1,53 0,25 1415 SAMPLE TIME POR SAMPLE WITH EXTRA VOLUME FOR MSI/MSD FINISHED BOTTLES FOR 1450 FILLING THIS LOCATION

YSI#: 98G-0508 AA NOTES:

SAMPLE TAKEN AT: 14/5

TURBIDITY #: 910 290

+/- 3%

41-3%

PUMP - Grundfos Rediflow II

+/- 0.1 unit +/- 10 mV

SAMPLER: PATRICE BLUNERIS

+/-10%

+/-10%

# P	SCREENE H20 LEVE DATE: 4	well #: 32 ED INTERVA EL: PRB-PUM POST-PU E/6/05 TH OBY: PY ED BY: PY	L DEPTH: 1 IP INSERTIC IMP INSERT ME: <u>0910</u> SIGNAT	4.0 – 23.0 f DN <u>/5</u> TION <u>/5</u> SAMPLI TURE: <u>Po</u>	13'7' 43' E DEPTH_2 Lyoung		Project Nan SAMPLE M PCBs: 2 x 1 L EPH: 2 x 1 L VOC: 3x40m VPH: 3x40m TOC: 2 x 40 Dislyd Gas: (45 glass)	ne: ETHOD: L amber, i glass am nl vial HO nl vial, HO ml vial, F 3 x 40ml v	EPA LOW ST ice ber, HCI CI CI I2SO4 vial, HCI	Sampli S Areas 3 RESS ME Ammoni COD: 25 Total Me Sulfate, Sulfide: NO ₃ ,NO	ng Log Sl 2/43A ETHOD ia: 1 liter hdp 50 ml hdpe, 1 etals: 1 x 500 Alkalinity:50 1L hdpe, zin	beet Bay #29; Ground is incorrectly marked "16XOB" pe, H ₂ SO ₄ H ₂ SO ₄ 0 ml hdpe HNO ₅ 00ml hdpe, ice acetate/NaOH liter hdpe, H ₂ SO ₄
						it for reco						below are obtained.
	Time (24 hr)	Wir Dpth below MP feet	Pump Setting (Hz)	Purge Rate (ml/min)	Cumulative Volume Purged	Water Temp (Celsius)	Specific Conductance	pH	ORP/Eh (mV)	D.O. mg/L	Turbidity NTUs	COMMENTS
	0920	15.43			24.gal							slight chlorinated ode
	0525	22.3										WATER IS CLEAR TO GYE
	0138 0947	16.18			24944							
	1045	15,63										
				HOT TAKEN								
	1140	17:85	96,2	TAKEN	0	13.66	465	6.34	98.9	2,95	0.98	Slight chlowneted ofon
	1145	17,55	96,2			14,01	469	6.30	53.2	1,01	0,25	
į	1148	17.48	96,2	1		14,35	478	6.30	33.7	0.86	0.85	
	11.51	17,48	96,2	-	<u> </u>	14.40	479	6,30	30.6	0.75	0.56	<u> </u>
	11.54 11.57	17:48	96,2			14,41	480		27,9 26,7	0.61	0.59	
	1200	17.48	96.2			(4,43	481	630	25.3	0.66	0.60	
	1203	17.48	96,2		229/1	14.43	48/	6179	24,7	0,50	0.51	
	SAMDIE.	TAKEN AT:	INUE			+/- 3%	+/- 3%		t +/- 10 mV	+/-10%	1/-10%	

YSI #: 986 0508 NOTES:

TURBIDITY #: 910290 (REUTH UMIT)

PUMP - Grundfos Rediflow II

SAMPLER: PAUL YOUNG

G A well #: 43M-01-16XBR US Army Corps of Engineers SCREENED INTERVAL DEPTH: 47.5 - 57.5 ft below top of PVC Groundwater Sampling Log Sheet Located opposite 3 yellow poles at Project Name: Devens Areas 32/43A 22,28@10:25 H20 LEVEL: PRE-PUMP INSERTION Door B5 SAMPLE METHOD: EPA LOW STRESS METHOD POST-PUMP INSERTION (PB) 20.69' PCBs: 2 x 1 L amber, ice Ammonia:500 ml hdpe, H2SO4 EPH: 2 x I L glass amber, HCl COD:500 ml hdpe, H2SO4 DATE: 617/2005 TIME: _____ SAMPLE DEPTH 52 Fed VOC: 3x40ml vial HCl Total Metals: 1 x 500 ml hdpe HNO3 SAMPLED BY: 9.6. SIGNATURE: P.Bi. VPH: 3x40ml vial HCl Sulfate, Alkalinity:500ml hdpe. ice TOC: 2 x 40 ml vial, H2SO4 Sulfide: 1L hdpe, zinc acetate/NaOH NO2, NO3, T. Phos: 500 ml hdpe, H2SO4 Dislyd Gas: 3 x 40ml vial, HCl RECORDED BY: P.B. SIGNATURE: P.B. (15 glass) (6 hdpe) Well was drawn down from 26.1 to 35.7 ft below TOPVC in Dec 2003; and from 23.2 to 44.3 ft in Oct 2004. Therefore expect at least 10 ft drawdown during stabilization. Time Wtr Doth Рипи Purge Rate Cumulative Water Specific рH D.O. ORP/Eh Turbidity COMMENTS (24 hr)below MP Setting (ml/min) Conductance Volume Temp (mV) m_2/L NTUs fect (Hz) Purged (Celsius) 11:23 22.30 106.7 δÔ 18.3 70 6,59 196,1 5.52 40 Seeme clear. 24 80 11:26 111.6 ~ 21. 16.67 7.34 171,7 2.64 25 100 406 Flow rate needs const. throwing 11:31 26,95 118.2 13/21 1762 4.28 480 16.57 275 7.26 14-11:36 27,60 5.49 N EL 121.0 16.3 6,82 182.0 1 200 124 12.5 11:41 32,50 126.6 600 ~ 71 16.77 81 185,1 6.54 5.75 6,1 n sg sg 11:A6 34.85 133,7 Nº 91 400 68 643 185.0 16.70 5,60 9.5 36,80 11:51 540 133.9 ~ 101 18,42 75 6.50 180.2 560 6.6 11:55 38,58 137,9 76 200 2 Ill 17.83 6.51 179.2 5,53 5,12 12:15 SAMPLE THE

YSI#: 650 MDS, SN= 063644 TURBIDITY#: 608/AG PUMP-Grundfos Rediflow II
NOTES: YSI MDS does not measure conductively initially continual!!! (measured 0.0 central water confirming) PB
SAMPLER PATRICE BLUMERS

+/- 3%

+/- 3%

+/- 0.1 unit +/- 10 mV

+/-10%

+/-10%

SAMPLE TAKEN AT: 1215

SCREENE H20 LEVE DATE: 6/ SAMPLED	vell#: 43 d interval L: pre-pum Post-pu (7405 th bby: 18	L DEPTH: 24 P INSERTION IMP INSERTION ME: SIGNATION	1.0 – 34.0 ft n <u>22.4</u> ion <u>3</u> sampli ure: <u>1,8</u> U	15 (2 to) 2 (2) 12 E DEPTH	10 10 138	Project Nam SAMPLE MI PCBs: 2 x 1 1 EPH: 2 x I L VOC: 3x40m VPH: 3x40m TOC: 2 x 40 Dislvd Gas: 3 (15 glass)	Gi ETHOD: I L amber, ic glass ambe ol vial HCl il vial HCl ml vial, HCl	EPA LOW ST ce er, HCl I l 2SO4	Sampling Areas 32 RESS ME Animonia COD:500 Total Me Sulfate, A Sulfide: 1	ng Log Sh 443A THOD a:500 ml hdp ml hdpe, H tals: 1 x 500 Alkalinity:50 IL hdpe, zine	pe, H2: 12SO4 1 ml ho 10ml ho c aceta	dpe HNO3 dpe, ice
Time (24 hr)	Wtr Dpth below MP feet	Pump Setting (Hz)	Purge Rate (ml/min)	Cumulative Volume Purged	Water Temp (Celsius)	Specific Conductance	рН	ORP/Eh (mV)	D.O. mg/L	Turbidity NTUs		COMMENTS
1324	22.70	109,7	880	~	16.2	138	5.50	148.3	7.50	50,5		
1329	22,70	109,7	880	N 8 L	14.81	137	5.40	185.0	7,10	16,2		**************************************
1334	22.70	109.7	880	~101	14.61	137	5,40	193.1	7,08	8.0		
1337	22,70	109.7	୧୫୦	7 15461	6) 14,47	137	5,40	198,9	7,06	6, 2		
1340	22,70	109.7	880	171.	14,47	(37	5,40	207,4	7.03	5,0	Seme	7.1
13.43	22,70	109,3	900	18 + 28	14,47	136	5,40	214,4	7.01	4,0	CBCK	ET
1347	22.70	109,7	900	18+4=22	14,47	136	5,40	218,0	6,99	3 2		
1350	22,70	109,7	900	18+7 = 258	14,45	136	5,40	220,5	6, 49	3.5		
1000	STAPLA	7/HB										
								ANOTORS LANGE				
		<u> </u>									<u> </u>	
SAMPLE'	TAKEN AT:_	1400			+/- 3%	+/- 3%	+/- 0.1 unit	t +/- 10 mV	+/-10%	+/-10%		

YSI #: 650 MDS , SN = 063644 NOTES:

TURBIDITY#: 608146

PUMP - Grundfos Rediflow II

Sonny day may explain initial high temp (chamber still hat from before the water entered it)

SAMPLER: PATRICK BLUMERIS

C_Mr	vell#: 4.	3M-01-17	/XOB				L	IS Army (Corps o	f Engine	ers	1 Door B4;
SCREENE	D INTERVA	L DEPTH: 2	23.5 - 33.5	ft below to	o of PVC			roundwate	~	107		about 6 paces
1700 t mirr	77 - Ph. Ph. 775 - mar a n	at at the second at the second at the second at	~ > >	921		Project Nar			Areas 3			from bottom step
HZULEVE	EL: PRE-PUM							EPA LOW ST			·	
	POST-PU	JMP INSER'I	10N <u>23</u>	1921		PCBs: 2 x 1				a: I liter hdr	oe. H.S	O
					ż	EPH: 2 x I L				0 ml hdpe, I		-1
DATE: 👙	//3/05 TI	ME: <u>/50°</u>	SAMPL	E DEPTH_3	<u>oʻ</u>	VOC: 3x40n				etals: 1 x 500		dpe HNO,
) BY: <u>AG</u>					VPH: 3x40u				Alkalinity:50		
					سد	TOC: 2 x 40				IL hdpe, zin		
RECORDI	ED BY: <u>H</u>	SIGNAT	LIRE. Alm	, C.		Dislyd Gas:	3×40 ml v	ial, HCl		T. Phos: I	liter ho	Ipe, H ₂ SO ₄
					Water	(15 glass)			(6 hdpe)		T	
Time (24 hr)	ar) below MP Setting (ml/min) Volume					Specific Conductance	pН	ORP/Eh	D.O.	Turbidity		COMMENTS
√~"1 €E3)	feet	(Hz)	(1181,11811)	Purged	Temp (Celsius)	Conunctance		(mV)	mg/L	NTUs		
1518	23.97	114.2	1220		16.63	71(2)	4.9	ZAZ.0	8.58	12.7		
<u>1522</u>	Z3.97	110.9	100	57	15,27	97	SIA	76/,3	6.79	3,83	~	· · · · · · · · · · · · · · · · · · ·
<u> 1525</u>	23,97 110:4 400 15:9					100	522	259,4	6.19	2,26		
1528	23.97	110.4	400		16.74	103	5,26		6,07	1,57		
1531	2397	110,5	100	2 8C	16.90	104	5.26	256,0	5.80	1.40		
1537	23,96	110.5	400		17,13	100	5.28		5.55	1.73		
1537	23.9L	110,5	400	2/24	17.20	103	5,29	252,3	5.41	1,15	, , , , , , , , , , , , , , , , , , , ,	
1540	23.96	110.5	400		17,32	103	5.28	249.6	5.76	1.17		
·*************************************												

SAMPLE T	AKEN AT:_	1543			+/- 3%	+/- 3%	+/- 0.1 unit	+/- 10 mV	+/-10%	+/-10%		

YSI#: 05 E Z39Z NOTES:

TURBIDITY #: 605/16 PUMP - Grundfos Rediflow II

SAMPLER: ALEX GARNEAU

	well #: 43			т	# FDT 1/7	<u> </u>		JS Army (-	-		Door B4; about 6 paces
SCREENE	ED INTERVA	L DEPTH: 4		•	of PVC		G	roundwater	Sampli	ng Log Sh	ieet	from bottom step
H20 LEVE	EL: PRE-PUM	P INSERTIC	_{in} 24	,06		Project Nan	ne:	Devens	Areas 3	2/43A		** 144 0000044 0000
IMA MELA				······································		SAMPLE M	ETHOD:	EPA LOW ST	RESS ME	THOD		
	POST-PU	IMP INSERT	'ION <u>22</u>	<u> 73 </u>		PCBs: 2 x 1	L amber, i	ce		a: 1 liter hdp		O ₄
	6/13/05 TU	tili l z	_	· ·	-11	EPH: 2 x I L			COD: 25	i0 ml hdpe, F	ĻSO,	
DATE: _	<i>412/_</i> Tu	ME: 1770	2 SAMPL	E DEPTH_0	<u> </u>	VOC: 3x40n				etals: 1 x 500		
CAMPI III	BY: TIM	CICNIAT	TION The	was OM.		VPH: 3x40n				Alkalinity:50		
			_	27		TOC: 2 x 40				IL hdpe, zin		
RECORDI	ED BY: IIW	SIGNATI	URE: Thou	us D'Mar	cather.	Dislyd Gas:	3 x 40ml v	ial, HCl	NO.NO	, T. Phos: 1	liter ho	dpe, H ₃ SO ₄
						(15 glass)	· · · · · · · · · · · · · · · · · · ·		(6 hdpe)	1		
Time (24 hr)	Wtr Dpth below MP	Pump Setting	Purge Rate (ml/min)	Cumulative Volume	Water Temp	Specific Conductance	pН	ORP/Eh (mV)	D.O. mg/L	Turbidity NTUs		COMMENTS
(27 (13)	feet	(Hz)	(Him min)	Purged	(Celsius)	Conductance		(11.47)	Ing/L	74103		
1547	25.25	11/19	.160		12-53	226	5.56	259.5	5-65	9.43		
1351	25.55	112.0	160		17.17	27/	5.00	325-2	2.90	i3.2		,
1355	25.85	113.5	300	0.25 gel	16.30	344	4.4a		2-17	10.05		
1359	26.55	115.7	400		15.69	347	4.20	424.8	1.93	8.79		
1403	d7.35	115.7	300	0.75 95	17.44	319	4.36	461.6	1.93	5.89	· · · · · · · · · · · · · · · · · · ·	2
1407	27.40	115.7	250		19.21	312	4.98	480-7	1.95	4.80		-
1411	27.40	115.7	240	1,25 gd	18.99	318	4.74	498.5	1.88	4.05		
1415	27.40	115.7	240		18.66	325	4.58	510.6	1.81	3.55		
1419	27.40	115.7	240	1.5000	18-42	336	4.42	530.0	1.65	2.65		
1423	27.40	115.7	240		18,55	339	4.38	540-6	1.60	2.25	·············	
1427	27.40	115.7	240	1.75 gel	18-66	346	4.41	551.9	1.58	2.33		
1431	27.40	115.7	240		18.55	354	4.50	557.1	1.59	2.30		
1435	27-40	115.7	240	2.60 gal	18.62	357	4.55	553.9	1.60	2,35		
								<u>,,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,, ,,</u>				
					*							
	<u> </u>		,			1						
SAMPLE	TAKEN AT:	1440	*		+/- 3%	+/- 3% 19.5	+/- 0.1 unit	+/- 10 mV	+/-10%	H-10%		<u> </u>
					± 0.0				1.15			

YSI#: 9860508 AA NOTES: TURBIDITY #: 39576

PUMP - Grundfos Rediflow II

SAMPLER: NOM MARCOTTE

C M well #: 43M-01-20XBR US Army Corps of Engineers SCREENED INTERVAL DEPTH: 68.3 - 78.3 ft below top of PVC Groundwater Sampling Log Sheet Devens Areas 32/43A Project Name: 23,69 H20 LEVEL: PRE-PUMP INSERTION SAMPLE METHOD: EPA LOW STRESS METHOD POST-PUMP INSERTION 23.68' PCBs: 2 x 1 L amber, ice Ammonia: I liter hdpe, H.SO. EPH: 2 x I L glass amber, HCl COD: 250 ml hdpe, H,SO, DATE: 6/13/05TIME: 0850 SAMPLE DEPTH 73' VOC: 3x40ml vial HCl Total Metals: 1 x 500 ml hdpe HNO, Sulfate, Alkalinity:500ml hdpe, ice VPH: 3x40ml vial HCl SAMPLED BY: PG SIGNATURE: Paul Young TOC: 2 x 40 ml vial, H2SO4 Sulfide: IL hdpe, zinc acetate/NaOH RECORDED BY: PG SIGNATURE: Paul young Dislyd Gas: 3 x 40ml vial, HCl NO,, NO,, T. Phos: 1 liter hdpe, H,SO, (15 glass) (6 hdpe) Obstructed (bent?) at -12 ft depth in Dec2003; used peristaltic pump in May 2004 and October 2004 Time Wtr Doth Pump Purge Rate Cumulative Water Specific Hq ORP/Eh D.O. Turbidity COMMENTS (24 hr)below MP Setting (mi/min) Volume Temp Conductance (mV)mg/LNTUs feet (Hz)(Celsius) Purged PERISTRUTE PERISTRUTE 1411 2907 1006 300 6.75 -3616 7,32 25,00 0.76 1 gol 150 25.42 13.79 2874 6.86 -13,4 4.83 0,47 1083 25,42 250 2873 1018 13,79 6-84 ~7,5 0.38 4-82 25.49 250 13.79 2845 1023 6.79 4,0 0.33 3,75 25.46 2 gl 1023 250 14.13 2849 6.83 6.1 0141 3,97 25,4C 1033 13.91 250 2827 C.83 3.40 11.6 0.31 13.92 25.46 2,54 2806 6.82 1079 150 12.4 0.30 3 gal 250 25/19 13.94 2752 6.81 0.29 1043 16.2 2,49 1048 250 25.54 2626 5,6 13.83 6.83 3,46 0.28 25,51 1053 250 14,02 2436 6.82 3.9 0,29 2,67 400 14,02 250 2306 1058 25,49 6.76 1018 0.31 3.04 25149 14,01 1103 250 2227 6.74 15.7 0,33 3,42

SAMPLE TAKEN AT: ________

+/- 3% +/- 3%

+/- 0.1 unit +/- 10 mV

+/-10% +/-10%

YSI#: DODOG98

TURBIDITY #:91@ 290

PUMP - Grundfos Rediflow II

NOTES:

(RIGHTAL UNIT)

SAMPLER: PAUL YOUNG

High homidity causing excessive moistone Buildop on Tun Bidity unit, difficult To keep clear

T 74.	well #: 4	20 10 VAE	27/10			-	T'	TC1 A	~1	£ 17*	
	well #:			thalass tan	AF DVO			JS Army (~	-	
OCKEDIAL	213 114 11716 A 19	L DEFIEL Z		•	ULTYC			roundwate			heet
H20 LEVE	EL: PRE-PUM	AP INSERTIC	ON 241	171		Project Nan	The state of the s		Areas 3		
								EPA LOW ST			
	POST-PU	JMP INSERT	TION <u>24.</u>	/3		PCBs: 2 x 1				a: I liter hd	
DATE: 6	<u> 13 05</u> TI	ME: 0957	S GAMDII	e nepru 7	γΛ ⁽	EPH: 2 x J L VOC: 3x40n				0 ml hdpe,	
			_	_		VOC: 3x40n VPH: 3x40n					0 ml hdpe HNO, 00ml hdpe, ice
SAMPLE	BY: 126	SIGNAT	URE: Ma			TOC: 2 x 40					oom nupe, ice ic acetate/NaOH
						Dislyd Gas:					liter hdpe, H,SO,
RECORDI	ED BY: LAL	SIGNAT	URE: Arch	x		(15 glass)			(6 hdpc)	3, 1.4 (100. 1	ntor negro, xizo oz
Time	Wir Dpth	Pump	Purge Rate	Cumulative	Water	Specific	pH	ORP/Eh	D.O.	Turbidity	COMMENTS
(24 hr)	below MP	Setting (Hz)	(ml/min)	Volume Purged	Temp (Celsius)	Conductance		(mV)	mg/L	NTUs	
0954	Z4.18	111,2	MINIMAL	raigea	15,86	157	5.37	193.9	10.01	6,27	1055 F (01)
1007	29.18	155.1	12 =		20,02	156	4.81	312.0	8,69	5.14	EACHFLUSHIN
1009	24.15	110,5	300		20.27	156	261	374.Z	8.59	2.14	
1012	24,15	110.5	,	2611	20,08	154	4,55	395.8	8.38	1,00	FLOW MARCHON DISTANT
1019	24.15	110.5	300		17.16	153	3.74	157.1	8.56	212	
1022	24,15	110.5	300		17.98	152	3.90	466.7	8.44	0.94	
1025	74.15										BELLENDERS (CRIN)
1037	24.15	112,3	800		17.10	153	9105	511,3	9,33	1,18	
1040	29,15	112.3	800	4616	16.73	154	3.83	522.9	9,35	0,51	
1093	Z4,15	1123	700		16.93	154	3,77	532.8	9,29	0.77	
1016	74.16	112.3	900		16,99	154	3.78	537,9	9,20	0.97	
1099	24.16	112.3	600		17.10	153	3,89	592,0	9,03	0.61	
1057	24.16	112.3	2450		1765	153	3,95	544,0	8.85	0.78	
1/50-											
<u></u>											
	<u> </u>										
ļ					<u></u>				-		
					<u> </u>				<u> </u>		
SAMPLE'	l'AKEN AT:	1832			+1-3%	+/- 3%	+/- 0.1 unit	t +/- 10 mV	+/-10%	4/-10%	

YSI#: 00 D0698 NOTES:

TURBIDITY#: 39574

PUMP - Grundfos Rediflow II

U.S.ARMY CORPS of ENGINEERS

YSI 600XL MULTIPARAMETER METER CALIBRATION LOG

SERIAL NO. DODOL94

SITE NAME: DEVENS ADC 32/13A

DATE: 13 June 2005

MODEL NO. (,00×1M

DECAL NO.

	calibration standard value	pre-calibration reading	post calbration reading	PM Check			initials	remarks
Lell od	na	99.4	લુલ .6	100.4	saturated sponge		FAK	bar. press. 79,8"=754.9mm
рH	7.00	6.57	7,00	6.97	lot# 4,597	exp 7.28.04		PM= 29.7"
pH	4.00	4.07	4,00	1	lot # 409.8	exp 9./8.05		
COND_uS/cm	000/	1006	a001	995	101# 4885	exp 4.16.06		,
REDOX mV	221,760	224.8	227.5	Z15.50	101 # 04C4958	exp 4.06	<u> </u>	• •
TEMP °C	27.5	па	na	33.4			\mathcal{V}_{-}	

SERIAL NO. 000 0698

SITE NAME: DEVENS ACC 32 /43A

MODEL NO. 600 XUM

DATE: 15 JUNE 2005

DECAL NO.

,	calibration standard value	pre-calibration reading	post calbration reading	PM Check	calibration standa	ard lot # and exp	initials	remarks
DO BAR	па	98,7	98.9	49.7	saturated sponge		PY	bar. press. 29,6 = 75% 84 mm/E
рН	7.00	7.68	7.01	7.01	101# 4557	exp 7-28-06	-	bar. press. 29,6"= 75% 84m m/64
pH	4.00	4.07	4,00	3.85	lot# 4098	exp 8-18-05		PRIOR TO PAN BACKCAL.
COND u\$/cm	cr00 /	978	000 f	1017	lot # 4885	exp 4-16-06		PM = 29.6" = 751.84 MM
REDOX mV	239184	244,0	240.0		lot#Eycus58	ехр <i>4.06</i>		
TEMP °C	18.2	na	na	13.2	23 9.84			

U.S.ARMY	CORPS of	ENGINEERS
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YSI 600XL MULTIPARAMETER METER CALIBRATION LOG

SERIAL NO. 9860508

DATE: 13 June 2005

MODEL NO. LOOXLM

DECAL NO.

	calibration standard value	pre-calibration reading	post calbration reading	PM Check	calibration standar	calibration standard lot # and exp		lials	remarks
DO HAY	па	P.101	99.6	98.1	saturated sponge		7	りと	bar. press. 29.8" = 756.9mm
<u>pH</u>	7.00	7.04	7.00	6.95	lot #4597	exp 7-28.0L		1	44= 29.7
pΗ	4.00	4.08	4,00	3,99	lot # 4098	exp 8.18.45	- 7		
COND uS/cm	/0000	<u> </u>	999	1019	lot # 4885	exp 4-16-06	7		
REDOX mV	227.75/00	231.5	227.4	235,50	101 #04 C4958	exp 4.06		1	
TEMP °C	27.5	na	na	34.2			W		

SERIAL NO. 980008

SITE NAME: DEVENS AUC 32/43A

MODEL NO. 600 XCM

DATE: 15 JUNE 2005

DECAL NO.

	calibration standard value	pre-calibration reading	post calbration reading	PM Check	calibration standa	rd lot # and exp	initials	remarks
- 사실 O O	na	102,6	98.9	104.3	saturated sponge		PY	bar. press. 29,6"= 75%,84mm
рН	7.00	7,78	7,00	7,02	lot# 4597	exp 7-28-06		PM = 29.6" = 751.81 MA
рН	4.00	3.94	4,00	3.96	101# 4698	exp&-/8-05		
COND uS/cm	1000	1016	999	1002	lot # 4885	ехр <i>9-16-01</i> -		
REDOX mV	235181	245.6	236. f	244.4	101#0424958	ехр 4:06		
TEMP °C	18,7	na	na	13.2	237,84			

U.S.ARMY CORPS of ENGINEERS

YSI-699XL MULTIPARAMETER METER CALIBRATION LOG

St.

SERIAL NO. OSE 2392

SITE NAME: DOURS AOC 32/43A

MODEL NO. 600R

DATE: 13 June 2005

DECAL NO.

	calibration standard value	pre-calibration reading	post calbration reading	PM Check	calibration standa	calibration standard lot # and exp		remarks
DO 品品	na ^c \	54°C	299.6	93.9	saturated sponge		コルト	bar, press, 29.8°=756,9mm
рН	7.00	7.16	6.99	6.39	lot#4597	exp7-28-04		PM = 29, 7"
Н	4.00	4.13	4.00		lot # 4098	exp \$.18.05		
COND 49/cm	-No Cm	duction ty	hobe Press	1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-	lot#	ехр —		NOTICED IN AM.
REDOX mV	221.75	229.7	221.7	2/7.10	10t#04C4958	exp 4.04		
TEMP °C	27.5	na	na	33.6				

SERIAL NO. 0/1085/

SITE NAME: DEVENS AC 32/43/

MODEL NO. 600 XCM

DATE: 215 AS JUNE 2005

DECAL NO.

	calibration standard value	pre-calibration reading	post calbration reading	PM Check	calibration standa	urd lot # and exp	initials	remarks
DO mg/Z	na	97,1	18,9	98,1	saturated sponge		Py	bar, press. 24,6 : 751,84 mm
lpH	7.00	7,10	7.00	7,15	lot # 4597	exp ን- ₂₋₆ - ወይ		PM= 29,6"= 751.84 MM
ا-ارم	4.00	4.13	И,00	4.03	lot # 4078	exp 8-18-05		
COND_uS/cm	7000	940	030	1013	lot # 4385	өхр 4-16-06		
REDOX mV	239.84	231.0	239,2	295,4	lot #04 c4958	ехр 4.06		
TEMP °C	18.7	па	na	13,2	239,84			

U.S.ARMY CORPS of ENGINEERS

YSI 600XL MULTIPARAMETER METER CALIBRATION LOG

SERIAL NO. DIJ 085 /

SITE NAME: South-Post-Impact Area

MODEL NO. 6 PXLM

DATE: 29-Oct-03-14 Jine 2005

DECAL NO.

1	calibration standard value	pre-calibration reading	post calbration reading	PM Check	calibration standar	calibration standard lot # and exp		remarks
DO mg/L	na	101.1	98,9	97.0	saturated sponge			bar. press. 757-92
рН	7.00	7,07	7,00	7.02	lot # 4597	exp 7.28.06		= 29.6" = 751.8mm
рН	4.00	3,44	٧,60	3.95	101#4098	exp 8./8.05		Pm: 27.6' = 751.8 mm
COND uS/cm	1000	1012	1000	1056	lot# 4885	exp 4،۱۴۰ مړ		
REDOX mV	24660	321.0	240.6	297.50	101# 04 C4958	exp 4, ac		
TEMP °C	13.0	na	na	14.9				

SERIAL NO. 986,0508

SITE NAME: South Post Impact Area

MODEL NO. GOOXEM

DATE: 30-Oct-83. 16 Jine 2005 DECAL NO.

	calibration standard value	pre-calibration reading	post calbration reading	PM Check	calibration standard lot # and exp	initials	remarks
DO migit	na	102.2	98.9	99.9	saturated sponge		bar. press. < 24.6" = 151,8mm
pH	7.00	6,92	7,00	6.95	lot#5 exp		PM = 29.6" = 751.8 MM
рН	4.00	3,47	4,00	3.90	lot# exp		
COND uS/cm	1000	1021	1000	1033	lot# & exp		
REDOX mV	246.600	241.5	246.7	251,60	lot# Ex6		
TEMP °C	<u>13. a</u>	na	na	15.0	100		

booxlm 16June 2005 98.7 6.97 3 92 98.9 101,0 7.00 6.97 1000 945 241.70149 1000 1132 546.005 246.60 747.8

bar press = 29.6 = 751.8 mm pm. 29.6 = 751.8 mm

U. S. Army Corps of Engineers

FIELD INSTRUMENT CALIBRATION LOG

INSTRUMENT N	AME: HF SELEN	titic DRT-15CE		MODEL NO.:		
SERIAL NO.:(508/16	. DECAL N	10,;	_ Devers Acc	32/437	
CALIBRATION DATE	INITIAL READING	PROCEDURE	FINAL READING	SIGNATURE	COMMENTS	
6/13	0.16	0.02 510	0,02	All	0.03 Backcolification (1B)	
6/13	10.02	10.00 510	10,00	Me	9.88 backcalibration (B)	
6/15	0./3	0.02 510	0,02	ARL	-0,04 BACKCALIBEATION (AG)	
1/15	10.67	10.00 500	10.00	ARL	10.03 BACKERLIBRATIN (AG)	
6/16	-0.00	6.00 STOL+41005	(0.00	P.Bh		sicile Vergioni) Secolt d
		,			10.10 Breken (Ac)	,,,,,,,
			•			
			•			
		. Ne				
-						
			. 41			

U. S. Army Corps of Engineers

FIELD INSTRUMENT CALIBRATION LOG

INSTRUMENT NA	AME: D- HF	Scientific DET-	15ce	MODEL NO.:	
SERIAL NO.: 3	9576		10.:	- Devers A	OC 32/43A
CALIBRATION DATE	INITIAL READING	PROCEDURE	FINAL READING	SIGNATURĘ	COMMENTS
6/13	-0,25	0.02 STD.	0,02	Aru-	Backeal -0.06 (and 11.0)
6/13	10.46	10,00570	10.00	Alex	3 aducal 11.0 PB
6/15	0.04	0.02 550	0,02	ARC	0.03 BRUCAUSERMON (AG)
6/15	10.20	10.00570	10,00	ARL	9,88 Brenerussams (20)
6/16	-0.04	0.02 570 64 41008	0.02	P. Blume	0.10 BACKER (FE)
6/16	10,14	10,00 570 LA 1005	10.01	f.BL	9.97 BACKER (TC)
			·	,	

U. S. Army Corps of Engineers

FIELD INSTRUMENT CALIBRATION LOG

INSTRUMENT NA	AME: HF Sci	entitle DRT-150	<u>, E</u>	MODEL NO.:	
SERIAL NO.:	910290	•	40.:	_ Devens Aoo	32/43A
CALIBRATION DATE	INITIAL READING	PROCEDURE	FINAL READING	SIGNATURE	COMMENTS
6/13	-0.02	0.02 500	0.02	ALL	0.04 Backalis (PB)
6/13	10.18	10.00 573	./0,00	ML 11.8	11.8 Backeal (Pb)
6/15	0.07	0.02 510	0.07	ARL	0.02 BACKENSELTTON (NG)
6/15-	10.06	10.00	10.00	All	10:13 BACKEAUSEATION (AF
6[16	-0,06	0.02 300 41008	10.01	P. BZ=	0.07 BALKER (DE)
6/16	10.30	6.012005	(0.01	P.BL	10.06 BAKKER (IE)
			-		
		· 154			
				,	

- NOTE - SUPPLIED BOTTLE IS DIRTY - USING A USACE SPARE

Appendix C

Groundwater Sampling Log Sheets October 2005

GWM well #: SHL-15 Page 1 of 2

SCREENED INTERVAL DEPTH: 15.0 to 25.0 ft below top of PVC

H20 LEVEL: PRE-PUMP INSERTION

POST-PUMP INSERTION 372 19.98 700

DATE: 10/3/1005 TIME: 11:00 per SAMPLE DEPTH 3: 1/2

SAMPLED BY: GIN SIGNATURE: July

RECORDED BY: W SIGNATURE:

US Army Corps of Engineers Groundwater Sampling Log Sheet

Project Name: Devens Area 32

SAMPLE METHOD: EPA LOW STRESS METHOD

Total Metals: 1 x 500 ml hdpe, HNO₃

EPH: 2 x 1 L glass amber, HCl VOC: 3 x 40 ml vial, HCI

VPH: 3 x 40 ml vial, HCl

SAMPLER: CEAN WALSH

			-		· \	MULLER	· > 5 CAR	10 11 to 12	ļ		
Time (24 hr)	Wtr Dpth below MP (feet)	Pump Setting (Hz)	Purge Rate (ml/min)	Cumulative . Volume Purged	Water Temp (Celsius)	Specific Conductance (µS/cm)	pH	ORPÆh (mV)	D.O. (mg/L)	Turbidity (NTUs)	COMMENTS
1219	20.05	98.5	λ30		15.65	195	3-88	344	1,8	4.59	
12/8	20.05	98.5	学 25t	_	16.08	185	D.60	324	L_24	4.12	
1821	20.05	98.5	280		16.37	183	3.62	298.4	_	3,95	
12.24	10.04	98.5	280		16,49	183	3_61	2845	1.04	456401	
1227	20.05	98.5	230		16 52	183	3_61	260.1	0.97	4-19	
1230	20.05	98.5 .	250		16.52	183	3-61	251-6	0.93	4.17	
19.33	20.05	ସ୍ଥି-5	250		16.47.	184	3.57	<u> 241.8</u>	0.88	4.3	
1236	20.05	98.5	230		16-52	184	3.డ్డు	236-1	0.86	4.28	
1239	2005	48.5	250		16.56	184	3.62	239.5	0.85	4-5	
1241	20.05	98.5	280		16-7	184	3.65	218.7	0.86	4	
12.44	20.05	98.5	250	<u> </u>	16.91	184	3.72	259.6	53.0	3.45	
1247	20.03	98.5	2 <i>.0</i> ∂		17.38	183	3.78	284.9	0.92	3.05	
12.50	70.01	98.5	200	****	17.82	185	సే.శ్రి ।	310,4	0.86	2.79	
253	20-11	103	900		16.00	183	3-53	3449	0.87	2.72	
1256	20.16	103	1260		13,91	ধ্রেই	3.01	356.7	0.99	2	
1259	20,09	985	400	4921	13.94	182	2,89	371.4	0.99	1.7-5	
1302	20.08	98-5	400	3	14,912	182	2.99	399_4	1.02	1-52	
1305	20,0%	98.5	400		15.69	182	3.34	3 <i>85</i> .9	1	1.43	
1500	20-06	98.5	100		15.96	(82-	3.5Ŝ	391.5	0.95	1.52	

SAMPLE TAKEN AT:

+/- 3%

+/- 3%

+/- 0.1 unit +/- 10 mV

+/-10%

+/-10%

ł	well#: S			2 of 2 below top of	covo.	US Army Corps of Engineers								
SUKEENI	ED INTERVA	L DEPTH:	ĮĮ.	below top (M P V C	Groundwater Sampling Log Sheet								
H20 LEVI	EL: PRE-PUM	IP INSERTIC	N			Project Name: Devens Area 32								
						SAMPLE METHOD: EPA LOW STRESS METHOD								
	POST-PU	JMP INSERT	ION	d the state of the		Total Metals: 1 x 500 ml hdpe, HNO ₃								
ŀ	TU				4	EPH: 2 x 1 L glass amber, HCl VOC: 3 x 40 ml vial, HCl								
l	DBY: GN		7, 1		il (VPH: 3 x 40 r								
RECORD	ED BY: <u>SW</u>	SIGNAT	URE:	- Wiln	ı	SAMPLER:	SEAN L	VALSH						
Time (24 hr)	Wtr Dpth below MP (feet)	Pump Setting (Hz)	Purge Rate (ml/min)	Cumulative Volume Purged	Water Temp (Celsius)	Specific Conductance (µS/cm)	pHq	ORPÆh (mV)	D.O. (mg/L)	Turbidity (NIUs)	COMMENTS			
1312	20.06	48.5	400		15.99	1831	3.64	418.6	0.93	1-35				
1315	20.06	48.5	400		15,95	182	3_5	437.6	0.92	1-27-				
1319	20.06	18.5	400		15-93	182	3_34	460_5	0.94	1-22				
1321	20.06	98.5	400		15.93	182	3.27	471.3	0_94	1_11_				
1324	20.07	98-5	400		15.96	182	5-12	4-98-4	O.95	1-14				
1327	20-07	48.5	375	-	15-94	182	5.10	509.	0.94	0.95				
1330	2.6.07	98,5	375		(5.92	182	5.21	516.9	0.95	1-2				
1333	20.07	98.8	375		15-64	181	3-15	<u>531,4</u>	0.96	0.8				
1336	20,07	98.5	37.5	2500	15,65	182	3.09	540	0.97	0.75				
			<u> </u>	 										
					<u> </u>		<u> </u>	······································			THE STREET STREET			
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	<u> </u>	<u> </u>	<u> </u>						 		<u> </u>			
							-				### ### ##############################			
		1												
	<u> </u>			<u> </u>										
SAMPLE	TAKEN AT:	1340		I.	+/- 3%	+/- 3%	+/- 0.1 unit	+/- 10 mV	+/-10%	+/-10%	And the second s			
YSI#: NOTES:	THE PROPERTY OF THE PROPERTY O	ininka (1) kilogi (191 7) ka ataun 1919 mattaa (191 6) kilogi (1916)	TURI	BIDITY#:	na a na k itadia dia 2018–2018–27 arawa a aka masa ka ma na anta	PUMP – G	rundfos Rec	liflow II			nesten er en			

GWM well #: 32M-92-01X US Army Corps of Engineers SCREENED INTERVAL DEPTH: 13.7 - 23.7 ft below top of PVC Groundwater Sampling Log Sheet Project Name: Devens Area 32 H20 LEVEL: PRE-PUMP INSERTION SAMPLE METHOD: EPA LOW STRESS METHOD POST-PUMP INSERTION 19.81 ++ Total Metals: 1 x 500 ml hdpe, HNO₃ DATE: 30ct '05 TIME: 0955 SAMPLE DEPTH 22.0 A EPH: 2 x 1 L glass amber, HCl VOC: 3 x 40 ml vial, HCl SAMPLED BY: REL SIGNATURE: METERS Lyd VPH: 3 x 40 ml vial. HCl RECORDED BY: REL SIGNATURE: KELLIL SAMPLER: BEN LOYD Time Wtr Dpth Pump Purge Rate Cumulative Water Specific ρH ORP/Eh D.O. Turbidity COMMENTS (24 hr) below MP Setting (ml/min) Volume Temp Conductance (mg/L)(NTUs) (mV)(feet) (Hz) (uS/cm) Purged (Celsius) 038 95.1 7.14 5.0 20.51 460 15.38 4.83 419,7 15G 1041 98.1 G1.59 20.55 320 15.96 15.1 4.71 446,7 5.0 520 1045 20,61 -18=1 16.12 98.1 473.6 6.47 150 46% 50 1048 320 20,66 16.17 491.5 98,1 150 6.05 4.72 6.0 320 1051 20.66 98.1 16,29 505.7 154 4.73 5,50 ~25al 6.9 4.67 20,56 156 517.6 1054 98.1 320 16.26 5,0% C.9 98.1 320 61 5281 1057 20.66 16,31 4.64 4.44 6.9 20.66 98.I 16.33 166 320 ~ 3gal 536.4 1100 4.59 4.14 7,0 98,1 1163 6,55 547.3 20 66 320 169 7 49 3,79 70 320 1106. 20,66 98.1 4.43 16.42 347 556.4 173 30,66 921 1100 320 w4 201 445 5,6 16,42 3 1x 120 568.7 1112 26,66 121 92, 431 16.47 574,5 <u> 2.63</u> 5.7 1115 20,66 98.1 16.49 181 4.37 320 579,7 2,90 5.5 16,59 1118 20.66 220 2,77 98.1 443 5,0. 1957 L85.4 742 1/21 20.66 98.1 310 ~5 mail 16,62 136 5295 2.75 49 SAMPLE TAKEN AT: 4/- 3% +/- 3% +/- 0.1 unit +/- 10 mV +/-10% +/-10% YSI#: TURBIDITY #: PUMP - Grundfos Rediflow II

NOTES:

GWM well #: 32Z-99-02X (PIEZOMETE) SCREENED INTERVAL DEPTH: 14.5-29.5 ft below top H20 LEVEL: PRE-PUMP INSERTION \$\frac{\tilde{6}}{6}.60\frac{\tilde{f}^{\tilde{f}}}{6}		US Army Corps of Engineers Groundwater Sampling Log Sheet Project Name: Devens Area 32 SAMPLE METHOD: EPA LOW STRESS METHOD								
POST PERPINSERTION DATE: 50ct 05 TIME: SAMPLE DEPTH SAMPLED BY: SIGNATURE: RECORDED BY: SIGNATURE:		Total Metals: 1 x 500 ml hdpe, HNO ₃ EPH: 2 x 1 L glass amber, HCl VOC: 3 x 40 ml vial, HCl VPH: 3 x 40 ml vial, HCl								
Time Wtr Dpth Pump Purge Rate Cumulative (24 hr) below MP Setting (ml/min) Volume (feet) (Hz) Purged	Water Temp (Celsius)	Specific Conductance (µS/cm)	pН	ORP/Eh (mV)	D.O. (mg/L)	Turbidity (NTUs)	COMMENTS			
Attended to sample with a draw any flow. Water level >20° of head.	peris Lis	teltie low - p	simp e-is1	(west)	5 1" d 3+ cs	iam), pable	Corld not of penping			
NO SAMPLE - DAR										
Pump USIED - 1500 150 (4	5 Enviro	mental !	leuta!	# Z∞C	0 20;	<u>)</u>				
AMPLE TAKEN AT: +/- 3% +/- 0.1 unit +/- 10 mV +/-10% +/-10%										

None:	GWM well #: 32M-01-13XBR SCREENED INTERVAL DEPTH: 13.7 – 23.7 ft below top of PVC							US Army Corps of Engineers Groundwater Sampling Log Sheet						
	H20 LEVE		IP INSERTIC	***************************************			Project Name: Devens Area 32 SAMPLE METHOD: EPA LOW STRESS METHOD							
,	SAMPLE	<u>oct '05</u> ti dby:	JMP INSERT ME: SIGNAT SIGNAT	SAMPL	E DEPTH_Z	2.01	Total Metals: 1 x 500 ml hdpe, HNO ₃ EPH: 2 x 1 L glass amber, HCl VOC: 3 x 40 ml vial, HCl VPH: 3 x 40 ml vial, HCl							
r	Time (24 hr)	Wir Dpth below MP (feet)	Pump Setting (Hz)	Purge Rate (ml/min)	Cumulative Volume Purged	Water Temp (Celsius)	Specific Conductance (µS/cm)	Hq	ORP/Eh (mV)	D.O. (mg/L)	Turbidity (NTUs)	COMMENTS		
	1500	20.2/	100.5	160		17.17	490	6.66	191.4	3.70				
	1503 1506	20.32	100.5	160 80	N/Z gelly	17.18	488 485	6.59	226.0	3.65	7111			
	1509	20.38	101.8	~40	2 C 35164	18.42	483	6.55	244.5	3.67	20,6			
	1512	₹0.43	112.7	~30		19.16	484	6.56	257.2	3.53	17.1			
	1515	20.42	112.7	×20		19.75		6.57	266.2	3.50	13.5			
MIN	61518 EVENT	20.59	145.0	200		20.41	481	6.58	275.5	3,32	12.9			
m111	1530	21.27	1515	120	the I galler	24.96	499 499	6.66	281.8	4,24 3.96	8.1			
12/5/05	by white	<u> </u>	14212	. 20	n garan	24.25	779	6.65	22017	3.76				
	1095.	21,50	110.5	~ 405		17,20	557	6,27	-27,8	4.97	2.10			
ļ	1651	22,00	112.5	4320 ⁰		17,47	535	6.24	-26,9	4/20	,	Well purged before the		
		751; C	45 86 g							200				
, ,					A									

	SAMPLET	TAKEN AT:_	1000	_		+/- 3%	+/- 3%	+/- 0.1 unit	+/- 10 mV	+/-10%	+/-10%			
	YSI#: (ackflush	E (I.N.)		IDITY#: 7	24	PUMP – Gr			5 -6.	i	10 . 2		
	\$*** # 276-1991	mentally)	617-4	I ram NEW	<u>arepped</u>	<u> </u>	0/5/05-		<u>M.EG Pa</u> > to 19.7		H20 kg =	11.18		

		vell #: 32				St. William. To June	US Army Corps of Engineers							
1	SCREENE	. DEPTH: 34	1	Groundwater Sampling Log Sheet										
	120 LEVEL. PRE-POMP INSERTION 87533 144.50							Project Name: Devens Area 32 SAMPLE METHOD: EPA LOW STRESS METHOD						
	DATE: 30	MP INSERT 11E: <u>092</u> 5	Bottom of Well	Total Metals: 1 x 500 ml hdpe, HNO ₃ EPH: 2 x 1 L glass amber, HCl VOC: 3 x 40 ml vial, HCl			ECOO INE	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	The second secon					
	SAMPLED	BY:	SIGNAT		VPH: 3 x 40 n									
	RECORDE	ED BY:	SIGNATI	!										
,	Time (24 hr)	Wtr Dpth below MP (feet)	Pump Setting (Hz)	Purge Rate (ml/min)	Cumulative Volume Purged	Water Temp (Celsius)	Specific Conductance (µS/cm)	pН	ORP/Eh (mV)	D.O. (mg/L)	Turbidity (NTUs)	COMMENTS		
0/4	1028	42.13	1385	320		12,68	692	<u>(51,2)</u>	3025	7,17	412			
ľ	<u> 1031</u>	42.45	140.1	320		13,00		G:23	306.9	- 241	389	*		
	1034	12,56	190,1	200		1394	c.97	6,26	316-3	7,52	266			
				<u></u>			100000000000000000000000000000000000000							
	 		 	and substitution of the su										
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	· · · · · · · · · · · · · · · · · · ·									: 1/3 Options to COMPAND Apparament				
ţ	SAMPLE	TAKEN AT:			L	+/- 3%	+/- 3%	+/- 0.1 unit	/- 10 mV	+/-10%	+/-10%	1		
	YSI#: NOTES:	ing and the second	AND THE REAL PROPERTY OF THE PARTY OF THE PA		BIDITY #:	6	PUMP – Gr				***************************************	MANAGARAN AND AND AND AND AND AND AND AND AND A		
	- Set	pump @	4\$.8°+,	Pump wat	n down to	增多	sex @ 39.0	6	į					
	· Wa	G @ 23,	5 when t	tarting 1	(umping	, fomp re-	sex @ 39.0	itt for s	ampling	1	:	had taken for milder		

	GWM v	vell #: 32	2NI-01-14	XOB	······································		US Army Corps of Engineers							
	SCREENE	D INTERVA	L DEPTH: 19	9-29 ft be	low top of I	PVC	Groundwater Sampling Log Sheet							
	H20 LEVE	L: PRE-PUM	P INSERTIO	N 25.	89 (to	top of)	Project Name: Devens Area 32							
				_			SAMPLE METHOD: EPA LOW STRESS METHOD							
ţ			MP INSERT				Total Metals: 1 x 500 ml hdpe, HNO ₃ EPH: 2 x 1 L glass amber, HCl							
i ;	DATE: 3	<u>Oct '05'</u> TII	ME: <u>093,</u>	SAMPLI	e depth <u>2</u>	8.0 ft								
i i	SAMPLED	BY:	_ SIGNAT	URE:			VOC: 3 x 40 ml vial, HCl VPH: 3 x 40 ml vial, HCl							
:	RECORDE	D BY:	SIGNATU	JRE:										
	Time (24 hr)	Wir Dpth below MP (feet)	Pump Setting (Hz)	Purge Rate (ml/min)	Cumulative Volume Purged	Water Temp (Celsius)	Specific Conductance (µS/cm)	pН	ORP/Eh (mV)	D.O. (mg/L)	Turbidity (NTUs)	COMMENTS		
10/4	0931	J Q 85	114.10	203		20,44		5,48	314.6	8,79	9,2	J. K. T. Value		
		27,03	113,10	320		[9.76]	2	5.46		8.75	E. 07	15 15 Not 2013		
		23.00	[60,2D	320		<u> 1995</u>	2	2.4	<u> 760 </u>			Dection		
	1013	27.06	19030			16,36	<u> 321</u>	5,97	<u> 105 </u>	397	_ <u>23, </u>	- fixed Tuniue, suser		
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. [SAMPLE 1	TAKEN AT:				+/- 3%	+/- 3%	42-0 1 unit	+/- 10 mV	+/-10%	4/_1004			
;														
*	YSI#:			TURE	NDITY#:		PUMP – Gr	undfos Red	liflow II					
	* V	Vall Pm	uperal at	~ 29.5	のよりない、	· Lest wi	Her (cone)	at 266:) _					
		, Po	imped L 1	-gallin		í						pump to 28.7'		
	~ /	of 4 Wate	en lovel =	`25.88	, 'San	oplas to	hen w/	311-4 31	onilts	B.EU	lowered	pump to 28.7		
							,				U ACA	r.*		

GWM well #: 32M-01-15XBR Sheet of I	US Army Corps of Engineers
SCREENED INTERVAL DEPTH: 34.5 – 44,5 ft below top of PVC	Groundwater Sampling Log Sheet
H20 LEVEL: PRE-PUMP INSERTION 22-69	Project Name: Devens Area 32
V .	SAMPLE METHOD: EPA LOW STRESS METHOD
POST-PUMP INSERTION	Total Metals: 1 x 500 ml hdpe, HNO₃
DATE: 1014/05 TIME: 1030 SAMPLE DEPTH 464	EPH: 2 x 1 L glass amber, HCl
	VOC: 3 x 40 ml vial, HCl VPH: 3 x 40 ml vial, HCl
SAMPLED BY: SIGNATURE:	Vrn. 5 x 40 mi viai, rici
RECORDED BY: SIGNATURE:	SAMPLER: FORREST KNOWLES
Time Wir Dpth Pump Purge Rate Cumulative Water	Specific pil ORP/Eh D.O. Turbidity COMMENTS
(24 hr) below MP Setting (ml/min) Volume Temp	Conductance (mV) (mg/L) (NTUs)
(feet) (Hz) Purged (Celsius) 1038 Pump 12387720 -	(µS/cm)
1044 21.60	
1050 21.75 Startown	
1653 82,40	Blockdetwo
1055 82:65 106:7	
1100 23.03 199.6 25.6 19.77	642 1018 2829 6.56 18,3
1105 23.25 109.3 50.0 80.50	
1117 23,52 152.5 21.93	
1122 23.62 21.89	
1/30 23:78	636 6.89 331 5.44 8.4
1135 24.05 166 20.69	
1138 24.38 166 19.27	
1141 24,66 [8,9] 1144 34.77 [9-3]	
1150 25.30 19.3	
1155 25.58	
1200 25.70 20.2	
12 -	
SAMPLE TAKEN AT: 1205 +/- 3%	+/- 3% +/- 0.1 unit +/- 10 mV +/-10% +/-10%
YS1#: TURBIDITY #:	PUMP – Grundfos Rediflow II
MOTES	

Promp is covitaling had to surge famp vertically

	GWM ·	well #: 32	2M-01-16	XBR			US Army Corps of Engineers						
		ED INTERVA			t below top	of PVC	Groundwater Sampling Log Sheet						
		EL: PRE-PUM			5.72-6	4	Project Name: Devens Area 32 SAMPLE METHOD: EPA LOW STRESS METHOD						
	DATE:	POST-PL	MP INSERT	ion <u>3</u> 0	9 10 0 ft	76 an	Total Metals: EPH: 2 x 1 L	1 x 500 ml	hdpe, HNO ₃	, , , , , , , , , , , , , , , , , , ,		Man make man make the man man man man man make the man	
	SAMPLE	BY: Last	SIGNAT	URE: 灯 🍃	mars Alle	and a South	VOC: 3 x 40 t VPH: 3 x 40 t	nl vial, HC	1				
		ED BY:	·					FOREST					
	Time (24 hr)	Wtr Dpth below MP (feet)	Pump Setting (Hz)	Purge Rate (ml/min)	Cumulative Volume Purged	Water Temp (Celsius)	Specific Conductance (µS/cm)	p₩	ORP/Eh (mV)	D.O. (mg/L)	Turbidity (NTUs)	COMMENTS	
	155	28472	1140	400		14.93	388	627	45,8	17,51		Stafreg Dung	
	200	37.90		4,00		V V			<u> </u>		5784		
	205	21.05	1190	400		17.34	415	5.27	= 2°0	7.24	3,00		
	215	26.07	1140	400 400	390	17.39	426	5.84	= 4.0	7-14	2,90		
	220	26,15	1/40	1/00	3/5gal	18,28	432	5.80	20	6.82 6.83	<u> </u>		
	Zal	0(61/2	11 (10)	ed Our	7-12	101013	Cello	11 18/ News	<u> 29</u>	التو القدر ف	2 : 80	; 	
	230	26.14	Stopp 11510	400	5.0	10,49	428		230	-7 5-7 6	3-20		
	23.3	26.16	1150	350	.3.0	1725	462	5.86	~30	3,70 3,99	2,50	WHITE AND THE STATE OF THE STAT	
	243	26.15	103.8	356		19,75	472	5.81	72-70 818	7.38	1.53	·	
	247	26,15	1/3.8	350	<u> </u>	18,93	476	5.94	<u> </u>	4.38	1, 40		
	256	26.14	1/9.8	930	\$100	18,82		45°, 68	9,9	4,45			
Lord	300	A Gold	113,8	350	8º Goden	18.23	492	5.81	16	4.58	0.75	7	
- Coracto			المناسبة الم		7		V G F						
						······································							
	SAMPLE	TAKÉNAT:	odery.	gfnp	H, on	OSR a	4-3% very	F- 0.1 unit	#/- 10 mV	+/-10%	+/-10%	A Mary grant and a state of the	
	YSI#:	h6142	tot _{var} agemente et sitti til stop en een propositististen. Ma	TURE	BIDITY#:		PUMP – Gri	undfos Rec	liflow H		······································		

NOTES: 068143

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GWM well #: 32M-01-17XBR US Army Corps of Engineers SCREENED INTERVAL DEPTH: 41.4 - 51.4 ft below top of PVC Groundwater Sampling Log Sheet Devens Area 32 Project Name: bollow=51.15 H20 LEVEL: PRE-PUMP INSERTION SAMPLE METHOD: EPA LOW STRESS METHOD POST-PUMP INSERTION 45,60 27.66 Total Metals: 1 x 500 ml hdpe, HNO₃ DATE: 10/9/05 TIME: 1316 SAMPLE DEPTH 45.0 EPH: 2 x 1 L glass amber, HCl VOC: 3 x 40 ml vial, HCl SAMPLED BY: RBL SIGNATURE: New VPH: 3 x 40 ml vial, HCl RECORDED BY: REL SIGNATURE: STAR BEN LOYD SAMPLER! COMMENTS ORP/Eh Turbidity Time Wtr Doth Pump Purge Rate Cumulative Water Specific pHD.O. below MP Selting (ml/min) Volume Temp Conductance (mV) (mg/L)(NTUs) (24 hr) (Celsius) (uS/cm) (feet) (Hz) Purged 5.09 396. 255 2G0 15.09 512 3.6. 114.0 **B**2 27.17 260 5,24 421,3 22 1324 15.07 1.7 27.17 114.5 524 260 529 450.9 1.38 27.17 114.5 15.63 462.5 260 114.5 - I 5al 5-30 5,41 0,65 27:12 BO 530 5 42 114.5 2.60 15,56 481.9 1458 0.40 2717 13ろ 27:17 260 5,40 494,7 14.5 530 151 0.39 万ら 2,60 567.3 2717 114.5 15.62 531 539 0.27 1339 ~ 2001 114.5 0.34 260 515.9 42 1502 5134 260 145 2-7/12 14.5 503 534,7 1.40 0.36 1549 15,84 477 0.35 27.17 114.5 20 5.499 1.44 1-36 260 ~ 35ga 565.1 1145 15.82 539 1.42 27.17 442 0.34 151 15.81 580,3 260 1.45 154 114.5 541 0.35 260 运,77 3,97 23.17 14.5 544 5943 1.49 0,33 1400 2717 260 15.70 543 >90 COB 3 1:45 0,35 ~ 4mal 616,9 1,39 15,65 554 7.86 0,54 1403 114.5 260 556 142 260 15.74 284 0.35 140G 1145 760 558 3.97 0,33 27/7 114.5 15.64 627.3 1.45 1409

SAMPLE TAKEN AT: 1410

+/- 3%

+1- 300

+/- 0.1 unit +/- 10 mV

+/-10% +/-10%

YSI#:

.

TURBIDITY #:

PUMP - Grundfos Rediflow II

NOTES:

GWM well #: 32M-01-18XBR US Army Corps of Engineers SCREENED INTERVAL DEPTH: 14.0 - 23.0 ft below top of PVC Groundwater Sampling Log Sheet Project Name: Devens Area 32 19.33' H20 LEVEL: PRE-PUMP INSERTION SAMPLE METHOD: EPA LOW STRESS METHOD POST-PUMP INSERTION 19.26' Total Metals: 1 x 500 ml hdpe, HNO; DATE: 4 Oct '05 TIME: 1047 SAMPLE DEPTH 22.00 FT EPH: 2 x 1 L glass amber, HCl VOC: 3 x 40 ml vial, HCI SAMPLED BY: TIM SIGNATURE: Thomash Manotto VPH: 3 x 40 ml vial, HCl RECORDED BY: TIM SIGNATURE: Thomas & Marsita SAMPLER: TOM MARCOTTE Time Wtr Dpth Pump Puree Rate Cumulative Water Specific рH ORP/Eh D.O. Turbidity COMMENTS (24 hr) below MP Setting (ml/min) Volume Temp Conductance (mV)(mg/L)(NTUs) (feet) (Hz)Purged (Celsius) (µS/cm) 1050 200 19.61 102.9 17.63 5.41 702 578 2.56 4.93 19-45 1056 1100 19.48 143.8 40 20.43 709 5.87 341 2,54 404 1105 19.71 166.7 240 28.49 694 5.88 29.1 2.66 19.65 1108 150.8 20 ++++= 19-20 750,0 1120 19.80 400 672 23.20 163-0 NIO gd 5.91 23.5 2.69 1123 20-10 148.8 160 22,64 677 5.92 21.3 2.97 1126 19.78 164.1 22.66 200 685 5.88 21.9 2.58 4.82 1129 19.83 1631 120 22-13 663 5.77 23,2 3,25 1132 19,98 60 1570 42.0 gal 22,06 662 26.6 5.76 3.60 1135 20.02 164.3 200 22.08 5.76 661 27.7 3,55 19.95 1135 156.9 100 22.31 658 5.75 28.9 3.55 1.45

SAMPLE TAKEN AT: 岩邨 1150

20.09 60.6

20.05

19,94

19,95

162.1

161.6

163.5

TIN

300

120

200

280

+/- 3%

21.45

22.35

22,43

22.52

+/- 3%

655

651

652

651

+/- 0.1 unit +/- 10 mV

31.5

33.6

33,0

33.8

+/-10% +/-10%

0.78

0.93

1.09

0.50

3.65

3.86

3,72

4.29

YSI#: 065862 (I.N.) NOTES:

1141

1145

1148

1151

TURBIDITY #: 39576

13.0 gal

PUMP - Grundfos Rediflow II

5.72

574

5.75

5.76

I Sample time of 1150 was approximate, actually began closer to 1200.

	-			1 PURGING			$\tau \tau_{1,1,5}$	MERBURI	emento.	RCHIM	
Location Well Nu Field F Samplin Identif	on (Site umber 3 Personne. ng Organ y MP	e/Facil: 2 M - Öl cation	ity Name) - <u>I8X8</u> Dai	Devens ce <u>4oc</u>	Днеа 32 F 05		Dept (bel Pump Purg	h to Ow MP) Intake ing Dev	tor at (ft ice; (p	boti below bump type	of screen EOM MP) =)
Clock Time	Water Depth below MF	Pump Dial	Purge Rate	Cum. Volume Purged	Temp.	Spec. Cond.?	рН	ORP/ Eh ¹	DO	Turb- idity	Comments
24 HR	ft		ml/min	liters	°C	μS/cm		mv	mg/L	NTU	
1154	30.00	162.0	120	43.5 gal	22,49	653	5.77	35.4	4.32	0.68	
									-		

EXAMPLE (Minimum

uirements) Page 2 of 2

^{1.} Pump dial setting (for example: hertz, cycles/min, etc). 2. μ Siemens per cm(same as μ mhos/cm)at 25 °C. 3. Oxidation reduction potential (stand in for Eh).

U. S. Army Corps of Engineers

FIELD INSTRUMENT CALIBRATION LOG

INSTRUME	ENT NA	ME: HF Scie	tific DRT 150		MODEL NO.:		
1				10.:			
CALIBRAT DATE		INITIAL READING	PROCEDURE	FINAL READING	SIGNATURE	COMMEN	TS PM CHECKERU
0300	Z005	0.11	0.07 St. L 2+41008 Exp4/010)	0.02	Mr	Turbidimeter SN#608146	
			(0.00 St / be)	9.99	(
		0,03	(see above)	0.02		SNHG08142	
7		994	(coe 2 6000 Std	(0.00		*	
OHOCT.	2005	-0.07	0.02 STD. (SOME ASONE)	0.02	Mayor	SN# USA-US 39576	0.02
		9.92	(0.00 STD.	(0.00			10.0(
		-0.03	0.02 STU/SIRE	0.02		SN# 608142	0.13
		10-00	10.00 STD	10.00		7	10-10
		- 0.05	0.02 STD.	0.62		5144 608 196	0.20
\		(0.03	(0.00 STD U	10.00	A		10.10
0500	125	0.02	0.02 SHI (See above	0.02	1him	SN# 608146	0.18
<u> </u>		10.14	10.00 State) [0.0)		V	10-17

U.S.ARMY CORPS of ENGINEERS

YSI 600XL MULTIPARAMETER METER CALIBRATION LOG

SITE N	AME:	Davers	Area	32
	DATE:	10/4/	05_	·

SERIAL NO. 0/C0979 AA

MODEL NO. 600 × L - 8 - 01

DECAL NO.

	calibration standard value	pre-calibration reading	post calbration reading	PM Check	calibration standa		ini 矣。	tials	remarks
DO %	na	106.7	101,5	96.3	saturated sponge		-	1	bar. press. 30, 7 = 727-2 mm
рН	7.00	7.13	17,01	593	lot#	ехр		1	
pH	4.00	3-95	4.00	3,31	lot #	ехр			
COND uS/cm	1000	917	1000	998	lot#	exp			
REDOX mV	288.114	236.7	238,2	751.1	lot#	exp		r"	
TEMP °C	19,9	na	па	24.62			9		

	SERIAL NO. 79 40320 AA
SITE NAME: DOVONS Areas	MODEL NO. 600 XL-5-0
DATE: 10/4/05	DECAL NO.

	calibration standard value	pre-calibration reading	post calbration reading	PM Check		dard lot # and exp	initials	remarks
DO %	na	102,7	101,6	99.1	saturated sponge	7	Her	bar. press. 30,4"=772.200
pH	7.00	m 7.21	15.96	6.75	lot#	ехр	<i>ii</i>	
рН	4.00	4102	4.01	4,00	lot#	exp		
COND_uS/cm	1009	1024	1000	967	fot#	exp		
REDOX mV	239.00	236.2	239,0	228.9	lot#	ехр		
TEMP °C	19.4	na	na	24.36				

U.S.ARMY CORPS of ENGINEERS

YSI 600XL MULTIPARAMETER METER CALIBRATION LOG

DATE: 10/4/05

SERIAL NO. \$32 - 0055 AC

MODEL NO. 600X(-B-M & DECAL NO.

	calibration standard value	pre-calibration reading	post calbration reading	PM Check	l	n standard lot # and exp	jnij	ials		remarks	
DO %	na	102.4	101.6		saturated s	ponge	Fe	7/C	bar. press.	304 =	7 W. Am
рН	7.00	2.54	7.01	7.70	lot#	ехр		j			
pH .	4.00	4,44	4.00	4.08	lot#	ехр		/			
COND uS/cm	1000	1077	1000	899	lot#	exp	7,	,			
REDOX mV	238,4/	238,3	238,4	228.2	lot#	ехр	I V	/			
TEMP °C	, 19.3	na	na ·	24.2							

DATE: 105 05

SERIAL NO. 9900323 AA

MODEL NO. 600XL

DECAL NO.

	calibration standard value	pre-calibration reading	post calbration reading	PM Check	calibration stands	ard lot # and exp	initials	remarks
DO %	na	108.4	_\01.6	103.7	saturated sponge		潮火	bar. press. = 30,4"= 772.2 ru
рН	7.00	6,98	7.00	<i>5.</i> 77	lot#	ехр	17	
pH	4.00	4,15	٧,٥٥	5.77	lot#	ехр		
COND uS/cm	000	961	C00/	1020	lot#	ехр		
REDOX mV	238,54	238.1	Z38.6	277.8	lot#	ехр	V	
TEMP °C	C19,2	na	na	29,45				

Appendix D

Groundwater Analytical Results Data Evaluation June 2005 &
Groundwater Analytical Results Data Evaluation October 2005

APPENDIX D - Part 1: June 2005

Data Evaluation Report For Devens Areas 32/43A (DRMO/POL Yard) Long Term Monitoring Groundwater Samples Collected June 2005

Introduction

Eighteen groundwater samples were collected from the AOC 32/43A site, Devens, MA on June 13, 15 and 16, 2005. The samples were analyzed at Severn Trent Laboratories in Colchester, VT for volatile organic compounds (VOCs), volatile petroleum hydrocarbons (VPH), dissolved gases, extractable petroleum hydrocarbons (EPH), polychlorinated biphenyls (PCB), alkalinity, nitrate, nitrite, sulfate, sulfide, ammonia, chemical oxygen demand (COD), total organic carbon (TOC), total phosphorus, and total and dissolved arsenic, lead and manganese. See Annual Report Table 4-2 for analytical results.

The results were evaluated for acceptability in accordance with the laboratory's defined acceptance limits, with standard EPA SW846 guidance, guidelines provided in Appendix I "Shell for Analytical Chemistry Requirements" in EM200-1-3, dated February 2001 and/or EM 200-1-10 "Guidance for Evaluating Performance Based Chemical Data Packages".

Sample Shipment and Receipt

All sample coolers were packed with sufficient quantities of ice in the field. The laboratory received sample shipments on June 14, 16 and 17, 2005. All samples were appropriately preserved as stated in Table 1.

Holding Times

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

Volatile Organic Compound (VOC) Analysis

Eighteen groundwater samples were analyzed for VOCs using SW846 Method 8260B. In addition, the laboratory analyzed, one field duplicate (32M-01-DUP, a duplicate of sample 32M-01-18XBR), three trip blanks (dated 6/13/05, 6/15/05 and 6/16/05), and one equipment blank sample (32-43A-EQB, dated 6/16/05).

A peristaltic pump was used to collect the samples from wells 32Z-99-02X and 43M-01-20XBR. It was necessary to use the peristaltic pump instead of the submersible pump due to the small diameter of the well casing at 32Z-99-02X and the slow recharge rate at 43M-01-20XBR. The wells were identified on the data tables as being sampled with the peristaltic pump.

<u>Laboratory Method Blank, Trip Blank and Equipment Blank Results</u>: Target analytes were undetected at levels above the practical quantitation limit (PQL) for method blank, and trip blank samples. The equipment blank sample had detections of chloroform and methylene chloride above

the PQL. There were no detections of either compound in the samples; therefore no data qualification was made due to the equipment blank contamination. The results for 1,2-dichlorobenzene that were within five times the result in the equipment blank sample were qualified as tentatively not detected (UJ) at the reported concentration as a result of the blank contamination. Methylene chloride and chloroform were not detected in any samples other than the equipment blank sample.

<u>Field Duplicate Sample Results</u>: The results of the VOCs for sample 32M-01-18XBR, and its duplicate sample, showed less than 20% relative percent difference (RPD) for all detected compounds.

<u>Surrogate Results</u>: All VOC sample surrogate recoveries were within the laboratory's stated quality control (QC) limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results: One set of MS/MSD samples was analyzed for this project. In both the MS and MSD samples, there was no recovery of the compound 2-chloroethyl vinyl ether. The laboratory report stated that the acid preservative added to the sample might have degraded the compound. Since they are not acid preserved, the acceptable percent of recovery of 2-chloroethyl vinyl ether from the LCS and LCSD further supported this theory. Since all of the samples were preserved with acid in the field and all of the sample results for 2-chloroethyl vinyl ether were less than the PQL, the results were rejected (R) due to the inability to determine if the compound existed in the samples. 2-chloroethyl vinyl ether is not a primary contaminant of concern at the site.

Chloroprene and tetrahydrafuran were both high in the MS and MSD.

1,3-Dichlorobenzene was marginally low in the MS

4-methyl-2-pentanone was marginally high in the MSD, but ok in the MS

Hexachlorobutadiene, Bromobenzene and 4-chlorotoluene were all low in the MS and MSD, 2-chlorotoluene was low in the MS, but OK in the MSD.

Chloroprene, tetrahydrafuran and 4-methyl-2-pentanone were not detected in any of the field samples, therefore no data was qualified due to the high matrix spike recovery percentages. 1,3-dichlorobenzene was only marginally low in the MS and within QC limits for the MSD, therefore the data was not qualified. Hexachlorobutadiene, bromobenzene, 2-chlorotoluene and 4-chlorotoluene reporting limit was qualified as estimated (UJ) in sample 17XBR since the matrix spike recovery for those compounds was low in the MS/MSD sample (17XBR).

All MS/MSD RPDs were within the laboratory's acceptance limits for VOC analysis.

LCS/LCSD VOC results are acceptable.

Volatile Petroleum Hydrocarbon (VPH) Analysis

Eighteen groundwater samples were analyzed for VPH using the MADEP method. In addition, the laboratory analyzed, one field duplicate (32M-01-DUP, a duplicate of sample 32M-01-18XBR), three trip blanks (dated 6/13/05, 6/15/05 and 6/16/05), and one equipment blank sample (32-43A-EOB, dated 6/16/05).

<u>Laboratory Method Blank, Trip Blank and Equipment Blank Results</u>: Target analytes were undetected at levels above the PQL for method blank and trip blank samples.

<u>Field Duplicate Sample Results</u>: The RPD between positive VPH results for sample 32M-01-18XBR and its duplicate were within 20%. The duplicate sample results were acceptable.

<u>Surrogate Results</u>: All VPH sample surrogate recoveries, for aliphatics and aromatics, were within the laboratory's stated acceptance limits except for 2,5-dibromotoluene in one LCS (E4LCS). The recovery was slightly high, 132% (70-130). The data was not qualified since none of the associated samples had VPH detected.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results: One set of MS/MSD samples was analyzed for this project. All MS/MSD recoveries and RPD values were within the laboratory's QC limits.

LCS/LCSD – All LCS and LCSD recoveries were within QC limits except Methyl tert-Butyl Ether was slightly high in one LCS/LCSD pair. The associated samples were trip blank samples (no VPH detected), therefore the data was unaffected.

Dissolved Gas Analysis (Methane, Ethane, Ethene)

Eighteen groundwater samples were analyzed for methane, ethane and ethene using the EPA 3810 RSK-175 method. In addition, the laboratory analyzed one field duplicate (32M-01-DUP, a duplicate of sample 32M-01-18XBR), and one equipment blank sample (32-43A-EQB, dated 6/16/05).

<u>Laboratory Method Blank, Trip Blank and Equipment Blank Results</u>: Target analytes were undetected at levels above the laboratory's reporting limit for method and equipment blank samples.

<u>Field Duplicate Sample Results</u>: The results of the dissolved gas analysis for sample 32M-01-18XBR and its duplicate sample had an acceptable RPD value of 9.8 for methane. Ethane and ethene were not detected in the sample or the duplicate sample. The field duplicate results are acceptable.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results: One set of MS/MSD samples was analyzed for this project. The matrix spike recoveries and RPDs were within QC limits.

<u>Laboratory Control Sample/ Laboratory Control Sample Duplicate (LCS/LCSD) Results</u>: All LCS/LCSD recoveries and RPDs were within the laboratory's acceptance limits for the dissolved gas analysis.

Extractable Petroleum Hydrocarbon (EPH) Analysis

Eighteen groundwater samples were analyzed for EPH using the MADEP method. In addition, the laboratory analyzed one field duplicate (32M-01-DUP, a duplicate of sample 32M-01-18XBR), and one equipment blank sample (32-43A-EQB, dated 6/16/05).

<u>Laboratory Method Blank and Equipment Blank Results</u>: No polycyclic aromatic hydrocarbons (PAH) target analytes or aliphatic and aromatic hydrocarbon ranges were detected at levels above the laboratory's reporting limit for the method blank and the equipment blank samples.

<u>Field Duplicate Sample Results</u>: The results of the EPH analysis for sample 32M-01-18XBR and its duplicate sample showed less than 25 % RPD for C₉-C₁₈ aliphatic hydrocarbon range. No other hydrocarbon range or PAH analyte was detected. The field duplicate sample therefore showed acceptable comparative results.

<u>Surrogate Results</u>: All EPH surrogate spike recoveries were within the laboratory's QC acceptance limits for both the aliphatic and aromatic fractions.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results: One set of MS/MSD samples was analyzed for this project. All MS/MSD recoveries and RPD values were within the laboratory's acceptance limits for EPH analysis.

Polychlorinated Biphenyl (PCB) Analysis

Eighteen groundwater samples were analyzed for seven PCB aroclors using EPA SW846 method 8082. In addition, the laboratory analyzed one field duplicate (32M-01-DUP, a duplicate of sample 32M-01-18XBR), and one equipment blank sample (32-43A-EQB, dated 6/16/05).

<u>Laboratory Method Blank, Trip Blank and Equipment Blank Results</u>: Target PCB aroclors were undetected at levels above the laboratory's reporting limit for all method blank samples and the equipment blank sample.

<u>Field Duplicate Sample Results</u>: Sample results for 32M-01-18XBR and its duplicate showed acceptable comparative results in that no PCB aroclors were detected in either sample.

<u>Surrogate Results</u>: All PCB sample surrogate recoveries were within the laboratory's QC acceptance limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results: One set of MS/MSD samples was analyzed for this project. All MS/MSD recoveries and RPDs were within the laboratory's acceptance limits for PCB analysis.

Target Analyte List (TAL) Metals Analysis

Eighteen groundwater samples were analyzed for total TAL metals using SW846 method 6010B. In addition, the laboratory analyzed one field duplicate (32M-01-DUP, a duplicate of sample 32M-01-18XBR), one laboratory duplicate (32M-01-17X Duplicate), and one equipment blank sample (32-43A-EQB, dated 6/16/05).

<u>Laboratory Preparation Blank and Equipment Blank Results</u>: Target analytes were undetected at levels above the Contract Required Detection Limit (CRDL) for preparation blank samples and the equipment blank sample. All results were acceptable.

<u>Field Duplicate Sample Results</u>: The metal results for sample 32M-01-18XBR and its duplicate showed less than 20 % RPD for all metals detected above the CRDL. The field duplicate results were acceptable.

<u>Laboratory spike sample</u>: Sample 32M-01-14XBR was spiked – the % recoveries were acceptable for lead and manganese. The arsenic percent recovery was slightly high, outside QC limits 127% (limits 80-120%). Therefore the arsenic result for that sample was qualified as J+ - possibly biased high as a result of the high spike recovery.

Sample spike for 32M-01-17XBR had acceptable spike recoveries for arsenic, lead, and manganese.

Matrix Spike (MS) and Laboratory Duplicate Results: A matrix spike sample and a duplicate sample were analyzed for total and dissolved metals. All MS recoveries were within QC limits. The RPD values were also acceptable. (Two samples were run as spikes and duplicates – 32M-01-17XBR and 32M-01-14SBR.)

General Analyses

Eighteen groundwater samples were analyzed for general inorganic and organic analyses, including alkalinity, nitrate/nitrite, nitrate by calculation, sulfate, sulfide, total phosphorus, ammonia, COD and TOC. Refer to Table 1 for methods of analysis. In addition, the laboratory analyzed one field duplicate (32M-01-DUP, a duplicate of sample 32M-01-18XBR), and one equipment blank sample (32-43A-EQB, dated 6/16/05).

Laboratory Preparation Blank and Equipment Blank Results: All target analytes were undetected at levels above the laboratory's reporting limit for the preparation blank samples. The equipment blank sample had a phosphorous concentration above the reporting limit. Phosphorous was reported at 0.055 mg/L, which exceeded the reporting limits of 0.010 mg/L. All of the samples had phosphorous results less than five times the concentration found in the equipment blanks sample. Therefore the phosphorous results for every sample was qualified as tentatively not detected at the reported concentration (UJ) due to the contamination found in the equipment blank sample.

Results for all other general analyses parameters were reported without qualification based on the blank sample results.

<u>Field Duplicate Sample Results</u>: The results of the general analyses for sample 32M-01-18XBR, and its duplicate, showed less than 20% RPD for all detected analytes, except ammonia. The sample and sample duplicate results for these ammonia were close to the reporting limit (within 5 times the RL), which could account for the higher RPD. The data was reported without qualification.

Laboratory Duplicate Sample Results: Sample 43M-01-20XOB was analyzed in duplicate for phosphorous and TOC. The phosphorous results of 0.043 mg/L and 0.026 mg/L had an RPD of 49 (limit 20%) The TOC results of 1.0 U mg/L and 1.9 mg/L had an RPD of 200. Laboratory duplicate sample of 32M-01-17XBR were run for alkalinity, ammonia, nitrate/nitrite, nitrite, phosphorous, sulfate, COD, TOC and nitrate (as N) by calculation. All RPDs were acceptable except for the TOC where the sample result of 1.6 mg/L was above the reporting limit and the sample duplicate result was less than the reporting limit, 1.0 U. The RPD cannot be calculated when one result is a detect and one is a non-detect. Since the sample result is within five times the concentration of the reporting limit, the duplicate data was acceptable.

Sample 32M-01-16XBR was run in duplicate for sulfide. The RPD was zero since sulfide was undetected in both the sample and the duplicate. .

<u>Laboratory Control Sample (LCS)Results</u>: All LCS recoveries were within the laboratory's QC limits for accuracy and precision.

Matrix Spike (MS) and Laboratory Duplicate Results: A matrix spike sample was run for 43M-01-20XOB for phosphorous and TOC. The phosphorous recovery of 95% was acceptable. The TOC recover was 68%, outside of the control limit of 75-125%. The reporting limit for TOC in sample 43M-01-20XOB was estimated (UJ) due to the low matrix spike recovery. Note: A matrix spike was not requested for sample 43M-01-20XOB.

A matrix spike sample was also run for 32M-01-17XBR for alkalinity, ammonia, nitrate/nitrite, nitrite, phosphorous, sulfate, COD and TOC. The recovery for sulfate was high (177%) The sulfate data was not qualified because the spike added was not high enough (10.0) relative to the native concentration in the sample (55.2). The COD recovery was low (59%) limit (75-125%). The TOC recovery was low (34%). The COD and TOC results for sample 32M-01-17XBR were qualified as potentially biased low (J-) due to the low recovery of the matrix spike from that sample.

An MS was run for sulfide in sample 32M-01-16XBR. The recovery was 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, duplicate samples and MS/MSD recoveries), all data may be reported without qualification, except as summarized below.

Volatile Organic Compound (VOC) Analysis

- As a result of equipment blank contamination, results for 1,2-dichlorobenzene in samples 32M-01-14XBR, 32M-01-15XBR, 32M-01-16XBR, and 32M-01-17XBR are qualified as tentatively not detected (UJ) at the reported concentration.
- Due to low matrix spike recovery, hexachlorobutadiene, bromobenzene, 2-chlorotoluene and 4-chlorotoluene reporting limits were qualified as estimated (UJ) in sample 17XBR.
- All 2-chloroethyl-vinyl ether results were rejected (R) due to the inability to recover the compound from the MS and MSD samples.

Target Analyte List (TAL) Metals Analysis

• Laboratory spike sample: Sample 32M-01-14XBR was spiked – the % recoveries were acceptable for lead and manganese. The arsenic percent recovery was slightly high; outside QC limits 127% (limits 80-120%). Therefore the arsenic result for that sample was qualified as (J+), possibly biased high as a result of the high spike recovery.

General Analyses

- Phosphorous results for all samples was qualified as tentatively not detected at the reported concentration (UJ) due to the contamination found in the equipment blank sample.
- The reporting limit for TOC in sample 43M-01-20XOB was estimated (UJ) due to the low matrix spike recovery.
- COD and TOC results for sample 32M-01-17XBR were qualified as potentially biased low (J-) due to the low recovery of the matrix spike from that sample.

TABLE 1
Sample Preparation and Analysis Methods, Containers, Holding Times, and Preservatives

Parameter	Preparation Method ¹	Analysis Method ¹	Sample Container ²	Preservative	Holding Time (VTS) ³
VOCs	5030B	EPA SW846 Method 8260B	3 X 40 mL vials with Teflon septa screw caps ⁴	HCl to pH less than 2 (No Headspace) 4°C ± 2°C	14 days
VPH	I I		with Teflon septa	HCl to pH less than 2 (No Headspace) 4°C ± 2°C	14 days
Dissolved Gas	EPA Method 3810 RSK-175	EPA Method 3810 RSK- 175	3 X 40 mL vials with Teflon septa screw caps ⁴	4°C ± 2°C	14 days
ЕРН	MADEP	MADEP	1-Liter amber glass bottle with Teflon-lined screw cap	HCl to pH less than 2 4°C ± 2°C	14 days
PCB	3510	EPA SW846 8082	1-Liter amber glass bottle with Teflon-lined screw cap	4°C ± 2°C	7 days
Metals ⁵	3010A	EPA SW846 Method 6010B	1-Liter HDPE	HNO ₃ to pH less than 2	180 days
Alkalinity	NA	EPA Method 310.1	500-mL HDPE	4°C ± 2°C	14 days
Nitrate Nitrite	NA	EPA Method 353.2	500-mL HDPE	4°C ± 2°C	48 hours
Sulfate	NA	EPA Method 375.4	500-mL HDPE	4°C ± 2°C	48 hours
Sulfide	NA	EPA Method 376.1	500-mL HDPE	4°C ± 2°C Add zinc acetate/NaOH	7 days
Total Phosphate	NA	EPA Method 365.2	250-mL HDPE	H_2SO_4 to pH less than 2, $4 \pm 2^{\circ}C$	28 days
Ammonia	NA	EPA Method 350.2	250-mL HDPE	H_2SO_4 to pH less than 2, 4 ± 2 °C	28 days
COD	NA	EPA Method 410.1	250-mL HDPE	H_2SO_4 to pH less than 2, 4 ± 2 °C	28 days
TOC	NA	EPA SW846 Method 9060	250-mL Amber glass	H_2SO_4 to pH less than 2, $4 \pm 2^{\circ}C$	28 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.
 - "Characterizing Risks Posed by Petroleum Contaminated Sites: Implementation of the MADEP VPH/EPH Approach", MADEP, Boston, MA, October 31, 2002.
- 2. Additional sample containers/volume is required for matrix quality control samples.
- 3. VTS Verified Time when the sample was collected.
- 4. Three 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. Select metals include Total and Dissolved Arsenic, Lead and Manganese. NA = Not Applicable

APPENDIX D Section 2: October 2005

Data Evaluation Report For Devens Areas 32/43A (DRMO/POL Yard) Long Term Monitoring Groundwater Samples Collected October 2005

Introduction

Nine groundwater samples were collected from the AOC 32/43A site, Devens, MA on October 3, 4 and 5, 2005. The samples were analyzed at ESS Laboratory, Cranston, Rhode Island for volatile organic compounds (VOCs), volatile petroleum hydrocarbons (VPH), extractable petroleum hydrocarbons (EPH), and total arsenic, lead and manganese. See Table 2 for analytical results.

The results were evaluated for acceptability in accordance with the laboratory's defined acceptance limits, with standard EPA SW846 guidance, guidelines provided in Appendix I "Shell for Analytical Chemistry Requirements" in EM200-1-3, dated February 2001 and/or EM 200-1-10 "Guidance for Evaluating Performance Based Chemical Data Packages".

Sample Shipment and Receipt

All sample coolers were packed with sufficient quantities of ice in the field. The laboratory received sample shipments on October 4, 6, and 7, 2005. All samples were appropriately preserved as stated in Table 1.

Holding Times

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

Volatile Organic Compound (VOC) Analysis

Nine groundwater samples were analyzed for VOCs using SW846 Method 8260B. In addition, the laboratory analyzed, one field duplicate (32M-01-DUP, a duplicate of sample 32M-01-18XBR), three trip blanks (dated 10/3/05, 10/4/05 and 10/5/05), and one equipment blank sample (32-43A-EQB, dated 10/4/05).

<u>Laboratory Method Blank, Trip Blank and Equipment Blank Results</u>: Target analytes were undetected at levels above the practical quantitation limit (PQL) for method blank. The equipment blank sample and one trip blank had detections of chloroform and methylene chloride above the PQL. There were no detections of either compound in the samples; therefore no data qualification was made due to the contamination.

<u>Field Duplicate Sample Results</u>: The results of the VOCs for sample 32M-01-18XBR, and its duplicate sample, showed less than 20% relative percent difference (RPD) for all detected compounds.

<u>Surrogate Results</u>: All VOC sample surrogate recoveries were within the laboratory's stated quality control (OC) limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results: One set of MS/MSD samples was analyzed for this project. All recoveries were within the acceptance range and precision between MS and MSD was acceptable. The laboratory spiked sample 32M-01-13XBR in addition to the sample designated for matrix spike. 1,2,3-trichlorobenzene was under recovered from this spike, consequently, the result for this compound in sample 32M-01-13XBR is qualified (UJ), tentatively not detected at the reporting limit value.

<u>Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD):</u> VOC results are acceptable.

Volatile Petroleum Hydrocarbon (VPH) Analysis

Nine groundwater samples were analyzed for VPH using the MADEP. In addition, the laboratory analyzed, one field duplicate (32M-01-DUP, a duplicate of sample 32M-01-18XBR), three trip blanks (dated 10/3/05, 10/4/05 and 10/5/05), and one equipment blank sample (32-43A-EQB, dated 10/4/05).

<u>Laboratory Method Blank, Trip Blank and Equipment Blank Results</u>: Target analytes were undetected at levels above the PQL for method blank and trip blank samples.

<u>Field Duplicate Sample Results</u>: The RPD between positive VPH results for sample 32M-01-18XBR and its duplicate were within 20%. The duplicate sample results were acceptable.

<u>Surrogate Results</u>: All VPH sample aliphatic and aromatic surrogate recoveries were within the laboratory's stated acceptance limits.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results: One set of MS/MSD samples was analyzed for this project. All MS/MSD recoveries and RPD values were within the laboratory's QC limits.

<u>Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD):</u> All LCS and LCSD recoveries were within QC limits.

Extractable Petroleum Hydrocarbon (EPH) Analysis

Nine groundwater samples were analyzed for EPH using the MADEP method. In addition, the laboratory analyzed one field duplicate (32M-01-DUP, a duplicate of sample 32M-01-18XBR), and one equipment blank sample (32-43A-EQB, dated 10/4/05).

<u>Laboratory Method Blank and Equipment Blank Results</u>: Naphthalene was detected in the method blank associated with samples SHL-15, 32M-92-01X, 32M-01-18XBR, AND 32M-01-18XBR-DUP. As a result, naphthalene results in these samples are qualified (UJ). No other polycyclic aromatic hydrocarbons (PAH) target analytes or hydrocarbon ranges were detected at levels above the laboratory's reporting limit for the method blank and the equipment blank samples.

<u>Field Duplicate Sample Results</u>: The results of the EPH analysis for sample 32M-01-18XBR and its duplicate sample showed greater than 25 % RPD for C₉-C₁₈ aliphatic hydrocarbon range. As a result, both results are qualified as (J) estimated.

No other hydrocarbon range or PAH analyte was detected. The field duplicate sample, except for C_9 - C_{18} aliphatic hydrocarbon range, therefore, showed acceptable comparative results.

<u>Surrogate Results</u>: All EPH surrogate spike recoveries were within the laboratory's QC acceptance limits

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Results: One set of MS/MSD samples was analyzed for this project. All MS/MSD recoveries and RPD values were within the laboratory's acceptance limits for EPH analysis.

Target Analyte List (TAL) Metals Analysis

Nine groundwater samples were analyzed for total TAL metals using SW846 method 6010B. In addition, the laboratory analyzed one field duplicate (32M-01-DUP, a duplicate of sample 32M-01-18XBR), one laboratory duplicate (32M-01-17X Duplicate), and one equipment blank sample (32-43A-EQB, dated 10/4/05).

<u>Laboratory Preparation Blank and Equipment Blank Results</u>: Target analytes were undetected at levels above the Contract Required Detection Limit (CRDL) for preparation blank samples and the equipment blank sample. All results were acceptable.

<u>Field Duplicate Sample Results</u>: The metal results for sample 32M-01-18XBR and its duplicate showed less than 20 % RPD for all metals detected above the CRDL. The field duplicate results were acceptable.

<u>Laboratory spike sample</u>: Sample 32M-01-13XBR was spiked – the % recoveries were acceptable for arsenic and lead. The manganese percent recovery was low; outside QC limits 44% (limits 75-125%). Therefore, the manganese result for that sample was qualified as (J-), possibly biased low as a result of the low spike recovery.

Matrix Spike (MS) and Laboratory Duplicate Results: A matrix spike sample and a duplicate sample were analyzed for total and dissolved metals. All MS recoveries were within QC limits. The RPD values were also 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, duplicate samples and MS/MSD recoveries), all data may be reported without qualification, except as summarized below.

Volatile Organic Compound (VOC) Analysis

• The laboratory spiked sample 32M-01-13XBR in addition to the sample designated for matrix spike. 1,2,3-trichlorobenzene was under recovered from this spike, consequently, the result for this compound in sample 32M-01-13XBR is qualified (UJ), tentatively not detected at the reporting limit value.

Extractable Petroleum Hydrocarbons (EPH) Analyses

- Naphthalene was detected in the method blank associated with samples SHL-15, 32M-92-01X, 32M-01-18XBR, AND 32M-01-18XBR-DUP. As a result, naphthalene results in these samples are qualified (UJ).
- The results of the EPH analysis for sample 32M-01-18XBR and its duplicate sample showed greater than 25 % RPD for C₉-C₁₈ aliphatic hydrocarbon range. As a result, both results are qualified as (J) estimated.

Target Analyte List (TAL) Metals Analysis

• Laboratory spike sample: Sample 32M-01-13XBR was spiked – the % recoveries were acceptable for arsenic and lead. The manganese percent recovery was low; outside QC limits 44% (limits 75-125%). Therefore, the manganese result for that sample was qualified as (J-), possibly biased low as a result of the low spike recovery.

TABLE 1
Sample Preparation and Analysis Methods, Containers, Holding Times, and Preservatives

Parameter	Preparation Method ¹	Analysis Method ¹	Sample Container ²	Preservative	Holding Time (VTS) ³
VOCs	5030B	EPA SW846 Method 8260B	3 X 40-mL vials with Teflon septa screw caps ⁴	HCl to pH less than 2 (No Headspace) 4°C +/- 2°C	14 days
VPH .	MADEP	MADEP	3 X 40-mL vials with Teflon septa screw caps ⁴	HCl to pH less than 2 (No Headspace) 4°C +/- 2°C	14 days
ЕРН	MADEP	MADEP	1-Liter amber glass bottle with Teflon- lined screw cap	HCl to pH less than 2 4°C +/- 2°C	14 days
Metals ⁵	3010A	EPA SW846 Method 6010B	1-Liter HDPE	HNO ₃ to pH less than 2	180 days
Alkalinity	NA	EPA Method 310.1	500-mL HDPE	4°C +/- 2°C	14 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.
 - "Characterizing Risks Posed by Petroleum Contaminated Sites: Implementation of the MADEP VPH/EPH Approach", MADEP, Boston, MA, October 31, 2002.
- 2. Additional sample containers/volume is required for matrix quality control samples.
- 3. VTS Verified Time when the Sample was collected.
- 4. Three 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. Select metals include Total and Dissolved Arsenic, Lead and Manganese. NA = Not Applicable

Appendix E

Chemical Quality Assurance Report

For

Sampling Event

June 2005

CHEMICAL QUALITY ASSURANCE REPORT

LONG TERM GROUNDWATER MONITORING AT AOC's 32/43A (DRMO/POL Yard) DEVENS, MASSACHUSETTS JUNE 2005 SAMPLING ROUND

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

March 16, 2006

CHEMICAL QUALITY ASSURANCE REPORT

LONG TERM GROUNDWATER MONITORING AT AOC'S 32/43A (DRMO/POL Yard) DEVENS, MASSACHUSETTS JUNE 2005 SAMPLING ROUND

One groundwater QA sample from Devens areas 32/43A Long Term Monitoring, Devens, Massachusetts project was analyzed by the QA laboratory, resulting in a total of 119 target determinations. In 37 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.

All primary lab analyses were performed by Severn Trent Laboratories, Inc., Colchester, Vermont. Analyses performed were volatile organics, MADEP-VPH, PCBs; metals, arsenic, lead, manganese, TOC, ammonia, nitrate/nitrite, nitrite, sulfate, sulfide, alkalinity, total phosphorus, nitrate by calculation, and chemical oxygen demand (COD). QA laboratory analyses were performed by AMRO Environmental Laboratories, Merrimack, New Hampshire.

Comparability and agreement were evaluated and expressed in terms of relative percent difference (RPD). For all analyses, RPD values greater than or equal to 75% RPD constituted a data discrepancy.

The primary and QA samples agreed overall in 111 (93%) of the comparisons. Primary and QA samples agreed quantitatively in 29 out of 37 (78%) of the comparisons. Refer to Table 1 for a QA split sample data comparison summary. Quantitative agreement represents only those determinations where an analyte was detected by at least one laboratory.

Primary laboratory QC was evaluated and reported in the data evaluation report. See that report for findings. QA laboratory data was evaluated for custody, holding times, and laboratory QC compliance and found to be within criteria except as noted: the Laboratory Control Sample (LCS) recovery for dichlorodifluoromethane, chloromethane, bromomethane, and trichlorofluoromethane were outside acceptance limits. Since these are primarily marginal outliers, the data remains unaffected. A matrix spike of the sample exhibited a high out of range recovery for 1,2-dichlorobenzene. The positive result for this compound has be qualified as (J+) for possible high bias. The EPH surrogate 1-chlorooctadecane was recovered below the control limits. All other surrogates were within acceptance limits, therefore the data is unaffected. None of the above noted QC issues significantly impact the usability of the QA data. All QA data is acceptable for its intended use except for results C5-C8 aliphatics and C9-C12 aliphatics. Due to dilution, the resulting elevated reporting limits for these two ranges are not usable to compare to MCP groundwater standards. Data comparison between laboratories exhibits mostly good agreement, except for metals, total dissolved gases, and VPH.

Quality Assurance Split Sample Data Comparison Summary June 2005 Sampling Round

Project: Devens Areas 32/43A (DRMO/POL Yard, Devens, Massachusetts

	Overall Ag	reement (1)	Quantitative A	Agreement (2)
Test Parameter	Number	Percent	Number	Percent
VOCs	64/66	97	19/21	90
VPH (targets)	5/7	71	0/2	0
VPH (carbon ranges)	2/3	67	0/1	0
EPH (targets)	17/17	100	N/A	N/A
EPH (carbon ranges)	3/3	100	1/1	100
Total Dissolved	2/3	67	0/1	0
PCBs	7/7	100	N/A	N/A
Trace Metals	1/3	33	1/3	33
TOC	1/1	100	1/1	100
Ammonia	1/1	100	1/1	100
Nitrate/nitrite	1/1	100 .	1/1	100
Sulfate	1/1	100	1/1	100
Alkalinity	1/1	100	1/1	100
Nitrite	1/1	100	1/1	100
Total phosphorus	1/1	100	N/A	N/A
COD	1/1	100	1/1	100
Nitrate (by calc.)	1/1	100	1/1	100
Sulfide	1/1	100	N/A	N/A
Total	111/119	93	29/37	78

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.

ATTACHMENT A DATA COMPARISON TABLES

Table 1 Groundwater Analytical Results - June 13-16, 2005 Sampling Event Devens Areas 32/434 (DRMO/POL Yard) (SHEET 1 of 2)

	Well No.		Reporting Limit	32M-01-18XBR	32M-UT-YEXER QA	RPD
PARAMETER (METHOD)	MCP	Site-Specific	µg/L	μg/L,	μg/L	
	GW-1	Cleanup Goals				
VOC (8250)	μg/L	μg/L				
Volatile Organic Compounds			4.0			
Vinyl chloride (chloroethene) trans-1.2-Dichloroethene	100	55	1.0	160 U	2.0 U	NC NC
cis-1,2-Dichlorgethene	70	55	1.0	160 U	11	NC NC
1,1,1-Trichloroethane	200	5	1.0	160 Ú	2.0 U	NC
Trichloroethens	5	5 [1.0	160 U	2.0 J	NC
1,3-Dichiorobenzene	40	600	1.0	590	560	NC
1,4-Dichlorobenzene 1,2-Dichlorobenzene	5 600	75 600	1.0	4500	400 aces	
Dichlorodifluoromethane (Freon 12)	-	- 600	1,D 1.0	160 U	5300 J+ 2.7 J	16 NC
Chloromethane	-	 	1.0	160 U	5.0 UJ	NC NC
Bromomethane	10	i - i	1,0	160 U	2.0 U	NC
Chloroethane	-	<u> </u>	1.0	160 U	5.0 U	NC
Trichlorofluoromethane (Freon 11)		•	1.0	160 U	2.0 U	NC
Acrolein Freen TF			5,0 1,0	800 U	NR 2.0 U	NC NC
1,1-Dichloroethene	7	:-	1.0	160 U	1.0 U	NC
Acetone	3,000		5.0	800 U	10 U	NC NC
Methyl ladide	-	- 1	1.0	160 U	NR	NC
Carbon disulfide	-	<u> </u>	1.0	160 U	2.0 U	NC
Allyl chloride			1.0	160 U	NR	NC
Methylene chloride Acrylonitrile	5		1.0	160 U	5.0 U	NC NC
1,2-Dichioroethene (total)	-	- :	1,0	160 U	NR NR	NC NC
Methyl-t-butyl ether	70	- :	1.0	160 U	2.0 U	NC NC
1,1-Dichloroethane	70	-	1.0	160 U	2.0 U	NC
Vinyl acetate	-		1.0	160 U	NR	NC
Chloroprene	250	-	1.0	160 U	NR	NC
2-Butanone Propionitriie	350		5.0	800 U	10 U	NC.
Methacrylonitrile		- : - 	1,0	640 U	NR NR	NC NC
Bromochloromethane			1.0	160 U	2.0 U	NC
Tetrahydrofuran			14	2200 U	10 U	NC
Chloroform	5	-	1.0	160 U	2.0 U	NC
Carbon tetrachloride	5	<u> </u>	1.0	160 U	2.0 U	NC
Isobutyi alcohol (butanel)			50	U 0008	2.0 ∪	NC
Benzene 1,2-Dichloroelhane	5		1.0	160 U	0.86 J	NC
1,2-Dichloropropane	5		1.0	160 U	2.0 U 2.0 U	NC NC
Melhyl Methacrylate			1,0	160 U	NR I	NC NC
Dibromomethane	-		1.0	160 U	2,0 U	NC
1.4-Dioxane		· 1	50	8000 U	50 U	NC
Bromodichloromethane	3	-	1.0	160 U	2.0 U	NC
2-Chloroethy! Vinyi Ether	0.5 *		1.0	160 U R	NR	NC NC
cis-1,3-Dichloropropene 4-methyl-2-pentanone	U.5 -	:	1.0 5.0	160 U 800 U	1.0 U	NC NC
Toluene	1,000	- :	1.0	150 U	2.0 U	NC NC
frans-1,3-Dichloropropene	0.5 *	-	1.0	160 U	1,0 U	NC
Ethyl methacrylate		-	1.0	160 U	NR	NC
1,1,2-Trichloroethane	5		1.0	160 U	2.0 U	NC
Tetrachloroethene	5		1.0	160 U	0.53 J	NC NC
2-Hexanone Dibromochloromethane	2		5.0 1.0	160 U	10 U	NC NC
Chiorabenzene	100	-:-	1,0	410	400	NC 2
1,1,1,2-Tetrachloroethane	5	_	1.0	160 U	2.0 U	NC
Ethylbenzene	700		1.0	160 U	1,1 J	NC
m-Xylene & p-Xylene	10000 *	- 1	1.0	160 U	1.2 J	NC
Xylene (total)	10000 *		1,0	160 U	NR	NC
o-Xylene Styrene	10000 °		1.0	160 U	0.76 J	NC NC
Bromoform	4		1.0	160 U	2.0 U	NC NC
Sopropyibenzene			1.0	160 U	3.0	NC NC
cis-1,4-Dichtoro-2-butene		-	1.0	160 U	NR	NC
1,1,2,2-Tetrachloroethane	2	-	1,0	160 U	2.0 U	NC
1,2,3-Trichloropropane			1.0	160 U	2.0 U	NC
rans-1,4-Dichloro-2-butene	•		1,0	160 U	NR	NC
1,2-Dibromo-3-chloropropane (DBCP)		_	1.0	160 U	٠	
1.2.4-Trichiorobenzene	70		1.0	49 J	5,0 U 4.1	169
Hexachtorobutadiene	1		1,0	47 J	2.0 U	NC NC
Naphthalene	140		1.0	79 J	2.6 J	187
2,2-Dichloropropane		•	1.0	160 U	2.0 ∪	NC
1,1-Dichloropropene	•		1,0	160 U	2.0 U	NC
1,3-Dichloropropane			1,0	160 U	2.0 U	NC
Bromobenzene n-Propylbenzene			1.0	160 U	1,5 J 1,9 J	NC NC
2-Chlorotoluene		- : 	1.0	160 U	2.0 U	NC NC
4-Chiorotoluene			1.0	160 U	2.00	NC NC
1,3,5-Trimethylbenzene			1,0	160 U	0.51 J	NC NC
ert-Butylbenzene	-		1.0	160 U	2.0 U	NC
1,2,4-Trimethylbenzene		- 1	1.0	160 U	1.9 J	NC
sec-Butylbenzene	•		1.0	160 U	1.2 3	NC
	- 1	<u> </u>	1.0	160 U	2.0 U	NC
-Isopropyltoluene			4.5	10011	0.011	N
1-Butylbenzene			1.0 1.0	160 U	2.0 U 2.0 U	NC NC

Bold numbers indicate exceedance of MCP GW-1 standard

Numbers in shaded areas indicate exceedance of site-specific cleanup goals

NR = Compound not reported by the DA laboratory

"Regulatory standard is for rotal 1,3-dichloropropene and total xylenes

D= Compound not detected at a concentration above the reporting limit.

UJ = Compound tentatively not detected at reported concentration due to blank contamination or reporting limit is estimated.

J= Estimated value loss than the reporting limit or an estimated value resulting from data evaluation

J+ = Value may be bissed high based on data evaluation of laboratory results.

R = Result was rejected based on inability to recover compound (0% recovery) from the matrix spike and matrix spike duplicate.

NC = Not calculated

Table 1 Groundwater Analytical Results - June 13-16, 2005 Sampling Event Devens Areas 32/43A (DRMO/POL Yard) (SHEET 2 of 2)

PARAMETERS MCP Site-Specific mg/L		Well No.		Reporting Limit	32M-01-18XBR	32M-01-18XBR- QA	RPD
VOLATILES PETROLEUM PgfL	DADAMETERS					<u> </u>	KI-D
VOLATILES PETROLEUM ygf. ygf. ygf. ygf.	FARAMETERS			- PA/L	1 hAur	P#/L	
VICLATILES PETROLEUM PRINCIPED PRINC			(contraction of the contraction				
HYDROCARBONS (MA DEP) Ranges	VOLATILES PETROLEUM	pg/L	Parc				
CS-CS Alphabic Hydrocarbons							
CS-CS Allphate Hydrocarbons							
C9-C12 Alphatic Hydrocarbons 200 200 470 1000 U C9-C10 Aromatic Hydrocarbons 200 200 7,800 U C9-C10 Aromatic Hydrocarbons 200 1.0		400	400	3.00	4.6	1000 U	NC
C3-C10 Aromatic Hydrocarbons 200 200 1.0 260 7,800 260 7,800 260 7,800 260		4000	4,000			1000 U	NC
Manylytes	C9-C10 Aromatic Hydrocarbons	200	200	1,0	260 (260)	7,800	187
Methy tert-buyl ether							
Benzene							
Toluene							NC
Ethybenzene							NC
Impairment							NC
Description							NC NC
Naphthelene							NC
Extractable Petroleum Hydrocarbons Anages			2				NC
Hydrocarbon Ranges		140	1	1,0	1.00	0.70	
CS - C18 Aliphatic Hydrocarbont 4000 4,000 50 1400 13					1	ŀ	
C19- C38 Aliphatic Hydrocarbons 5000 5,000 80 42 U 100 U C11-C22 Armatic Hydrocarbons 200 200 170 180 U 100 U Target PAH Analytes		4000	4,000	5 0	1400	1300	7
C11-C22 Aromatic Hydrocarbons 200 200 170 180 U 100 U Target PAH Analytes Target PAH Analytes		5000	5,000	80	42 U	100 U	NC
Naphthalene	C11-C22 Aromatic Hydrocarbons	200	200	170	180 U	100 U	NC
2-Methylnaphthalene							NC
Acenaphithene 300 - 10 10 U 2.0 U Acenaphithene 20 - 10 10 U 2.0 U Fluorene 300 - 10 10 U 2.0 U Phenaithrene 300 - 10 10 U 2.0 U Phenaithrene 300 - 10 10 U 2.0 U Phenaithrene 2000 - 10 10 U 2.0 U Phenaithrene 2000 - 10 10 U 2.0 U Phenaithrene 2000 - 10 10 U 2.0 U Phenaithrene 90 - 10 10 U 2.0 U Phenaithrene 80 - 10 10 U 2.0 U Phyrene 9.0 - 10 10 U 2.0 U Phyrene 9.2 - 10 10 U 2.0 U Phyrene 9.2 - 10 10 U 2.0 U Phyrene 9.2 - 10 10 U 2.0 U Phyrene 9.5 - 10 10 U 2.0 U 2.0 U Phyrene 9.5 - 10 10 Ph			-				NC
Acenaphthene 20							NC
Fluorene							NC
Phenanthrene 300 - 10 10 U 2.0 U							NC NC
Anthracene							NC
Fluoranthene			·				NC NC
Pyrene							NC NC
Banzo(a)anthracene			8				NC
Chrysene							NC
Benzo(k) Fluoranihene							NC
Benzo(k)fluoranthene			-				NC
Indeno(1,2,3-cd)pyrene		1			10 U	2.0 U	NC
Dibenzo(g,h)perylene	Benzo(a)pyrene	0,2	- 1	10	10 U	2.0 U	NC
Benzolg,h,l)perylene 300 - 10 10 U 2.0 U							NC
TOTAL DISSOLVED GASES (method RSK175) Methane							NC
Methane		300		10	100	2.0 U	NC
Methane 1000 - 2.0 32 103 Elhane 1000 - 4.0 4.0 U 2 U Elhene 100 - 3.0 3.0 U 2 U PCBs by EPA8082 - - 3.0 3.0 U 2 U Aroclor 1016 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1232 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1242 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1254 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1260 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1260 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1260 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1276 0.5 0.5 0.5 0.50 0.52 U 0.22 U					Ļ		
Ethane 1000 - 4.0 4.0 U 2 U Ethene 100 - 3.0 3.0 U 2 U PCBs by EPA8082 Aroclor 1016 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1221 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1232 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1242 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1248 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1248 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1250 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1260 0.5 0.5 0.5 0.5 0.50 0.52 U 0.22 U CP METALS 3010/6010B (Total metals) Arsenic 10 50 4.5 24.4 54.7 Lead 15 15 2.7 6.6 1.0 J Manganese - 3,500 0.7 16,700 16,600 mg/L mg/L n TOC by SW846:9060 Total Cyrganic Carbon - 1.0 4.6 5.5 AMMONIA (350.1) Ammonia as N 0.024 0.038 1.0 U ALKALINITY, TOTAL as CaCO3 - 1.0 199 190 ANIONS (300) Nitrate/nitrite (as N) by 353.2 0.010 2.9 2.2 Nitrite (as N) by 354.1 0.0050 0.038 0.010 U Sulfate by 375.2 - 0.020 0.020 U 1.0 U Nitrate (as N) by 355.2 5.0 0.20 0.020 U 1.0 U Nitrate (as N) by 375.2 0.020 0.020 U 1.0 U Nitrate (as N) by 375.2 0.020 0.020 U 1.0 U Nitrate (as N) by calc 0.020 0.020 U 1.0 U Nitrate (as N) by calc 0.020 0.020 U 1.0 U Nitrate (as N) by calc 0.020 0.020 U 1.0 U Nitrate (as N) by calc 0.020 0.020 U 1.0 U		1000	!	20	22	402	105
Ethene 100 - 3.0 3.0 U 2 U PCBs by EPA8082 Aroclor 1016 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1221 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1232 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1242 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1248 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1254 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1254 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1254 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1254 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1260 0 0.5 0.5 0.5 0.50 0.52 U 0.22 U Aroclor 1260 0 0.5 0.5 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.5 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.5 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.5 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.5 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.5 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.5 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.5 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.5 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.5 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.5 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.5 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.50 0.50 U 0.22 U Aroclor 1260 0 0.5 0.50 0.50 U 0.20 U 0.2							NC NC
PCBs by EPA8082 Aroclor 1016							NC
Aroclor 1016			i	0.0		~~~	NC
Arocior 1221		0.5	0,5	0.50	0.52 U	0.22 U	NC
Arocior 1232							NC
Arccior 1248							NC
Arocior 1254							NC
Arccior 1260			<u> </u>				NC
ICP METALS 3010/6010B (Total metals)							NC
Managanese		0.5	0,5	0.50	0.52 U	0.22 U	NC NC
Arsenic 10 50 4.5 24.4 54.7 2						***	
Lead 15 15 2.7 6.6 1.0 J Manganese - 3,500 0.7 16,700 16,600 UNIT CHANGE mg/L mg/L mg/L n Total Organic Carbon - - 1.0 4.6 5.5 AMMONIA (350.1) - - 0.024 0.038 1.0 U ALKALINITY, TOTAL - - 1.0 199 190 ANIONS (300) - - 1.0 199 190 Nitrite/nitrite (as N) by 353.2 - - 0.010 2.9 2.2 Nitrite (as N) by 354.1 - 0.0050 0.036 0.010 U 0.089 UJ 0.044 Phosphorus (as P) by 365.2 - - 0.010 0.089 UJ 0.044 Sulfate by 375.4 - - 5.0 25.1 27.0 Sulfate by 376.2 - - 0.020 0.020 U 1.0 U Nitrate (as N) by calc - </td <td></td> <td>10</td> <td>En .</td> <td>A.E.</td> <td>2//</td> <td>man of 7 min on</td> <td>77</td>		10	En .	A.E.	2//	man of 7 min on	77
Manganese							147
UNIT CHANGE mg/L					16,700		147
TOC by SW846:9060 Total Organic Carbon 1.0 4.6 5.5 AMMONIA (350.1) Ammonia as N 0.024 0.038 1.0 U ALKALINITY, TOTAL as CaCO3 1.0 199 190 ANIONS (300) Nitrate/nitrite (as N) by 353.2 0.010 2.9 2.2 Nitrite (as N) by 354.1 0.0050 0.036 0.010 U Phosphorus (as P) by 355.2 0.010 0.089 UJ 0.044 Sulfate by 375.4 5.0 25.1 27.0 Sulfide by 375.2 0.020 0.020 U 1.0 U Nitrate (as N) by 360.2 0.020 0.020 U 1.0 U Nitrate (as N) by 360.2 0.020 0.020 U 1.0 U Nitrate (as N) by calc 0.010 2.8 2.2							mg/L
Total Organic Carbon 1.0 4.6 5.5 AMMONIA (350.1) Ammonia as N 0.024 D.038 1.0 U AIKALINITY, TOTAL as CaCO3 1.0 199 190 ANIONS (300) Nitrate/nitrite (as N) by 353.2 0.010 2.9 2.2 Nitrite (as N) by 354.1 0.0050 0.036 0.010 U Phosphorus (as P) by 365.2 0.010 0.089 UJ 0.044 Sulfate by 375.4 5.0 25.1 27.0 Sulfide by 376.2 0.020 0.020 U 1.0 U Nitrate (as N) by calc 0.010 2.8 2.2 COD (410.4)				111812	9/12	117918	NC
AMMONIA (350.1) Ammonia as N 0.024 ALKALINITY, TOTAL as CaCO3 1.0 199 190 ANIONS (300) Nitrate/nitrite (as N) by 353.2 0.010 2.9 2.2 Nitrite (as N) by 354.1 Phosphorus (as P) by 365.2 0.010 Sulfate by 375.4 - 5.0 25.1 27.0 Sulfate by 376.2 - 0.020 COD (410.4)		-		1.0	4.6	5.5	18
Ammonia as N 0.024							NC
ALKALINITY, TOTAL as CaCO3 1.0 199 190 ANIONS (300) Nitrate/nitrite (as N) by 353.2 - 0.010 2.9 2.2 Nitrite (as N) by 354.1 0.0050 0.036 0.010 U Phosphorus (as P) by 355.2 - 0.010 0.089 UJ 0.044 Sulfiate by 375.4 - 5.0 25.1 27.0 Sulfide by 375.2 - 0.020 0.020 U 1.0 U Nitrate (as N) by calc - 0.010 2.8 2.2 COD (410.4)		-		0.024	0.038	1.0 U	NC
as CaCO3 1.0 199 190 ANIONS (300) 0.010 2.9 2.2 Nitrite (as N) by 353.2 0.0050 0.036 0.010 U Phosphorus (as P) by 365.2 0.010 0.089 UJ 0.044 Sulfate by 375.4 5.0 25.1 27.0 Sulfide by 376.2 0.020 0.020 U 1.0 U Nitrate (as N) by calc 0.010 2.8 2.2 COD (410.4)					1		NC
ANIONS (300) Nitrate/nitrite (as N) by 353.2 0.010 2.9 2.2 Nitrite (as N) by 354.1 0.0050 0.036 0.010 U Phosphorus (as P) by 365.2 0.010 0.089 UJ 0.044 Sulfate by 375.4 - 5.0 25.1 27.0 Sulfate by 376.2 0.020 0.020 U 1.0 U Nitrate (as N) by calc 0.010 2.8 2.2 COD (410.4)		-	-	1.0	199	190	5
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Nitrite (as N) by 354.1 0.0050 0.036 0.010 U Phosphorus (as P) by 365.2 - 0.010 0.088 UJ 0.044 Sulfate by 375.4 - 5.0 25.1 27.0 Sulfide by 376.2 - 0.020 0.020 U 1.0 U Nitrate (as N) by calc - 0.010 2.8 2.2 COD (410.4)		•		0.010			27
Sulfate by 375.4 5.0 25.1 27.0 Sulfate by 376.2 0.020 0.020 U 1.0 U Nitrate (as N) by calc 0.010 2.8 2.2 COD (410.4)	Nitrite (as N) by 354.1						NC
Sulfide by 376.2 0.020 0.020 U 1.0 U Nitrate (as N) by calc 0.010 2.8 2.2 COD (410.4)			•				NC
Nitrate (as N) by calc 0.010 2.8 2.2 COD (410.4)							7
COD (410.4)			-				NC
		-		0.010	2.8	2.2	24
COMMONICATION CAMBRIO I - 8 - 9 20 C I 32 C I 35 I					1	05 1	NC
COMMING CAPTON COMMING	Unemical Oxygen Demand			20.0	34.9	25 J	33

Bold numbers indicate exceedance of MCP GW-1 standard

Numbers in shaded areas indicate exceedance of site-specific cleanup goals

U = Compound not detected at a concentration above the reporting limit.

UJ = Compound tentatively not detected at reported concentration due to blank contamination or detection limit estimated due to low spike recoveries

 $J = Estimated value tess than the reporting limit or an estimated value resulting from data evaluation \\ J + \simeq Value may be biased high based on data evaluation of laboratory results.$

NC = not calculated

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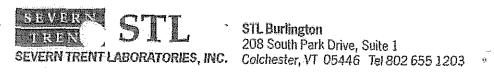
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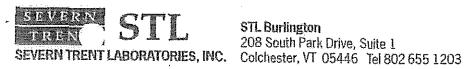


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208 South Park Drive, Suite 1 SEVERN TRENT LABORATORIES, INC. Colchester, VT 05446 Tel 802 655 1203

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208 South Park Drive, Suite 1.
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CHAIN OF CUSTODY RECORD

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Appendix F

Chemical Quality Assurance Report

For

Sampling Event

October 2005

CHEMICAL QUALITY ASSURANCE REPORT

LONG TERM GROUNDWATER MONITORING AT AOC's 32/43A (DRMO/POL Yard) DEVENS, MASSACHUSETTS OCTOBER 2005 SAMPLING ROUND

PREPARED BY
DAVID LUBIANEZ
OF THE
GEOLOGY & CHEMISTRY SECTION
ENGINEERING/PLANNING DIVISION

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

March 20, 2006

CHEMICAL QUALITY ASSURANCE REPORT

LONG TERM GROUNDWATER MONITORING AT AOC's 32/43A (DRMO/POL Yard) DEVENS, MASSACHUSETTS OCTOBER 2005 SAMPLING ROUND

One groundwater QA sample from Devens areas 32/43A Long Term Monitoring, Devens, Massachusetts project was analyzed by the QA laboratory, resulting in a total of 97 target determinations. In 16 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.

All primary lab analyses were performed by ESS Laboratory, Cranston, Rhode Island. Analyses performed were volatile organics, MADEP-VPH, MADEP-EPH; metals, arsenic, lead, manganese, QA laboratory analyses were performed by AMRO Environmental Laboratories, Merrimack, New Hampshire.

Comparability and agreement were evaluated and expressed in terms of relative percent difference (RPD). For all analyses, RPD values greater than or equal to 75% RPD constituted a data discrepancy.

The primary and QA samples agreed overall in 92 (95%) of the comparisons. Primary and QA samples agreed quantitatively in 11 out of 16 (69%) of the comparisons. Refer to Table 1 for a QA split sample data comparison summary. Quantitative agreement represents only those determinations where an analyte was detected by at least one laboratory. See Attachment A for Primary and QA laboratory data.

Primary laboratory QC was evaluated and reported in the data evaluation report. See that report for findings. QA laboratory data was evaluated for custody, holding times, and laboratory QC compliance and found to be within criteria except as noted: the Laboratory Control Sample (LCS) recovery for, dichlorodifluoromethane (low), chloroethane (low), naphthalene (high), acetone (low), 2-butanone (low), trichloroethene (high), 4-methyl-2-pentanone (low), 2-hexanone (low), and 1,2-dibromo-3-chloropropane (marginally low) were outside acceptance limits. Analytes with low LCS recoveries are qualified (UJ). Dichlorodifuoromethane is qualified (J-) for possible low bias. Since recovery of 2-dibromo-3-chloropropane is a marginal outlier, the data remains unaffected. None of the above noted QC issues significantly impact the usability of the QA data. All QA data is acceptable for its intended use. Data comparison between laboratories exhibits mostly good agreement except for VPH targets, VPH carbon ranges, and EPH carbon ranges.

Quality Assurance Split Sample Data Comparison Summary October 2005 Sampling Round

Project: Devens Areas 32/43A (DRMO/POL Yard, Devens, Massachusetts

	Overall Ag	reement (1)	Quantitative Agreement (2)				
Test Parameter	Number	Percent	Number	Percent			
VOCs	62/64	97	9/11	82			
VPH (targets)	6/7	86	1/2	50			
VPH (carbon	2/3	67	0/1 ·	0			
EPH (targets)	17/17	100	N/A	N/A			
EPH (carbon ranges)	2/3	67	0/1	0			
Trace Metals	3/3	100	1/1	100			
Total	92/97	95	11/16	69			

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.

ATTACHMENT A DATA COMPARISON TABLES

Table 1
Groundwater Analytical Results - October 3-5, 2005 Sampling Event
Devens Areas 32/43A (DRMO/POL Yard)
(SHEET 1 of 2)

	Well No.		Reporting Limit	32M-01- 18XBR	32M-01- 18XBR QA	RPD
PARAMETER (METHOD)	MCP	Site-Specific	µg/L	μg/L	μg/L	
	GW-1	Cleanup Goals	<u> </u>	F3'-	M9, 2	
VOC (8260)	μg/L	µg/L				
Volatile Organic Compounds	Ma.r.	M9, E				
Vinyl chloride (chloroethene)	2	2	1.0	1.0 U	2.0 U	NO
trans-1,2-Dichloroethene	100	55	1.0	1.0 U	2.0 U	NC NC
cis-1,2-Dichloroethene	70	55	1.0	0.5 U	2.0 0	NC NC
1,1,1-Trichloroethane	200	5	1.0	1.0 U	2.0 U	NC NC
Trichloroethene	5	5	1.0	0.6 U	2.0 U	NC NC
1,3-Dichlorobenzene	40	600	1.0	209	190	10
1,4-Dichlorobenzene	5	75	1.0	120	100	8
1,2-Dichlorobenzene	600	600	1.0	1450	1,500	16
Dichlorodifluoromethane (Freon 12)			1.0	2.0 U	2.2 J-	NC NC
Chloromethane		-	1.0	1.0 U	5.0 U	NC NC
Bromomethane	10		1.0	1.0 U	2.0 U	NC NC
Chloroethane	-	-	1.0	2.0 U	5.0 UJ	NC NC
Trichlorofluoromethane (Freon 11)	-	-	1.0	2.0 U	2.0 U	NC
1,1-Dichloroethene	7		1.0	1.0 U	1.0 U	NC NC
Acetone	3,000	<u> </u>	5.0	25.0 U	10 UJ	NC NC
Carbon disulfide	-	-	1.0	1.0 U	2.0 U	NC NC
Methylene chloride	5	-	1.0	5.0 U	5.0 U	NC NC
Methyl-t-butyl ether	70	-	1.0	10 U	2.0 U	NC
1,1-Dichloroethane	70		1.0	1.0 U	2.0 U	NC
Vinyl acetate	-		1.0	5.0 U	NR NR	NC
2-Butanone	350	_	5.0	25.0 U	10 UJ	NC NC
Bromochloromethane	-	<u>-</u>	1.0	1.0 U	2.0 U	NC
Tetrahydrofuran	-	-	14	5.0 U	10 U	NC
Chloroform	5	-	1,0	1.0 U	2.0 U	NC
Carbon tetrachloride	5	-	1.0	1.0 U	2.0 U	NC
Benzene	5	-	1.0	1.0 U	1.0 U	NC
1,2-Dichloroethane	5	-	1.0	1.0 U	2.0 U	NC
1,2-Dichloropropane	5	_	- 1.0	1.0 U	2.0 U	NC
Dibromomethane	-	_	1.0	1.0 U	2.0 U	NC
Bromodichloromethane	3	-	1.0	1.0 U	2.0 U	NC
cis-1,3-Dichloropropene	0.5 *	-	1.0	0.5 U	1.0 U	NC
4-methyl-2-pentanone	350	-	5.0	25.0 U	10 UJ	NC
Toluene	1,000	-	1.0	1.0 U	2.0 U	NC
trans-1,3-Dichloropropene	0.5 *	-	1.0	0.5 U	1.0 U	NC
1,1,2-Trichloroethane	5	-	1.0	1.0 U	2.0 U	NC
Tetrachloroethene	5	-	1.0	1.0 U	2.0 U	NC
2-Нехапопе	-	-	5.0	10.0 U	10 UJ	NC
Dibromochloromethane	2	-	1.0	1.0 U	2.0 U	NC
Chlorobenzene	100	-	1.0	83.9	87	2
1,1,1,2-Tetrachloroethane	5	-	1.0	1.0 U	2.0 U	NC
Ethylbenzene	700	-	1.0	1.0 U	2.0 U	NC
m-Xylene & p-Xylene	10000 *	-	1.0	2.0 U	2.0 U	NC
o-Xylene	10000 *	-	1.0	1.0 U	2.0 U	NC
Styrene	100	-	1.0	1.0 U	2.0 U	NC
Bromoform	4	-	1.0	1.0U	2.0 U	NC
1,1,2,2-Tetrachloroethane	2		1.0	0.5 U	2.0 U	NC
1,2,3-Trichloropropane			1.0	1.0 U	2.0 U	NC
1,2-Dibromo-3-chloropropane (DBCP)			1.0	5.0 U	5.0 UJ`	NC
1,2,4-Trichlorobenzene	70		1.0	1.2	1.1 J	9
Hexachlorobutadiene	1	-	1.0	0.6 U	2.0 U	NC
Naphthalene	140	-	1.0	1.0 U	5.0 U	NC
2,2-Dichloropropane	-	-	1.0	2.0 U	2.0 U	NC

Table 1 Groundwater Analytical Results - October 3-5, 2005 Sampling Event Devens Areas 32/43A (DRMO/POL Yard) (SHEET 1 of 2)

	Well No.		Reporting Limit	32M-01- 18XBR	32M-01- 18XBR QA	RPD
PARAMETER (METHOD)	MCP	Site-Specific	μg/L	μg/L	μg/L	
	GW-1	Cleanup Goals		100 1 0000000 0000000 100		200 1 2 100
1,1-Dichloropropene	-	-	1.0	2.0 U	2.0 U	NC
1,3-Dichloropropane	-	-	1.0	1.0 U	2.0 U	NC
Bromobenzene	-	-	1.0	2.0 U	2.0 U	NC
n-Propylbenzene	-	-	1.0	0.8 J	2.0 U	NC
2-Chlorotoluene	-	-	1.0	1.0 U	2.0 U	NC
4-Chlorotoluene		-	1.0	1.0 U	2.0 U	NC
1,3,5-Trimethylbenzene	-	-	1.0	1.0 U	2.0 U	NC
tert-Butylbenzene	-	-	1.0	1.0 U	2.0 U	NC
1,2,4-Trimethylbenzene		-	1.0	0.6 J	2.0 U	NC
sec-Butylbenzene	-	-	1.0	0.5 J	2.0 U	NC
p-Isopropyltoluene	-	-	1.0	0.7.J	2.0 U	NC
n-Butylbenzene	-	-	1.0	1.0 U	2.0 U	NC
1,2,3-Trichlorobenzene	-	-	1.0	1.0 U	2.0 U	NC

Bold numbers indicate exceedance of MCP GW-1 standard

Numbers in shaded areas indicate exceedance of site-specific cleanup goals

NR = Compound not reported by the QA laboratory

R = Result was rejected based on inability to recover compound (0% recovery) from the matrix spike and matrix spike duplicate.

NC = Not calculated

^{*} Regulatory standard is for total 1,3-dichloropropene and total xylenes

U = Compound not detected at a concentration above the reporting limit.

UJ = Compound tentatively not detected at reported concentration due to blank contamination or reporting limit is estimated.

J = Estimated value less than the reporting limit or an estimated value resulting from data evaluation

J+ = Value may be biased high based on data evaluation of laboratory results.

Table 1 Groundwater Analytical Results - October 3-5, 2005 Sampling Event Devens Areas 32/43A (DRMO/POL Yard) (SHEET 2 of 2)

	Well No.	•	Reporting Limit	32M-01-18XBR	32M-01-18XBR- QA	RPD
PARAMETERS	MCP	Site-Specific	μα/L	µq/L	µg/L	***************************************
	GW-1	Cleanup Goals		P 9 -		
	µg/L	μg/L				
VOLATILES PETROLEUM						
HYDROCARBONS (MA DEP)						
Ranges						
C5-C8 Aliphatic Hydrocarbons	400	400	3.00	162 U	100 U	NC
C9-C12 Aliphatic Hydrocarbons	4000	4,000	2.00	686	1000 U	NC
C9-C10 Aromatic Hydrocarbons	200	200	1.0	1,150	3,800	107
VPH (MA DEP) Target VPH						
Analytes						
Methyl tert-butyl ether	70	-	1.0	1.5 U	1.0 U	NC
Benzene	5	5	1.0	5.0 U	1.0 U	NC
Toluene	1000	-	1.0	5.0 U	1.0 U	NC
Ethylbenzene	700	500	1.0	114	1.0 U	NC
m,p-Xylene *	10000	-	2.0	10.0 U	1.0 U	NC
o-Xylene *	10000	-	1.0	5.0 U	1.0 U	NC
Naphthalene	140	-	1.0	5.0 U	1.2 J	NC
Extractable Petroleum						
Hydrocarbon Ranges						
C9 - C18 Aliphatic Hydrocarbons	4000	4,000	60	228 J	920	121
C19 - C36 Aliphatic Hydrocarbons	5000	5,000	80	200 U	100 U	NC
C11-C22 Aromatic Hydrocarbons	200	200	170	150 U	100 U	NC
Target PAH Analytes						NC
Naphthalene	140	-	10	0.6 UJ	2.0 U	NC
2-Methylnaphthalene	10	-	10	0.5	2.0 U	NC
Acenaphthylene	300	-	10	0.2 U	2.0 U	NC
Acenaphthene	20	-	10	0.2 U	2.0 U	NC
Fluorene	300	-	10	0.2	2.0 U	NC
Phenanthrene	300	-	10	0.4	2.0 U	NC
Anthracene	2000	-	10	0.2 U	2.0 U	NC
Fluoranthene	90	-	10	0.2	2.0 U	NC
Pyrene	80	-	10	0.2 U	2.0 U	NC
Benzo(a)anthracene	1	-	10	0,2 U	2.0 U	NC
Chrysene	2	-	10	0.2 U	2.0 U	NC
Benzo(b)fluoranthene	1	-	10	0.2 U	2.0 U	NC
Benzo(k)fluoranthene	1	-	10	0.2 U	2.0 U	NC
Benzo(a)pyrene	0,2	-	10	0.2 U	2.0 U	NC
Indeno(1,2,3-cd)pyrene	0.5	-	10	0.2 U	2.0 U	NC
Dibenzo(a,h)anthracene	0.5	-	10	0.2 U	2.0 U	NC
Benzo(g,h,l)perylene	300	-	10	0.2 U	2.0 U	NC
ICP METALS 3010/6010B (Total						-
metals)					ĺ	
Arsenic	10	50	4.5	2.5 U	5.0 U	NC
Lead	15	15	2.7	2.5 U	5.0 U	NC
Manganese	-	3,500	0.7	11,600	12,000	3
		-1-55				

Bold numbers indicate exceedance of MCP GW-1 standard

Numbers in shaded areas indicate exceedance of site-specific cleanup goals

NC = not calculated

U = Compound not detected at a concentration above the reporting limit.

UJ = Compound tentatively not detected at reported concentration due to blank contamination or detection limit estimated due to low spike recoveries

 $^{{\}bf J}$ = Estimated value less than the reporting limit or an estimated value resulting from data evaluation

J+ = Value may be biased high based on data evaluation of laboratory results.

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978 318 5791 978 3188611	Email Address	Number of Containers Type of Containers (7260 8) 624 (7260 8) 624 (7260 8) 634			
ESS LAB Date Collection X Sample#	ça <u>.</u> ç	Number Type of (1996)	### ##################################	155	
Sample# Time & Collection & WILLIAM Sample WILLIAM STATE & Collection & WILLIAM STATE & Collection & WILLIAM STATE & Collection & WILLIAM STATE & Collection & WILLIAM STATE & Collection & WILLIAM STATE & Collection & WILLIAM STATE & Collection & WILLIAM STATE & Collection & WILLIAM STATE & Collection & WILLIAM STATE & Collection & WILLIAM STATE & Collection & WILLIAM STATE & WILL	Sample Identification (20 Ctax. or teas)		MT RCI	Menison	
0506+05 - XW	Trip Black	12 11			
V 1000 XGW	Trip Black 32M-01-13XBR	9 3	3 2		
	<u>-</u>				
05 × 60					
	Segman and the segment of the segmen				
Container Type: P-Poly G-Glass S-Sterile V-VOA Matrix: S-Sc	oil SD-Solid D-Sludge WW-Waste Water GW-Gr	ound Water SW-Su	rface Water DW-Drinking Water	O-Oil W-Wipes F-Filters	
Cooler Present Yes No Internal Use Only			37.7	No facility and the second of the second of the second of the second of the second of the second of the second	
Seals Intact Yes No NA: [] Pickup	Sampled by: Thomas O. Ma			,	
Cooler Temp: [] Technicians_	Comments:	ARCOLAL.			
Relinquished by: (Signature) Date/Time Received by: (Signature)	Signature) Date/Time Relinquished by	: (Signature) Di	nte/Time Received by: (Sign	nature) Date/Time	
-1600 KU92028	357539				
Relinquished by: (Signature) Date/Time Received by: (S	Signature) Date/Time Relinquished by:	(Signature) Da	te/Time Received by: (Sign	nature) Date/Time	

^{*}By circling MA-MCR, client acknowledges samples were collected in accordance with MADEP CAM VII A

CHAIN OF CUSTODY **ESS Laboratory** Division of Thielsch Engineering, Inc. Turn Time > Standard Reporting Limits ESS LAB PROJECT ID Other 185 Frances Avenue, Cranston, RI 02910-2211 If faster than 5 days, prior approval by laboratory is required # Shoulerd State where samples were collected from: Tel. (401) 461-7181 Fax (401) 461-4486 (MA) RI CT NH NI NY ME Electronic Deliverable ≫ Yes No www.esslaboratory.com 18 this project for any of the followings MA-MCP Navy (USACE) Format: Excel Access PDF Other 30 50-08. Other Co. Name Project # Project Name (29 Char. or less) Circle and/or Write Required Analysis US Army Corps of Engineers Devers Acco 32 PP13 TAL23 Contact Person Address Kathy Miller 696 Virginia Road Number of Containers State Type of Containers Concord 01742_ NIF Telephone #. Fax# Email Address 978318 8791 Collection **ESS LAB** Date COMP GRAB Sample# Time Sample Identification (20 Chat or less) 04 oct 05 Trip Blank 9 32M-01-14X0B 0831 3 2 0, 32M-01-14 YBR 1040 Container Type: P-Poly G-Glass S-Sterile V-VOA Matrix: S-Soil SD-Solid D-Sludge WW-Waste Water GW-Ground Water SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filters Cooler Present ____ Yes ____ No Internal Use Only Preservation Code: 1- NP, 2- HCI, 3- HSO, 4- HNO, 5- NaOH, 6- MeOH, 7- Asorbic Acid, 8- ZnAct, 9-Seals Intact ____ Yes ____ No NA: ____ [] Pickup Sampled by: Comments: Cooler Temp: _____ | | Technicians_ cooler pilled HP Received by: (Signature) Relinquished by: (Signature) Relinquished by: (Signature) Received by: (Signature) Date/Time Date/Time Date/Time Date/Time **科学/到在155** Received by: (Signature) Relinquished by: (Signature) Date/Time Date/Time Received by: (Signature) Date/Time Relinquished by: (Signature) Date/Time

^{*}By circling MA-MCP, client acknowledges samples were collected in accordance with MADEP CAM VII A

Division of Thielsch Engineering, Inc. 185 Frances Avenue, Cranston, RI 02910-2211 Tel. (401) 461-7181 Fax (401) 461-4486 www.esslaboratory.com Co. Name	b:
Tel. (401) 461-7181 Fax (401) 461-4486 www.esslaboratory.com State where samples were collected from: (MA) RI CT NH NJ NY MB Other Is this project for any of the following: MA-MCP Navy QSACE Other Co. Name Project # Project Name (20 Che. or less) Circle and/or Write Required Analysis	b.
Www.esslaboratory.com Compare	
Co. Name Project # Project Name (20 Che. or less) Circle and/or Write Required Analysis	
Co. Name Project # Project Name (20 Cher. or less) Circle and/or Write Required Analysis	
Contact Person Address	
City State Zip PO# Sign Fig. Sign Fi	
City State Zip PO# State Zip PO# State	
Telephone # Fax # Email Address O O O O O O O O O	
Email Address Collection Fax # Fax # Family Fax #	
Sample# Time at OO Brush Sample Identification (20 Clear, or less) 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	
0401605 - XW - Try Blak 2 11	
1150 NGN 32M-01-18XBR 9 3 3 2 1	
1410 x 32M-01-17XBR 9 3 3 Z 1 1	
1150 × 32m-DUP 9 3 3 2 1	
140 x 32M-01-17X8R-M5 9 33 2	
14/0 × 32M-01-17XBR-MSD 9 33 2	
12=5 × 32m-01-15×8R 8 3 Z Z 1	
1505 X 32M-01-16XBR. 9 3 3 2 1	
1630 NN 32M-EQB 7 22 2 1	WAG SAME
From WA 1-040C+2005	
Container Type: P-Poly G-Glass S-Sterile V-VOA Matrix: S-Soil SD-Solid D-Sludge WW-Waste Water GW-Ground Water SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filt	ers .
Cooler Present Yes No Internal Use Only Preservation Code: 1- NP, 2- HCI, 3- H:SO., 4- HNO., 5- NaOH, 6- MeOH, 7- Asorbic Acid, 8- ZnAct, 9-	
Seals Intact Yes No NA: [] Pickup Sampled by: Head Knowles Rottle A. H. H. B., Contracting: Comments:	
Cooler Temp: Comments:	Far Charles
Relinquished by: (Signature) Date/Time Received by: (Signature) Date/Time Relinquished by: (Signature) Date/Time Received by: (Signature) Date/Time	No.
1601 1 1930 94970285 7550 1 Date American	(MITTLES
Relinquished by: (Signature) Date/Time Received by: (Signature) Date/Time Received by: (Signature) Date/Time Received by: (Signature) Date/Time	

^{*}By circling MA-MCP, client acknowledges samples were collected in accordance with MADEP CAM VII A

ESS Laboratory CHAIN OF CUSTODY Page ____ of Division of Thielsch Engineering, Inc. Reporting Limits ESS LAB PROJECT ID Turn Time 🔀 Standard 185 Frances Avenue, Cranston, RI 02910-2211 If faster than 5 days, prior approval by laboratory is required # Standard State where samples were collected from: Tel. (401) 461-7181 Fax (401) 461-4486 MA) RI CT NH NJ NY ME
Is this project for any of the following:
MA-MCP Navy (USACE) Electronic Deliverable _X Yes No www.esslaboratory.com Format; Excel Access PDF Other See See See Other Co. Name Project # Project Name (20 Char, or less) Circle and/or Write Required Analysis US Army Corps of Engineers Devens Area 32 PP13 TALZ3 Contact Person Address Kathy Miller 696 Virginia Road Number of Containers Zip State Type of Containers MA 01742 Carrend Telephone# Fax# Email Address 978 318 879: MCP. METALS (13) RCRAS ESS LAB Collection Date MATRIX GRAB Sample# Time Sample Identification (20 Char. or less) 03 02+05" Trip Black 9 32M-92-01X 3 1128 Q XGN 3 3 1340 2 SHL-15 Container Type: P-Poly G-Glass S-Sterile V-VOA Matrix: S-Soil SD-Solid D-Sludge WW-Waste Water GW-Ground Water SW-Surface Water DW-Drinking Water O-Oil W-Wipes F-Filters ____ Yes ____ No Cooler Present Internal Use Only Preservation Code: 1- NP, 2- HCI, 3-H:SO; 4-HNO; 5-NaOH, 6-MeOH, 7-Asorbic Acid, 8-ZuAct, 9-___ Yes ___ No NA: ___ [] Pickup Seals Intact Sampled by: Comments: Cooler Temp: ____ [] Technicians_ cooler Toicked Relinquished by: (Signature) Date/Time Relinguished by: (Signature) Date/Time Received by: (Signature) ; Date/Time Received by: (Signature) Date/Time 030005 / Was 3651 CO Steen M. Relinquished by: (Signature) Date/Time Received by: (Signature) Relinquished by: (Signature) Date/Time Date/Time Received by: (Signature) Date/Time

^{*}By circling MA-MCP, client acknowledges samples were collected. In accordance with MADEP CAM VII A

APPENDIX G

Mann-Kendall statistics

Mann-Kendall Test on Selected Parameters from 32M-01-18XBR

Trichloroet	nene - 32l	VI-01-18XBI	₹			
	1	2	3	4	5	
	Apr-02	Dec-03	May-04	Oct-04	Dec-05	
	-1	1	-1	-1	**************************************	
	-1	0	-1			
	-1	-1				
	-1					
SUM:	-4	0	-2	-1		
Total:	S=	-7	n=	5		p= 0.< 0.1 (interpreted)

Conclusion: Significant decrease at 90%

1,3-dichlor	obenzene	- 32M-01-1	8XBR					
	1	2	3	4	5	6	7	8
	Apr-02	Oct-02	Jun-03	Dec-03	May-04	Oct-04	Jun-05	Dec-05
	-1	1	-1	1	-1	1	-1	
	-1	1	1	1	-1	-1		
	-1	1	1	1	-1			
	1	1	1	-1				
	-1	1	-1				,	
	-1	-1						
	-1	_	_					
SUM:	-5	4	1	2	-3	0	-1	
	S=	-2	n=	8		p=	0.452	

Conclusion: Not significant at 90%

1,4-dichlor	obenzene	- 32M-01-1	8XBR					
	1	2	3	4	5	6	7	8
	Apr-02	Oct-02	Jun-03	Dec-03	May-04	Oct-04	Jun-05	Dec-05
	-1	1	-1	1	-1	1	-1	
	-1	1	1	1	-1	-1		
	-1	1	1	1	-1			
	. 1	1	1	-1				
	-1	1	-1					
	-1	-1						
	-1							
SUM:	-5	4	1	2	-3	0	-1	
	S=	-2	n=	8		p=	0.452	

Conclusion: Not significant at 90%

Mann-Kendall Test on Selected Parameters from 32M-01-18XBR

1,2-dichloro	benzne -	32M-01-18	XBR				,	
	1	2	3	4	5	6	7	8
	Apr-02	Oct-02	Jun-03	Dec-03	May-04	Oct-04	Jun-05	Dec-05
And by a Grant Tourist Collection and Annual Collection of Annual Collec	-1	1	1	1	-1	1	-1	
	-1	1	1	1	-1	-1		
	-1	1	1	1	-1			
	1	1	1	-1				
	-1	1	-1					
	-1	-1						
	-1							
SUM:	-5	4	3	2	-3	0	-1	-
	S=	0	n=	8		p=	0.548	

Conclusion: Not significant at 90%

C9-C12 Alij	phatics - 3	32M-01-18X	BR					
	1	2	3	4	5	6	7	8
	Apr-02	Oct-02	Jun-03	Dec-03	May-04	Oct-04	Jun-05	Dec-05
	-	-	1	1	-1	-1	1	
	-	-	1	1	-1	-1		
	-	-	1	-1	-1			
	-	-	1	1				
	-	-	1					
	-	-						
	-							
SUM:	0	0	5	2	-3	-2	1	
	S=	3	n=	6		p=	0.36	

Conclusion: Not significant at 90%

C9-C10 Arc	omatics -	32M-01-18)	(BR					
	1	2	3	4	5	6	7	8
	Apr-02	Oct-02	Jun-03	Dec-03	May-04	Oct-04	Jun-05	Dec-05
de foldamen mountain Addresses and supplies a sequence has	-1	-1	1	1	-1	-1	1	
	-1	-1	1	1	-1	-1		
	-1	1	1 -	-1	-1			
	1	1	-1	-1				
	-1	-1	-1					
	-1	-1						
	-1							
SUM:	-5	-2	1	O	-3	-2	1	
	S=	-10	n=	8		p=	0.138	

Conclusion: Not significant at 90%

Prepared by: K. Winship, 07/06/06 Checked by: S. Reed, 07/10/06

APPENDIX H

Monitoring Well Inspection and Maintenance Record

	Total Depth			
Well ID	(Feet below top of PVC)	Problems Noted	Recommendations	Repairs made in January 2006
TICH ID	top on rej	Unable to locate well. Poss, covered by new pavement and	Determine if well was properly	
32M-01-04XBR	?	new electric gate or landscaping.	abandoned.	none.
02111-01-017(0)(•	Grooms gave as same as approximation	Replace well ID; remove old	
32M-01-08XOB	24.3	No Label; Old sample tubing dropped inside well	tubing & discard.	none.
 •			Replace lock, clean out sait	
			deposits and make sure lid	
32M-01-13XBR	23.3	No Lock; Abundant salt deposition inside road box	securely closed.	Road box and surface seal replaced. Road box set slightly below grade.
32M-01-14XOB	29.8	No issues noted	None.	none.
32M-01-14XBR	46.22	No issues noted	None.	none.
		Surface seal cracked & degraded. Abundant salt deposition		
32M-01-15XBR	44.1	within road box.		Road box and surface seal replaced. Road box set slightly below grade. Road box and surface seal replaced. Well redeveloped using a whale-
		Surface seal heavily cracked and degraded; compression cap	Replace road box/surface seal;	pump to surge and pump. Initial purge water included sand sized material
		shattered? Abundant black sediment/debris within annulus	Redevelop well; Replace	and off scale turbidity. Final turbidity 16 NTU's at 1.25 GPM, approx. 25
32M-01-16XBR	30.93	and well riser; some silt on bottom.	compression cap.	gallon purged.
			Check amount of siltation and	
32M-01-17XBR	54.05	Some sign of siltation.	poss, need to redevelop.	none.
32M-01-18XBR	23.88	No Lock	Add padlock.	none.
32M-92-01X	26.15	slight siltation. No major issues noted.	Check amount of siltation.	none.
			Replace well ID; Check total	
1			depth to check amount of silt in	
32-M-92-03X	35.55	Missing well ID; Slightly silty on bottom	screen.	none.
			Replace road box and seal. Add	Road box and surface seal replaced. Road box set slightly below grade.
32Z-01-05XOB	35.21	No lock; No ID; No surface seal remaining.	lock & ID.	Road box and surface seal replaced. Road box set signly below grade.
		Not also to Old annually believe decreased in old a small	Relabel; Remove old tubing & discard.	none
32Z-01-06XBR	28.7	No Label; Old sample tubing dropped inside well Faded ID.	Relabel.	none.
32Z-01-07XOB	24.94	Faded ID.	Kelabel.	Tione.
Ì		Minor snow plow damage, but seal and road-box intact; No		
		lock or ID./ Snow plow sheared off 1/2 of lid and damaged		
32Z-01-09XOB	33.2	road-box frame. Interior annulus filled with road sand.	Replace missing lock & ID.	Road box and surface seal replaced. Road box set slightly below grade.
		No lock; Surface seal heavily cracked & degraded. Heavy salt	replace road box/ surface seal;	
32Z-01-10XBR	22.26	deposition inside road box	Replace lock.	Road box and surface seal replaced. Road box set slightly below grade.
	•		Replace road box/surface seal;	
		No Lock; No ID; Material in annulus to same height as well	redevelop well; replace lock &	
32Z-01-11XBR	17.11	riser & running inside well; Surface seal cracked and loose	ID.	Road box and surface seal replaced. Road box set slightly below grade.
			Add well ID; use internal PVC	
			cutter to cut flush end; adjust	
			PVC elev. based on amount of	
		Missing well ID, No lock on compression cap, old sample	PVC removed or resurvey	
		tubing dropped inside well; compression cap does not seal	elevation; remove old unused	none
32Z-01-12XBR	37 <u>.6</u>	well due to jagged top end.	tubing	none.

Monitoring Well Inspection and Maintenance Record Devens AOC 32/43A LTM October 3, 2005

	Total Depth		· · · · · · · · · · · · · · · · · · ·	
Well ID	(Feet below top of PVC)	Problems Noted	Recommendations	Repairs made in January 2006
			Replace riser cap; Check	Trebatto Mado III BELLEGIS 2004
32Z-99-02	31.15	No cap on riser; slight siltation.	siltation amount.	none.
				Road box and surface seal replaced. Road box set slightly below grade.
				Well redeveloped using a whale-pump to surge and pump. Initial purge
		Road box damaged; incorrectly labeled; No lock; surface seal	Replace road box and seal;	water opaque & off scale turbidity. Final turbidity= 8 NTU's at 1.25 GPM,
43M-01-16XOB	33.74	broken up; slight evidence of debris inside well riser.	redevelop well; replace lock & ID correctly.	approx. 35 gallons purged. Final total well depth = 33.80 feet below top of PVC (0.3' sand and silt removed).
140M-01-10XOB	00.74	bloken up, alignit evidence of debits inside well fiser.	Replace lock; Check amount of	
			siltation and consider	
43M-01-16XBR	56.92	No Lock; slight siltation noted	redevelopment.	поле.
		•	Replace surface seal and add	
43M-01-17XBR	57.25	No lock; Surface seal broken up.	padlock.	Replaced damaged surface seal and reset road-box slightly below grade.
			Replace surface seal and add	
43M-01-17XOB	32,98	No lock; Surface seal broken & degraded.	padlock.	Replaced damaged surface seal and reset road-box slightly below grade.
		Road-box & lid are broken and jammed shut. Unable to open	1	Driller used internal PVC cutter to trim off top 0.33 feet of PVC and
		to measure water level or assess well condition. Find -20XOB	.	installed new compression cap. Replace surface seal and road box. Use
		totally missing road box and top end of PVC riser. Road		whale pump to redevelop. Remove approx, 20 gallons of turbid water.
43M-01-20XOB	33.23	sand/salt and slush flowing down well from melting snow.	Replace road box and assess	Pumped dry numerous times and let recover. Final turbidity down to 11
43W-01-20AOB	33.23	There is a jagged vertical crack running down PVC.	well condition once open.	NTU's. Final total depth - 33.23 feet below top of PVC.
			Replace road box; Check total	
ļ			depth to check amount of	
		No lock or compression cap; Surface seal broken and road-	siltation; replace missing	
43M-01-20XBR	77.8	box damaged; some silt on bottom.	compression cap and padlock.	Road box and surface seal replaced. Road box set slightly below grade.
		Found well unlocked (had been cut off?); found old tubing	Replace lock, investigate who cut off old lock?; remove old	
SHL-15	26,49	hanging inside well.	tubing	none.
SHL-25	37.2	Old tubing hanging inside well.	Remove old tubing & discard.	none.
		Unable to locate well. Poss. covered by new pavement and o		
63BO9901	?	landscaping.	abandoned.	none.
Cap Coppa	•	Unable to locate well. Poss. covered by new pavement and or		
63BO9902	?	landscaping.	abandoned.	none.
63BO9903	?	Unable to locate well. Poss. covered by new pavement and o landscaping.	r Determine if well was properly abandoned.	none
5555555	r	Unable to locate well. Poss. covered by new pavement and or		none.
63BO9904	?	landscaping.	abandoned.	none.
Disaletant m manag	-1 C-1-	L0 000F		

Black text = generated from October 3, 2005 assessment.

Red Text = Generated from December 2005/January 2006 assessment and repair activities.

APPENDIX I

Well Construction Information

Boring Logs and Construction Diagrams

	Project: F	+ Devens DRMO	Boring:	9 <u>2-01</u>	X Page: 3 of 3
	Depth/ Elevation (Pt.) USCS Symbol/ Core Stentiti	- Soll/Rock Description	Semple Number & Depth	Blow Count & Recovery	Drilling Data
8 BORING LOG GENERAL DATA 1 pe Page: 3 of Xerox. Sent to USATHAMA: Borehole Number: 32 m - 12 - 0 h X Signature: A.T. Date Sent:		S#5 20-22 S: 11 - Sand of granite up to 2.5 " S: 11 30% Sund Wet 20-21 Hus = Oppor in arger S#6 22-22.8 S: 11 - Sand of granite Fragme up to 2" S. 11 - 30% Sund 40% Franite 30% 30% Wet Bottom of arger hole = 24	R= 1.0 S=5 Huve D R= .8' S=6 Huve O		Note 20: 1) Drove 2X 20-22 2) Drove 2X 22-24 3) Augered ahead to 24! Refusal. 4) Will attempt to Set well at 23.5' Selling running Sands into augers 6) Place bettom of Screen at 23.2' 7) Top of sand pack a 9.0' 8) Top of bentonite seal 4.0 9) Place initial grout. Use-25 secer: 24016 = 40 Casing on well w/ pad lock. ENO 10/17/42

nesonda Lpn

	WELL CONSTRUCTION LOG	
		Page: 1 of 3
1 1	She io: Ff. Devens DRMO	Installation Difficulties:
	Well Number: 32M-92-01X	Same propring rands at T.A.
1 1		- Code Dibbins - Sabar 84 - 1.1).
111	Job Number: <u>UC 4043</u>	
	Today's Date: 10/17/92	
:		Remarks: Well sext at designed
	Well Start/Completion Dates:	1 1
	10/17/92 1 10/17/92	depth
Sent to USATHAMA: Date Sent:		
₹ <u>.</u> !		
5 5 1	Check as appropriate, record depths as below gr	ound surface (BGS)
Sent		
⊃ . I	Screen:	
Date D	Manufacturer: BUFFALO Well 5.	م داره د
<u> </u>	LIC LICE	4400
- & 1	Schedule: 40	
, co	Type: Continuous Slot	
	- Perforated	
1 11		
1 1 1	Louvre	
1 1 1 1 1	Other Stotted &" apar	₹
1 11	· <u>-</u> ·	
1 1 1 1	Materials: Stainless Steel	
1 1 11	PVC X	
1 11		•
1 1 1 1	Other	
1.3	Length:	
, 92-31	Screened Interval: 13.9-23.9	
	Contented theretal,	3.5
3/1000	Diameter: (ID) 4/1	(OD) 14.05 14.05 4.5"
12		_ (00)
1 😅 🕛	Thickness: / '	
- P	Siot: Size (inches): 0.010 11 11	d Configuration: Hand and A
Page 1 of Signature:	ONE ONE (MONEY).	(1 configuration, Fig., 30x4c)
多差・	Open Area per Foot of Screen:	
	}	
- "	·	
.l l	Casing	· · · · · · · · · · · · · · · · · · ·
1 .1	Manufacturer: GVFF ALO VJELL	SUPPLIES.
] []	Schedule: HO	
	. Material: Stainless Steel	
1 1		
1 11	PVC X	
	Other	
	Length:	<u> </u>
	Diameter: (ID)	(00) 4.05
1 71	1	
1 '	L #	
254	Thickness: Yy	
I그어I		Thread
2	Jour(s): Design HO M 1-100	I Versa
125	Composition	· · · · · · · · · · · · · · · · · · ·
1 はかし	Depth(s)	
コスドー	•	
]E'1	Centralizer: Design	
l M F	Composition	
1221	Depth(s)	
\X E I		
7.3	Solvent, Glues, Cleaners: Manufacturer	
	Use(\$)	·- <u></u>
WELL CONSTRUCTION Well Number: 32 m -	Protective Casing: Material	RBON STEEL
1 - 1	Protective Casing: Material 1041 (A	7700M 77587
74	Inner Diameter	

•

deposit of the cology and environment

End

re voied paper

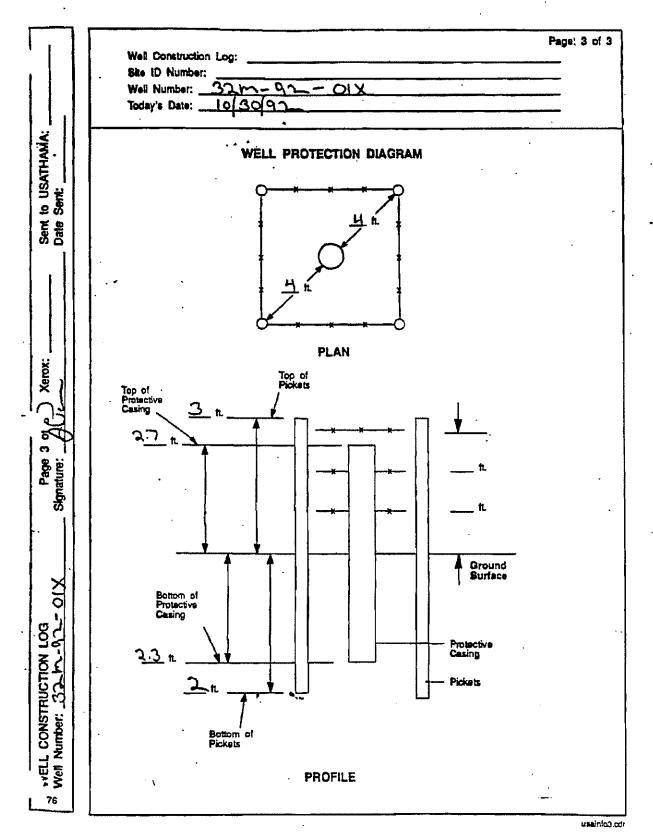
		Projec	*: F }	Devens Diamo	Boring:	10-ef	Page: 2 of <u>3</u>
 		Depth (Pt.)	USCS Symbol/ Core Sketch	Sol/Rock Description ROUND SURFACE	Sample Number & Depth	Blow Count & Recovery	Drilling Data
	Date Sent:			5#1 , Brown worth loam	A* 1.3	7	Acte: 1) All samples driven w/140 16 hours N/30" Front-11
				04 Brown of 40% graves	गःवड		a) Depth + R in Feart 3) Depth + management
	THAMA			1:1-1.3 dame as . H-1 with phyllise 4 growts.		10	When below suffered 4) Augured w/ 64" I.D. H.S.A.
	Sent to USATHAMA:	2 =			Hunto_		
.	Sen	5	·	5-5.67 toorly sorted	R=1.0	5	
				5-5.67 Poorly sorted gravelly sand ul piccus up to !!! 5.7-6 Fine - grained sand	11:54	11	
_	Xerox:			apartz		11	114 0 0
-	D. B.	7-=			Huve 0	20	Note 0: Drove
	2 of ture:	10=		5=3 10-12 R Sand 100% no grave	1.7	A 43	Drove 2x 5-7
	Page: 2 of Signature:			Percolation banding at 10.4, 11.0 +11.5.	روزوا	800	4) Drove 2X 15-17
			•	Loose + Dog		45	·
	1TA 2-0/2	12	•		Hauso	10	·
	RAL DA			5*4 15-17 5:1+	R= .8	27 41	
	BORING LOG GENERAL DATA Borehole Number: 32 M- 12 -			all pravite pieces up to	1241	1532	·
	NG LOC	. =		15.5-15.8 5itt w/ granite up to 21: 30% Damp 1048 4/4 Dk malhadel.		19 Kg 15	
		7		elightly cohosive brown	How= O	19	
L	50						

A-8

Page: 2 of 3 Well Construction Log: Site ID Number: Well Number: 32 M-92 Today's Date; Sent to USATHAMA: WELL CONSTRUCTION Date Sent: Cover Top of Protective Casing Protective Casing Cap/Plug 1/4" Drainage Port "Stick-up" Coarse Gravel Blanket <u>3.5 t</u>t <u> ጔ. 7</u>ቈ Well Casing/ Riser Ground ~ .5' + Surface internal Mortar Coliar Bottom of Protective Casing <u>፯.ኌ</u>ቈ Grout Page 2 Signature: Quantity 5-9616 suks Composition Iron sind Tope I Portland (HBOIL) Grout Bottom/ Seal Top 4.0 t Bentonite Seal Seal Bottom/ Pack Top 9.0 h. Quantity 3.50/3 sacks Composition Cates X10-٥ Por sold chios Top of Screen 13.77 h. Well Number 33 m - 93. Well Screen 0 ٥ Fifter Pack Quantity 5 585 KS 0 Composition Bottom Screen 23.7h. Bottom of Plug 23.9 ft. **Bottom of Floor** 0 Cap/Plug Pack 240 ft. 75

usu info2.cd:

10-1-28 2500



Stone & Webster **Engineering Corporation**

BORING LOG

Boring 32Z-99-02X J.O. 0500032

Sheet 1 of 1

Date Start - Finish: 03/31/99 - 03/31/99

Site: AOC 43A & 32, Devens, Ma

Client: Army Corps of Engineers

Coordinates:

Groundwater Depth: 23.1

Contractor: Stone & Webster

ft on 04/01/99

Driller: NH Boring

Casing Used: 2.25

Depth to Bedrock: NA

Total Depth Drilled: 29.5 ft

Ground Elevation:

Logged by: Joseph Coyne

Rig Type:

Methods:

Drilling Soil: Hollow stemmed augers

Sampling Soil: Drilling Rock:

Comments:

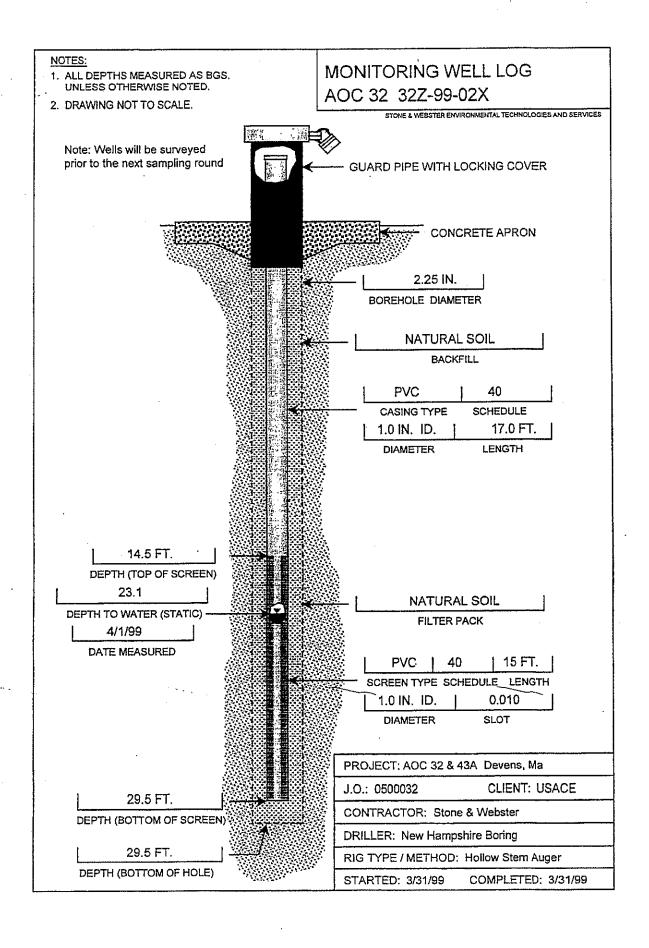
(ft)	Depth (ft)	Samp Type	No.	Blows or Recovery RQD	SPT N V a l u e	USC Symbol	Sample Description
0.0_	0 -						Light brown medium, well sorted sand. PID = 0.0 ppm
-5 -	5						Light brown medium sand. PID = 0.0 ppm.
-10	10-						Light brown medium sand. PID = 0.0 ppm.
-15 —	15-						Light brown medium sand. PID = 0.0 ppm.
-20	20-						Light brown medium sand. PID = 0.0 ppm.
-25 -	25 -						Light brown medium sand, PID = 0.0 ppm
-30	30 -		-	·			
-35	35						
-40 -	40						

Legend/Notes

- · Datum is
- ∑ indicates groundwater level.
- indicates location of samples.
- · Blows = number of blows required to drive 2" O.D. sample spoon 6" or distance shown using 140 pound hammer falling 30".
- \cdot () = inches of sample recovery.
- · Recovery = % rock core recovery.
- · RQD = Rock Quality Designation.
- · SPT N = Standard Penetration Test resistance to driving, blows/ft.
- · USC = Unified Soil Classification system.
- * indicates use of 300 pound hammer.

· Sample Type:

Approved Date 06/21/99



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Page: 2 of 2 Well Construction Log: Site ID Number: Well Number: Today's Date; Sem to USATHAMA: WELL CONSTRUCTION Date Sem: Cover Top of Protective Casing Key Padlock Protective Casing Cap/Plug 1/4" Drainage Pon "Stok-up" Coerse Gravel Blanket 2.5 ft Well Casing/ Riser විතයක්ව 4 8 4 4 - 5' + Surface internal Montar Collar Bottom of Protective Casing Grout Quantity 846 Composition Groun Bottom/ Seal Top Elemonite Seal Sual Bottom/ Pack Top Quantity 100 Composition 0 0 23.2 Top of Screen Well Screen Þ WELL CONSTRUCTION LOG Well Number: 3211-92 Filter Pack Quantity 400 My 0 Composition S/N/D Bottom Screen Bottom of Plug Bottom of Floor Pack ۵ Cup/Piug 49

asanb2.cd

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Description Solly Const. Description Desc	Project:	DEVENS /DRMO	Boring:	82M-92-C	P3X Pape: 1601 2
S THE STATE OF THE	on (PL) Symbol/ Ketch	Spil/Rock Description	Sample Number & Depth	Biow Count & Recovery	Drilling Data
Dente board with Buttle of the state of the	5	SAWDY LOPE - DUSKY YELDWEST-BAY. (10 M 2/2), phy, mar-partic ("- \$' bhotely smaj-pale you-ban(1040 b/2), thus, the [2001, phose] - 15% chief to be	NA NA	NA	Mall Emples being by
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PRODUCTION MIST AS ABOVE EMERY PRODUCTION MAN AS ABOVE WITH HEAVY SO STATE OF STAT	, =	15'- 20' GRAV, SAME AS ABOVE		NA	More S':
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DEAR TO SO, REPURL OF -25.5. DINTMLEFIAL OF 4"ID CASING STREAM ROUSE BUTTING FROM SESSION TO ASSUME SOLUTE ATTING FROM SESSION FROM TO 29", RUSELING SESSION ROUSE ROUSE AND A TO REFUSAL CLY). DIROT EX 29" 51" CAMBOTOM TO REFUSAL CLY). DIROTE EX 29" 51" CAMBOTOM TO REFUSAL MET SET THE SAME. RETE EX DIROTE TO SUP HUCKEING DIROTE TO SUP HUCKEING DIROTE TO SUP TO SUP TO SESSION FOR SOME. REFUSAL MET SESSION BULL AT 28-3" URLEAM WHY ENLY SESSION TO SESSION WHY ENLY SESSION BULL AT 28-2" MITTERIAL STREET SAME MANUAL TO SUP TO	55	arthy werefered bedock, vet	<u> </u>	Ma / C. 5	West parts
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A-20

Sent to USATHAMA: Date Sent: 10-26-72 (747)	WELL CONSTRUCTION LOG Site ID: DRMO (32) Well Number: 32M-92-53X Job Number: 10-19-92 Well Start/Completion Dates: 10-18-92 1 10-19-92	
Sent to USATI Date Sent	Check as appropriate, record depths as below ground surface (BGS) Screen: Manufacturer: Schedule: Formula: Continuous Slot Perforated Louvre Other	
Wallet -	Materials: Stainless Steel PVC Other Length: /0 Screened Interval: 33.2'-23.2' Diameter: (ID) 4" (OD) 4.05'' Thickness: /4''	
Page A' of Signature	Slot: Size (inches): 0.0/0 Configuration: Open Area per Foot of Screen: Casing Manufacturer: BUFFAZO WELL SYADLIES Schedule: 40 Material: Stainless Steel	
277-92-03X	PVC Other. Length: 25.2 Dismeter: (ID) 4" (00) 4.05" Thickness: V4" Joint(s): Design ASTM - F 480 THICEAD Composition Depth(s)	
WELL CONSTRUCTION LOG Well Murber: 32/11-92-4	Centralizer: Design Composition Depth(s) Solvent, Glues, Cleaners: Manufacturer Lise(s) Protective Dasing: Material Inner Diameter G CARBON STEEL	

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l A	IAI ALD	EY & RICH	Š I		TEST BORING REPORT											Boring No.32Z-01-04XBR														
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ł			all (in.)]	24 30 - Casing: driven Hoist/Hammer: Winch Doughnut Hammer								FORMOR See LIST																	
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€			Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	Symbol		V	isual-i	Mar	nual Ide	entifica	tion a	nd De	scr	ription			9		92	Ę							
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5 1	D	ate	Time		psed (hr.)	Botton	n Bo	ttom	Water	_ 		Open En				;	Screen	`		Overburden (lin. ft.) 11.3 Rock Cored (lin. ft.) 25.0										
- 1.	121	27/01	0700	- 	16	of Casir 11.0		21 2 20 0 11 Undisturbed Sample Cuttings Sa					Samples S4, C5																	
183		27/01 11/02	0730		Days	- 11.0		5.0	23.8	S		Split Spe		···thic			Grout													
USCE	G Geoprobe Seal Bentonite Seal					Boring No. 32Z-01-04XBR																								
TB1 VSCSLIB3.0LB	Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low Toughness: L-Low M-Medium, H-High Dry Strength: N-None, L-Low.				.ow, M-Medium, H-High w, M-Medium, H-High, V-Very High																									

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HAU AUDI	NCH	CORE BORING REPORT								Boring No. 32Z-01-04XBR File No. 10884-056 Sheet No. 2 of 2
epth (ft) .	Drilling Rate Min./ft	Run No.	Depth	Recovery/RQD		Weath-	Well Dia-	Elev./ Depth	Visual Des	
			(ft)	in.	%	ering	gram	(ft)	and Remarks	
			: ————————————————————————————————————					253.5	SEE TEST BORING REPORT I	FOR OVERBURDEN DETAILS OCK AT 8.0 FT
						į		8.0	Note: Advanced borehole with roller t	bit to 11.3 ft.
- 10 -									,	
										•
	5	CI	11.3 16.3	57 37	95 62	Fresh to			C1: Very hard, slightly weathered to to coarse grained granitic GNEISS. Gnei	fresh, mottled white-gray fine to very
	4					Slight			angles. Primary joint set at moderately moderate, smooth to rough, planar to	/ to high angles, extremely close to
	5								Secondary joints set at low angle, extrough, planar to stepped, oxidized, tig	emely close to moderate, smooth to
	5								Note: 3.0 in. inclusion of Quartzite in	•
	4								Troops 5.0 m. motasion of Quartette in	top of the turn.
	7	C2	16.3 21.3	57 34	95 57	Fresh to			C2: Same as above, except joints very	close to moderate.
	8				J.	Slight			pro	DOOK
	7									ROCK- yer Granite)
- 20 -	8							•		
	8							240,2		
	15	C3	21.3 26.3	53 31	88 52	Fresh to		21.3	C3: Very hard, fresh to slightly weath	ered, gray, aphanitic to fine grained
	16			J.	J.	Slight			QUARTZITE. Foliation extremely this close to moderate, smooth to rough, p	n at high angle. Joints high angle, lanar to stepped, discolored, partly
	18								oxidized, tight to open.	
· 25 -	18								7	
	16									
	8	C4	26.3 31.3	53 33	88 55	Fresh			C4: Same as above.	•
	7		21.2	7,5	J.J	to Slight			Note: Sand infilling at approximately	27.0 to 27.3 ft.
	6								DED	Door
30 -	6									ROCK- n Hills Formation)
	8									
	8	C5	31.3 36.3	39 17	65 28	Fresh to			C5: Same as above, except secondary	joints set at low angle, very close to
	7					Slight			moderate, smooth to rough, stepped to Note: Oxidized zone from 32.6 to 33.	
	6								21000. OAIMIZOU ZOIRO HORR 32.0 10 33	<i>ા</i> લ.
35	6								-BEDI	ROCK-
	8							225.2		
			·					36.3	BOTTOM OF EXP	LORATION 36.3 FT

HAY	LEY& DRICH				··· ···	•	TEST E	BOR	ING REPOR	Γ			В	ri	กรู	, N	lo.	322	Z-0	1-0	5X	OE
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			Casir	19	Sam	pler	Barrel		Drilling Equipment a	nd Prod	edures	1 -	rille							ood		
Туре	,		SW	,	5	;	-	Rig M	ake & Model: Mobile	B-57 T	nick	H	& A	R	ep.		W	. R	ubi	k		
Insid	e Dian	eter (in	6.0	}	13	3/8	-	Bit Ty				1 "	lev atu					51.8 GV		192	D)	
Ham	mer W	eight (II	300)	14	10	-	Casin	fud: None 9: driven			1-		-		S		<u>O r</u> Plai		174	<u></u>	
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				ΕĪ		<u></u>						G	ave	4		and	_	\neg	F	ield	Tes	t
Depth (ft.)	SPT*	Sample No. & Rec. (in.)	Sample Depth (ft.)	well Diagram	Elev./Depth (ft.)	USCS Symbol	(Density	consist	Manual Identification a ency, color, GROUP Notisture, optional descript	AME, ma	x. particle size**.	1)	A Fine		% CORTAG	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
		ഗം	W C1 5	-		5						-	+	<u> </u>	-	+		•	믝	<u>+</u>	<u>a</u>	
	63	SI	0.5	4	261.3 0.5	GM	Very dense	brown	-Black ASPHA silty GRAVEL with sau		mps 2.0 in no	-	5 2	5 4	5	5 2	25	15	-			
	124 31	5 S2	2.0	2000		GM	odor, dry		July Clary DD Will Jul	(anpo are arri, ire		5 3									
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- 5 -	24 26	S3 13	4.0 6.0		257.9 3.9	SP- SM	Very dens no odor, n		poorly graded SAND v	vith silt (SP-SM), mps 1.0 i	n., !	5 :	5 1	15 2	25	40	10				
3	26 19				255.0				-GLACIOFLUVIAL I	DEPOSIT	rs-			۱		ł						
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-	16 13 11	S5 9	8.0 10.0		8.0	SP	Medium d		own poorly graded SAN			icdi,	5	5	20	20	45	5				
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•	13 18	S7 14	12.0 14.0			SP	Same as a	bove	-GLACIOFLUVIAL	DEFOSI	13-		5	5	20	35	35					
	21 27		110				S	t					5	_	15	35	40					
-15	10	S8 12	14.0 16.0			SP	Same as a	bove					,	`		33	10					
	19 27	S9 14	16.0 18.0		245.8 16.0	- -			gray poorly graded SAl	1D with	gravel (SP), mps 1	.0	5	10	30	40	15	\vdash	<u>.</u>	+-	-	-
	43 58						III., Suan	HOLL IN	-GLACIOFLUVIAL	DEPOSI	TS-											
-	29 46 63	\$10 10	18.0 20.0			SP	Same as	above					10	10	30	40	10					
- 20	68	<u> </u>	1	1	<u> </u>	<u> </u>									1	[<u> </u>	1	1	<u> </u>	l	<u>_</u>
ı _		Wa	ter Leve			onth 14	+ 1 +0+		ample Identification	W	ell Diagram Riser Pipe					mn						_
. f	Date	Time	Elapse Time (f	₹	Botton	ı Bol	t.) to: tom Wate		•	遺	Screen	Ove				•		•	36.	0.		
H.	131 /01	11.05	 		of Casin		rose	⊢ `	Thin Wall Tube Undisturbed Sample	醫	Filter Sand Cuttings	Ro Sa				ı (til		L) 118	-			
1	/21/01 /12/02	1145	1.5 22 Day *Pu	1	34.0 - ed out.		5.0 31.6° 5.5 32.8	S	Split Spoon		Grout Concrete Bentonite Seal	Bo				ο.			01-	052	ΚO	В
1	_	sts:			atancy:	. B	-Rapid, S-				N-Nonplastic, L-L		6.4	-6	1777		1.11	iah				_

器	LEY & DRICI						TEST BORING REPORT	F	Sor ile ihe	No	١.		884	22.4 -056		XC	В
Depth	SPT.	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual identification and Description (Density/consistency, color, GROUP NAME, max. particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)		velue will %		Sai WilbaM %	% Fire	% Fines	Dilatancy	Toughness P	Plasticity s	Strength
- 20 -	54 66 58 58 53 59 62 78	S11 13 S12 3	20.0 22.0 22.0 24.0			SP SP	Same as above, except gray-brown -GLACIOFLUVIAL DEPOSITS- Same as above. Poor recovery.	10	15	25	35	15					
- 25 - -	19 14 19 30 19 23 27	S13 11 S14 15	24.0 26.0 26.0 28.0		237.8 24.0	SP- SM SP- SM	Dense light brown poorly graded SAND with silt (SP-SM), mps 2.0 mm, in partings, no odor, moist -GLACIOFLUVIAL DEPOSITS- Same as above		5			30					
-30 -	24 47 69 51 52 55	S15 16	28.0		233.8 28.0		Very dense brown-gray well graded SAND with gravel (SW), mps 1.0 in., stratified, no odor, moist to wet					15					
-	53 67 42 45 40 27 19 30	\$16 14 \$17 17	30.0 32.0 32.0 34.0			sw	in., stratified, no odor, moist to wet -GLACIOFLUVIAL DEPOSITS-	10	20	30	2:	5 15					
- 35 -	67 16 13 23	\$18 6	34.0 36.0		227.3 34.5 225.8 36.0	SP	Dense gray poorly graded SAND (SP), mps 1.0 in., no odor, wet -GLACIOFLUVIAL DEPOSITS- BOTTOM OF EXPLORATION 36.0 FT	5		1(4	5 40				_	
			•		Particular of the Control of the Con		INSTALLED PIEZOMETER AT 35.5 FT										
				٠						***************************************							
SF	T = Sac	pier blov	vs per 6 i	n	laximum	partic	the Size (mm) is determined by direct observation within the fimitations of sampler	<u> </u>					30	7-0	1-05	\ \ X'	_

HALEY& ALDRICH		ION REPORT	Z-01-05XOB
Project MONITO	RING WELL INSTALLAT	32	-Dec-01
City/State DEVENS,			≈ Pian
, 	VELOPMENT/ DEVENS CO		
	XPLORATION SERVICES,		9884-056
Driller R. EASTV	VOOD	H&A Rep. W	'. Rubik
Ground El. 261.8			
Ground El. 261.8	29)	Type of protective cover/lock:	Bolted Cover
SOIL/ROCK	BOREHOLE	Depth of top of roadway box below ground surface	0.0 ft
CONDITIONS [Numbers refer to elevation/depth	BACKFILL		
(not to so	· · ·	Depth of top of riser pipe below ground surface	<u>0.4</u> ft
-ASPHALT-	-CONCRETE-	Type of protective casing:	Roadway Box
0.5	-CONCRETE-	Type of protective casing.	
	0.7	Length	0.8 ft
-FILL-	-FILTER SAND-	Inside diameter	6.0 in
TILLS	3.0	Depth of bottom of casing	ft
	3.0	Seals: Depth to Thickness	
3.9		$\frac{\text{Type}}{\text{Concrete}} \frac{\text{top (ft)}}{0.0} \frac{\text{(ft)}}{0.7}$	
	1	Bentonite 3.0 20.5	
	-BENTONITE-		
		Type of riser pipe: Sch	40 PVC Solid
		Inside diameter of riser pipe	2,0 in
	23.5	Type of backfill around riser:	Seal
-GLACIOFLUVIAL DEPOSITS-	ļ	Diameter of borehole	6,5 in
		Depth of top of well screen	25.5 ft
		Type of screen or manufacturer: Machin	e Slotted PVC
	-FILTER SAND-	Screen gauge or size of openings	0.010 in
		Diameter of well screen	in
		Type of backfill around screen	Filter Sand
		Depth of bottom of well screen	35.5 ft
		Depth of bottom of sitt trap	
36.0	36.0	Depth of bottom of borehole	36.0 ft
Bottom o	f Exploration	(Depths refer to ground surface)	

...

	EY& RICH					•	TEST I	30R	ING REPORT	Γ			Вс	rir	ıg	No	32	Z-0	1-0	6XI	BF
Proje 'lien		ASSDE	VELO	PMI	ENT/I	DEVI	ENS COM	MERCE	32/43A DEVENS, ECENTER NTHAM, MA	MA		Si	nee art		o. No	l of	iber	13,			
			Cas	sing	Sam	pler	Barrel		Drilling Equipment a	nd Prod	edures		nis rille	••	No		iber Gal	: 15, Ivin	, 2UC	} }	
Туре		······································	+	w	-	3	HQ	Rig M	ake & Model: Mobile			— ∤ ¯ `		 Re	p.			ivui Ticho	ols		
	Niam	eter (in.	.1	.0		3/8	2.5	Bit Ty	pe: Roller Bit /			1		atio	n	_	60.8	_			
		eight (lb	_	.u 00		40	2.3		lud: None				atu	·	<u> </u>		IGV Pla	/D (192))	
		egn (ib ill (in.)	1	50 50	-	0	-		9: driven Hammer: Winch Do		**)Ca	luqi		366	Pia	п			
		· · ·	1 3	-	<u> </u>	·	•	HOISIN	nammer. Winch Do	ougnnut	Hammer	Gr	ave	J)	Sar	vd		E	ield '	Taci	-
£	.	<u>ي</u> څ څ	. 2	gram	epth	Symbol	V	fisual-N	fanual Identification a	nd Des	cription		_								Г
Depth (ft.)	SPT	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS S)	(Density structure, o	/consist dor, mo	ency, color, GROUP NA isture, optional descripti	VME, ma ions, ge	ix. particle size**, ologic interpretation) S	% Fine	% Coarse	% Med	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Stranoth
0	2	31	0.0		260.6	SM	ı Medium d	ense dar	k brown silty SAND (S)	M), mos	10.0 mm_ no	丰	ŧ	-		70		$\bar{\equiv}$			
	7	3 SIA	0.2	4 4	0.2	SP			ssy odor, moist, trace m]	ĺ
	6	13	2.0	4 4			1		-TOPSOIL-						1					ĺ	ĺ
	7 7	S2 13	2.0 4.0	4	i	SP			nt brown poorly graded ! no odor, dry	SAND (SP), mps 5.0 mm,										
	11 31						6	b	-GLACIOFLUVIAL D	EPOSIT	.2 -	ļ									
. }	15	S3	4.0		256.3	SP	Same as a	-					1								
- 5 -	46	4 \$3A	4.5		4.5	SP			rown poorly graded SA	ND (SP)	, mps 5.0 mm, fair	ıt	┰	1	1						-
	49 37	6	4.5 6.0				stratificati	on, no o	xior, wet -GLACIOFLUVIAL D	DEPOSIT	rs-				Ì						l
•	36	S4	6.0			SP			prown poorly graded SA	ND (SP)	, mps 5.0 mm, fair	ıt	l	1							
	146	4 54A	6.5 6.5		253.8		stratificat	•		1 (0) ()			. -	01	0 14	40	15	_			┞
ı		4	7.0		7.0 252.8	1	bonded, n		silty SAND with grave moist	: (SM), 1	mps 40.0 mun, wen	' '	" "	١,	יי) 40	13				
	72	S5	8.0		8.0		Very dan	se vellou	-GLACIAL TI v-brown poorly graded S		ith prayel (SP) mp	_/	1	1		T	Γ				T
-	67 152	11	9.5			ļ			nded, no odor, moist	21110 4	in graver (er), sup	"	ļ							İ	
- 10 -	00/0.5	ļ							-GLACIOFLUVIAL I	DEPOST	rs-		Ì								
"	22 137	S6 8	10.0 11.2			SP	Same as a	ibove				1	5 1	10 1	0 3	0 30	5				
 	132/3"					\vdash	╁		TOP OF BEDROCK	AT 11.2	Fr ·	}	+	╬	+	+	+	+	╁	-	+
								EE COI	RE BORING REPORT I	FOR RO	CK DETAILS										
-																					
-																					
15 -	l																		Ì		
}	ł				1								1								١
												l		- [1	1		١
							ļ]	Į		١	l					1
ŀ			1																		
]				ļ														
																ļ					
-20		Wa	ter Le	vel D	ata		1	1 8	ample Identification	W	ell Diagram			<u>.</u> ;		ma		<u></u>	<u>'</u>	-	
			Elap	sed	De		ft.) to:	0			Riser Pipe	Ove	rbı					11	5		
L L	ate	Time	Time	the t	Botton of Casir	n Bo	Hole Wate	1	Thin Wall Tube		Screen Filter Sand	Roc									
111	/15/01	0740	13	1	11.5	T	- 21.7	บ	Undisturbed Sample		Cuttings	San					6, C				
1	/16/01	1300	1.		11.5		- 24.1	1	Split Spoon		Grout Concrete	Bo	rin	g l	No	. 3	27.	.01.	16 0	(R	R
1 11				_ ¥	11 6	- 1	- 22.2							٠.		-		- V.E.	0.07		
11	/19/01 ield Te	0710	<u> 60</u>		11.5 atancy	_ 1	- 1 22.2 ₹-Rapid, S-	1	Geoprobe	sticitu	Bentonite Seal N-Nonplastic, L-L				HTO						_

HALEY& ALDRICH

Boring No. 32Z-01-06XBR File No. 10884-056

			,				<u> </u>		File No. 10884-056 Sheet No. 2 of 2
'epth	Drilling Rate	Run	Depth	Recove	ry/RQD	Weath-	Well Dia-	Elev./ Depth	
(ft)	Min./ft	No.	(ft)	in.	%	ering	gram		and Remarks
									SEE TEST BORING REPORT FOR OVERBURDEN DETAILS
	11	CI	11.5 16.5	57 45	95 75	Fresh		249.6 11.2	TOP OF BEDROCK AT 11.2 FT
	7		10.5		כו				GNEISS. Gneissic foliation extremely thin to massive, at high angles. Join at horizontal to low angles, close to moderate, smooth to rough, planar to
	6			ĺ		i			stepped, oxidized, open.
	7								-BEDROCK-
- 15 -									(Possible Ayer Granite)
	7	C2	16.5	60	100	Track			
	6	C.	21.5	60	100	Fresh			C2: Same as above, except joints widely to moderately spaced.
	6							ļ	
	8								
- 20 -	10								
	11								•
	6	C3	21.5	44	92	Fresh			C3 to 22.5 ft: Same as above.
	6		25,5	35	73	to Slight		238.3 22.5	C3 from 22.5 ft; Very hard, fresh to slightly weathered gray apparitie to
	6			<u> </u>	j 				medium grained QUARTZITE, with gneissic zone from 23.8 to 25.1 ft. Foliation extremely thin at high angle. Joints extremely close to moderate,
25					<u>.</u>				smooth, planar, oxidized, open.
- 25 -	10	C4	25.5	23	96	Fresh			-BEDROCK-
	30		27.5	8	33	to			C4: Same as above, except observed single vertical joint, smooth, planar, oxidized.
	20					Slight		233.3	
								27.5	BOTTOM OF EXPLORATION 27.5 FT
									INSTALLED PIEZOMETER AT 26.7 FT
								!	
									•
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Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

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XI	ALEYA DRIC		I	1	I	I	TEST BORING REPORT] {	ile	No) <u>.</u>	108	32 84 01	056		7X(ЭB
Depth (11.)	SPT*	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)		% Fine		Sa maile W	- 1	% Fines	Dilatancy	Toughness R	Plasticity 37	1
-20 -							Note: Boulder from 19.5 to 23.7 ftGLACIAL TILL-							0	_		
-25 -	94 -85 120/3*	S10 2 S10A	24.0 24.5 -24.5		233.5 24.5	SM ML	Very dense yellow SILT (ML), mps 0.1 mm in partings, no orien west	-	_	-			100		-	N	Ĺ
		9	25.2		232.8 25.2		-GLACIOLACUSTRINE DEPOSITS- REFUSAL AT 25.2 FT INSTALLED PIEZOMETER AT 22.7 FT										
			,														

Proje Clier	at M	IASSDI	EVEL	OPM	(ENT/I	NST/ DEVE	ALLATIO	N AOC 3 MERCE	NG REPOR 82/43A DEVENS, CENTER			s	ile hed	No.	lo.	1088	34-0 f 2	56	1-0		:C
Con	tractor	EAR	7	XPL(asing	Т.		ERVICES Barrel		THAM, MA	and Procedure		F	tari inis rille	h		cen	aber	10	, 200 , 200)1	
Гуре		· · · · · · · · · · · · · · · · · · ·	┪	sw	1 .		04.10.	<u> </u>	ce & Model: Mobil			`		ગ . Re	D.		(. E: V. F		rood k		
• •		neter (in		6.0		3/8	_	Bit Type				E	iev	atic	n n		58.				_
		eight (f	1	300		978 40	_		d: None				atu				IGV Pia		1929	9)	_
		alt (in.)	1	30	-	0	_		driven ammer: Winch D	onghout Hami	ner		UU	uu		900	Pia	п			
_	1	· ·	_!	T		المستر	!	11010011	THE PARTY IS	Originiae xiana		G	ave	त्र	Sar	nd		F	ieid `	Tes	
€		S (ii)	⊕ €	gra	ept	Symbol	\ \	īsual-Ma	nual Identification	and Description	on.	8	3	_	Ę						
Depth	SPT	Sample & Rec. (i	Sample	Well Diagram	Elev./Depth (ft.)	85			icy, color, GROUP N lure, optional descrip			1) 2	% Fina	% Coarse	% Med	% Fine	% Fines	Ditatancy	Toughness	Plasticity	
0	22 37 38	S1 14	0.0 2.0	A A	4 3	MIL	Very dens- in., disturb		gray-brown sandy SIL or, dry	T with gravel (ML), mps 1	0 5	11	5	10	20	50				
	42								-FILL-												
	19 23	\$2 5	2.0 3.0		255.8	ML	Same as a	oove													
	27	S2A 12	3.0		3.0	ου	Black OR	GANIC SC	OIL (OL/OH)	note:		-	╀	5	10	10 20	80		\dashv		t
	14 7	S3	4.0			ML	Dense yell	ow-brown	-FORMER TOP: sandy SILT (ML), n		partings, no		╌├╴	- -	1 -	65			- +		l
5 -	12	12	5.0		254.8 4.0	SM	odor, dry		-LOESS-					_							ļ
	23 40	S3A 4	5.0 6.0		253.8 5.0	SP- SM	Medium d	ense yello	w silty SAND (SM),	mps 2.0 mm, ir	partings, no	,	1	0 10	20	40	10		i		l
	21	S4 11	6.0		3.5	SP- SM	Calot, thy					5	1	0 10	25	40	10				İ
	36 41	*	0,8			2M			-LOESS- wn poorly graded SA		d gravel	-									١
	56				250.8	SP	(SP-SM), Same as a		, stratified, no odor,	dry	-	<u>_</u>	-			L					ļ
	32 28	S5 9	8.0 10.0		8.0	SP	Ì	ند.	GLACIOFLUVIAL I	DEBOGILG"		1	1	0 21	J 50	10	5				۱
	40 48							e gray-bro	wn poorly graded SA		(SP), mps	.0.	١	١							
- 10 -	22	S 6	10.0		248.8 10.0	SP	in., no od l	or, wet				}	- -	2	- - 5 60	10	-				1
	16 21 23	14	12.0	2000000			Dense gra	y-brown p	GLACIOFLUVIAL I corly graded SAND (in., stratified										
•	15	\$7	12.0			SP	Same as a	bove					;	5 2	5 55	10					İ
	21 29	12	14.0	ĿĦ.					GLACIOFLUVIAL I	DEPOSITS-											
	32			扯	244.8									_		L		L.			
- 15 -	27 27 19	S8 14	14.0 16.0		14.0	SP		no odor, v			, mps 1.0 in	., :	5 2	0 3	5 30	10					
,	53 125	S9 11	16.0 17.0	f. T.	241.8		Same as a		GLACIOFLUVIAL	DEPOSITS-		1	0 1	5 3	0 30	10	5				
				1	17.0	ML	Note: Bot	ilder from	17.0 to 20.2 ft.												
	المستسيس بينيا ويتواقع								-GLACIAL T	LL					-						
- 20 -	<u> </u>																				
<u> </u>		Wat	er Le					Sam	ple Identification	Well Diag				S	וווונ	nar	<u> </u>				_
D	ate	Time	Elap Time	12-1	Bottom	Botto	m	. [pen End Rod	Riser Scree	•	Ove						22.5	5		
171	4/02	1300		(,,,,	f Casing	l at Hk	de vvater	վ ՝ ՝	Thin Wall Tube Indisturbed Sample		Sand	Rock Sam			d (li		•				
1/1	-4/02	ram	35 E	ays	-	21.	7 19.0	s s	Jindisturbed Sample Split Spoon Geoprobe	Grou	: -	Bor	·		lo.		10 Z- 0)1-(18X	OI	8
Fi	eld Tes	ts:			tancy:		Rapid, S-S	low, N-N	ione Plas	ticity: N-None	lastic, L-Lo	w, M-	Me	diur	n, i	1-11	gh		ery H	in.	

XI	LEY & DRIC	XH H					TEST BORING REPORT	F	ile	No		108	32 84 0 of)56		3XC)B
Depth (11.)	SPT•	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)		% Fine		% Medium		% Fines	Dilatancy	Toughness &	Plasticity sa	Strength
-20 -	49 60 30	S10 11	20.5 22.5			ML	well bonded, no odor, wet										_
	30	 			236.3 22.5		-GLACIAL TILL- BOTTOM OF EXPLORATION 22.5 FT	_	<u> </u>	_			_		1		<u> </u>
					22.5		INSTALLED PIEZOMETER AT 22.0 FT							l	1		
•																	
	,														4-14-14-14-14-14-14-14-14-14-14-14-14-14		
					and the same of th												
							f. le size (mm) is determined by direct observation within the limitations of sampler	-	Во	느		1			<u>i : : : : : : : : : : : : : : : : : : :</u>	L	1

HALEY & ALDRICH			OMETE		Piezometer	32Z-01-08XOB
		INSTALLA	TION R	EPORT	Test Boring	32Z-01-08XOB
Project	MONTED	RING WELL INSTALLA	TION AOC	32/43A	installation Date	10-Dec-01
City/State	DEVENS,	MA ·			Location	See Plan
Client	MASSDE	VELOPMENT/ DEVENS C	OMMERC	E CENTER		
Contractor	EARTH E	XPLORATION SERVICES	, WRENTI	HAM, MA	H&A File No.	10884-056
Driller	R. EASTV	WOOD			Н&А Кер.	W. Rubik
Ground El.	258.8			,		
El. Datum	NGVD (19	29)		Type of protective cover/le	ock:	Cover/Padlock
SOIL/I	ROCK	BOREHOLE	†	Height of top of casing ab	ove ground surface	2.9 ft
CONDI		BACKFILL			~	
(Numbers refer to	o elevation/depth : not to so:	from ground surface in feet) ale)	□	Height of top of riser pipe	ahove nround surface	2.5 ft
				troight of top of floor pipo	above ground surface	2.5 11
		-CONCRETE- 2.0		Type of protective casing:	·	Guard Pipe
-FI	LL-	2.0		Length		5.0 ft
		-FILTER SAND-		Inside diameter		6.0 in
3.0		3.0		Depth of bottom of roadw	ay box	2.0 ft
1	TOPSOIL-	į		Seals:	Depth to Thicknes	S
3.3		-BENTONITE-		Type Concrete	top (ft) (ft) 0.0 2.0	
, -LO	ESS-	-BENIONITE-		Bentonite Seal	$\frac{0.0}{3.0} = \frac{2.0}{7.0}$	-
5.0		i				
		1		ļ ————		
		10.0	-	Type of riser pipe:	<u>.</u>	ch 40 PVC Solid
		i		Inside diameter of ris	er pipe	in
-GLACIO	FLUVIAL			Type of backfill arour	nd riser:	Seal
DEPO	OSITS-	[← Diameter of borehole		6.5 in
		ļ	-	Depth of top of well scree	en	ft
		-FILTER SAND-	4	Type of screen or manufa	acturer: Mac	hine Slotted PVC
17.0			4-7-4 4-7-4	Screen gauge or size	e of openings	0.010 in
				Diameter of well scre	en	2.0 in
-GI ACI	AL TILL-	1		Type of backfill arous	nd screen	Filter Sand
				Depth of bottom of well s	creen	122.0 ft
1				Depth of bottom of silt tra	g p	
2	2.5	22.5		Depth of bottom of boreh	ole	22.5 ft
		Exploration			s refer to ground surfac	
Remarks:	Ground	El. reflects estimated gro	und surfac	e at time of drilling, prior to	gravel pad placeme	nt.

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H. Al	VEY & DRICE	1					TEST	BOF	RING REPOR	T				Во	rîı	ıg	No	.32	Z-0	11-0	9X	ОВ
		(ASSD	EVELO	PM	ENT/I	DEVI	ENS COM	MERC	C 32/43A DEVENS, CE CENTER ENTHAM, MA	MA			Sŀ	e A ee eart	tΝ	o. No		f 2 nbe	г 19	, 20		
			Cas	ing	Sam	pler	Barrel		Drilling Equipment	and Pro	ocedures	1		nisl ille	•	No				, 20 vood		
Тур	е		-/S	w	S	3	•	Rig I	Make & Model: Mobil	e B-57	Truck			ξA		p.			Rubi			
Insid	de Dian	neter (îr	ւ.) 8.0/	6.0	13	3/8	_	Bit T	••					eva		n		58.			^\	
Han	nmer V	/eight (l	b.) 30	00	14	10	-	,	Mud: None ng: 8" Casing to 34.	n e		}		atui xca		1	See			(192	9)	
Han	nmer F	all (in.)	2	4	3	0	-	Hois	t/Hammer: Winch D	oughnu	t Hammer											ĺ
<u> </u>		No. in.)	3	mg.	£	Symbol	١	lisual-	Manual Identification	and De	ecrintian			ve		Sar			F	ield	Tes	
Depth (ft.)	SPT•	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Syr	(Density	/consi:	stency, color, GROUP Noisture, optional descrip	AME, m	ax. particle size**,	on)	% Coarse	2	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength ·
-0-				ΠΔ	258.1				-Black ASPHA	LT-				=	F	F	=			$\dot{\exists}$		<u>~</u>
	31 37 46	S1 15	0.5 2.0		0.5	SM	Very dens asphalt spo	e mottl ecks, m	ed brown-gray silty SAN ups 1.5 in., no odor, moi	ID with st to we	gravel (SM), trace t		10	10	10	20	30	20			-	
-	25 17 11	S2 19	2.0 4.0	ONE WARE	255.6 3.0	SM	Same as a	bove, e	except dense -FILL-						-							
	8 13	S3 10	2.0 4.0 6.0 6.0 8.0 10.0			SP			own to light gray poorly to odor, dry	-graded	SAND (SP), mps	0.25		5	10	20	60	5				:
-5	11 14		2			SP	Same as a	bove	PID = -GLAC	IOFLU	VIAL DEPOSITS-	ppm										
t	17	S4	6.0		252.6 6.0	SP	\		-GLACIOFLUVIAL	D <u>EPOS</u> I	<u>TS</u>		10	10	15	20	40	5				-
1	16 15	12	8.0	TANKE BEEF	250.6		stratified,	no odo	poorly-graded SAND wi r, dry -GLACIOFLUVIAL		-	•										
	10 11 17	S5 10	8.0 10.0	A PARTIE A	8.0	SP	Medium d in., stratif	iense li ied, no	ght gray to brown poorly odor, wet			0.25		5	15	30	45	5	-			
- 10	17	27	100		248.6	<u> </u>	<u> </u>		-GLACIOFLUVIAL								L		<u>_</u> _			
-	17 20 14 18	\$6 11				sw	Dense light stratified,		m weil-graded SAND wi or, wet	th grave	i (SW), mps 1.5 ù	L,	10	15	20	25	25	5				
	17 14 19	S7 18	12.0 14.0 14.0 16.0 18.0			sw	Same as a	bove	-GLACIOFLUVIAL	DEPOSI	rts-											
	13 15	S8 13	14.0 16.0	A Western	244.6 14.0		Dense light	nt brow	/n poorly-graded SAND	(SP), m	ps 3.0 mm., in			_	-	45	50	5				-
- 15	18								-GLACIOFLUVIAL	DEPOSI	ETS-											
ł	23	59	16.0		242.6 16.0		Very dens	e brow	n poorly-graded SAND			ìn.,	10	15	11	25	30	5	┝-	-	 	-
}	35	17	18.0				stratified.	no odo	or, moist	-	•											
	120				240.6	L.	<u>_</u>		-GLACIOFLUVIAL	DEPOS	ITS-											
	57 27 19	S10 11	18.0 20.0		18.0	SP	Dense ligi no odor,	ht brov	n poorly-graded SAND			ed,		10	5	40	40	5				
- 20	27	<u> </u>			1	1	1		-GLACIOFLUVIAL	DEPOS	FTS-		1	<u> </u>	1	1	_		<u> </u>	1_	<u> </u>	<u> </u>
'			ter Leve			oth (fi	_) to:	1	ample Identification	W ₀	ell Diagram Riser Pipe						nar					
Ĺ	Date	Time	Time (I		Bottom f Casino	Bott	om	- O T	Open End Rod Thin Wall Tube	團	Screen						n. fi n. f		34.0)		
•	/20/01	0740	16	Ī	16.0	18		U	Undisturbed Sample		Filter Sand Cultings	Sa				(18		L) 17	-			
ı	/28/01 '12/02	0730 1300	in wel		-	-	.5 28.9	S	Split Spoon		Grout Concrete	Bo	ri	ng	N	о.	32	7.1)1_)9X	OI.	
· }	ieki Tes			Dila	tancy:		Rapid, S-S		N-None Pias	ticity: 1	Bentonite Seal N-Nonplastic, L-I	Low, N	1-N	fed	iun	1, I	Н	gh				_
SP	T = San	npler blo	vs per 6	100 in,	ghness	L- Maxir	Low, M-Me num particle	size (r	H-High Dry nm) is determined by dire	Strengt	h N-None I-Ic	NE M	-14	edii	em	н	His	٠Ē٠ '	V-V	ery i	ligh re\	

	VLEY & DRIC				T		TEST BORING REPORT	1	īle	No	g N o. No.	10	884	2Z- -056 of 2		9X	(
Depth (ייי,)	SPT*	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)		e Li		% Medium	-3- -3-	% Fines		Toughness a	Plasticity a	
20 -								18	8	8	8	8	8	흅	ᅙ	E SE	_
•	23 25 19 18	S11 10	20.0 22.0			SP	Same as above -GLACIOFLUVIAL DEPOSITS-										
•	22 24 27 42	S12 13	22.0 24.0			SP	Same as above, except very dense, moist		5	5	45	40	5				
	34 23	\$13 15	24.0 26.0		234.1					L				L _			
- 25 -	45 56	1.5	20.0		24.5	SW	Very dense light brown well-graded SAND with gravel (SW), mps 1.0 in., stratified, no odor, moist to wet	10	20	20	25	20	5				
	29 43 35	S14 13	26.0 28.0			sw	Same as above -GLACIOFLUVIAL DEPOSITS-										
	43 40 19 13	S15 7	28.0 30.0		230.6 28.0	GP	Dense brown poorly-graded GRAVEL with sand (GP), mps 3.0 in., no odor, wet	30	25	25	15	5				_	
-30	17	S16	30.0				-GLACIOFLUVIAL DEPOSITS- No recovery. Pushing gravel.										
	13 14 10	ő	32.0		226.6		10 feetily. I usuing graves.										
	21 19 22	S17 14	32.0 34.0		32,0	SP	Dense light brown poorly-graded SAND (SP), mps 0.5 in., stratified, no odor, wet		5	25	40	25	5				
	33				224.6 34.0		-GLACIOFLUVIAL DEPOSITS- BOTTOM OF EXPLORATION 34.0 FT.	-	_		_			_			
							INSTALLED PIEZOMETER AT 33.5 FT.										
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							^-										
*SP1	= Samp	ier blows	per 5 in.	Ma	ximum s	artick	size (mm) is determined by direct observation within the limitations of sampler	+		_		-	<u></u>		-092		-

PIEZOMETER Piezometer 32Z-01-09XOB **INSTALLATION REPORT** Test Boring 32Z-01-09XOB Project MONITORING WELL INSTALLATION AOC32/43A Installation Date 20-Nov-01 City/State DEVENS, MA Location See Plan Client MASSDEVELOPMENT/ DEVENS COMMERCE CENTER H&A File No. Contractor EARTH EXPLORATION SERVICES, WRENTHAM, MA 10884-056 Driller H&A Rep. W. Rubik R. EASTWOOD Ground El. 258.6 El. Datum Type of protective cover/lock: Bolted Cover NGVD (1929) SOIL/ROCK **BOREHOLE** 0.0 ftDepth of top of roadway box below ground surface CONDITIONS BACKFILL (Numbers refer to elevation/depth from ground surface in feet) 0.4 ft Depth of top of riser pipe below ground surface (not to scale) Type of protective casing: Roadway Box -ASPHALT--CONCRETE-0.5 0.5 0.8 ft Length -FILTER SAND-Inside diameter 6.0 in -FILL-.0.8 ft Depth of bottom of casing 3.0 Thickness Depth to -CEMENT GROUT-Seals: Type top (ft) (ft) Concrete 0.5 0.0 Cement Grout 2.0 16.5 18.5 Bentonite 18.5 3.0 -BENTONITE-21.5 Sch 40 PVC Solid Type of riser pipe: Inside diameter of riser pipe 2.0 in Type of backfill around riser: Seal -GLACIOFLUVIAL Diameter of borehole 9.0 in **DEPOSITS-**23.5 ft Depth of top of well screen Machine Slotted PVC Type of screen or manufacturer: -FILTER SAND-0.010 in Screen gauge or size of openings 2.0 inDiameter of well screen Filter Sand Type of backfill around screen Depth of bottom of well screen 33.5 ft Depth of bottom of silt trap Depth of bottom of borehole 34.0 ft 34.0 **Bottom of Exploration** (Depths refer to ground surface) Remarks:

Proje liei Con		(ASSD	EVE	.OPA	ÆNT/	DEV	ENS COMI	MERC	C 32/43A DEVENS E CENTER ENTHAM, MA	, MA			Sh Sta	e N eel	t N	o. De	l o cen					
			C	asing	Sar	npler	Barrel		Drilling Equipment					ille				-	lvin			
Гуре	÷			SW		S	HQ		lake & Model: Mobi	e B-57	VTA	1	H8	A	Re	p.). V	elo	zzi		
nsid	e Dian	neter (iı	1.)	6.0	1	3/8	2.5	Bit Ty	/pe: Roller Bit Vlud: None			- 1		eva Itur		n		58.	6 /D (1102	٥١	
lam	mer V	/eight (l	b.)	300	1	40	-		NUG. None 19: SW to 9.0 ft.			ŀ		_		; د		Pla		174	.,,	-
lam	mer F	all (in.)	ļ.	24	1:	30	-		Hammer: Winch D	oughnu	t Hammer	Ì										
		<u>i</u>		E	£	8	<u> </u>						_	vel		Sar				ield		
Depth (ft.)	SPT	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	(Density	/consis	Manual Identification tency, color, GROUP N disture, optional descrip	AME, m	ax, particle size**.	en)	6 Coarse	% Fine	& Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	asticity	
0				1	-				-Black ASPHA	IT.	· · · · · · · · · · · · · · · · · · ·		٥`	-		=			۵	f-	<u> </u>	ŧ
	110	Sı	0.6	-4	258.0 0.6	SM	Very dense	dark i	rown silty SAND with		M) mac 6.0 mm	no.	10	10	H	35	25			\vdash		+
	93 90	15	2.0				structure, i			pratul (i	, mps o.v mili,	410	, ,			ļ.°	23	"				
	10 25 20 15	S2 12	2.0 4.0		254.6 4.0	SM	Medium de no structur		-FILL- rk brown silty SAND w dor, wet	ith grave	el (SM), mps 1.0 in	ı.,	10	25	15	30	15	20				
5 -	32 28 70	S3 6	4.0 6.0		4.0				prown poorly graded Gire, no odor, wet	AVEL	with sand (GP), mp	os	30	30	20	20	-		-			
	50			-111		00		•	-FILL-													
	32 80 120	\$4 4	6.0 7.5			SP	Same as al	bove	TOP OF BERROOM	4TT 6	T-W		40	30	15	15						
					1		\ <u> </u>		TOP OF BEDROCK			/				ĺ		:				
]] Si	EE CO	RE BORING REPORT	FOR RC	OCK DETAILS											
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-20 -		Wa	ter L	vel [Data		-	S	ample Identification	W	ell Diagram		<u></u>		Si	mn	nar	<u>'</u>		<u>, </u>	*	=
D	ate	Time	Elap	sed	De	pth (f		0	Open End Rod		Riser Pipe	O۷	ert	ш			n. fl		10.0	 3		_
		- 4110	Time	(hr.	Botton of Casin	9 of F			Thin Wall Tube		Screen Filter Sand								17.0	-		
	03/02	0700	1	6	9.0	27	•	U	Undisturbed Sample		Cuttings Grout	ŀ		les		_		, C				_
1/	1/02	0855	91	ays	-	22	.5 21.8	S	Split Spoon		Concrete	Вс	rii	ng	N	ο.	32	Z- 4)1-l	 10X	RI	R
Fi		1			atancy:		Rapid, S-S	3 "	Geoprobe		Bentonite Seal	.ow, R								41		

AL E	LEY A					CO	RE B	ORIN	NG R	EPORT	Boring No. 32Z-01-10XBR File No. 10884-056 Sheet No. 2 of 2
	nth R	iling ate	Run	Depth	·	ry/RQD	Weath-		Depth	Visual De	scription
<u>.</u> 4;) Mi	n./ft	No.	(ft)	in.	%	ering	gram		and Re	marks
									251.1 7.5		FOR OVERBURDEN DETAILS ROCK AT 7.5 FT
- 10	enterminal del la company de l	3 3 4 4	CI	10.0 14.0	45 4	93 8	Fresh to Slight Fresh to Moder-, ate		244.6	CI to 12.0 ft: Very hard, fresh to slig fine grained QUARTZITE. Foliation moderate to high angle, extremely clo oxidized, tight to open CI from 12.0 ft: Very hard, fresh to to coarse grained QUARTZITE. Foliatets at high angle, close to open, roug	ROCK- ittly weathered, gray white aphanitic to extremely thin at high angle. Joints at se to close, rough, stepped to planar, moderately weathered, gray white, fine ation extremely thin at high angle. Joint h, stepped to planar, oxidized, tight to
- 15		4 5 3 4 5	æ	14.0 19.0	59 23	98 38	Fresh to Slight		14.0	Note: Cavities 1.0 to 4.0 in., vugs, hit C2 from 14.0 ft: Very hard, fresh to grained QUARTZITE. Foliation extra angle, extremely close to moderate, so oxidized, tight to open	ROCK- ghly weathered quartz veins, slightly weathered, aphanitic to fine emely thin at high angle. Joints at high
- 20	-	4 5 5	C3	19.0 22.0	29 13	81 36	Fresh to Slight			C3: Same as above, except oxidized f	rom 21.0 to 22.0 ft
- 25		5 4 5 4	C4	22.0 27.0	52 30	87 50	Fresh to Slight		221.6	C4: Very hard, fresh to slightly weath grained QUARTZITE. Foliation extremely thin at high angle, extreplanar, oxidized, tight to open. Secon rough, planar, oxidized, tight to open	emely thin at high angle. Primary joint mely close to close, rough, stepped to dary joint set at low apple, moderate
									231.6 27.0	BOTTOM OF EXP	LORATION 27.0 FT
CORE-WELLS USCSLIES "SCSTBCZ.GDT GAIGSSAUSSULOGS.GPJ MW. 27, 02										INSTALLED PIEZO	OMETER AT 22.5 FT

HALEY & ALDRICH		PIEZ(OMETE	R	Observation Well	32Z-01-10XBR
ALUKCA		INSTALLA	TION R	EPORT	Test Boring	32Z-01-10XBR
Project	MONITO	RING WELL INSTALLA	TION AO	C32/43A	Installation Date	2-Jan-02
City/State	DEVENS,	MA			Location	See Plan
Client	MASSDE	VELOPMENT/DEVENS CO	OMMERC	E CENTER		
Contractor	EARTH E	XPLORATION SERVICES	, WRENT	HAM, MA	H&A File No.	10884-056
Driller	J. GALVI	N .			H&A Rep.	D. Velozzi
Ground El.	258.6					
El. Datum	NGVD (19	29)		Type of protective cover:		Bolted Cover
SOIL/RO	оск	BOREHOLE		Depth of top of roadway !	oox below ground surfa	ce . 0.0 ft
CONDITI		BACKFILL from ground surface in feet)	-			·
(NONDESTEIG 10 E	(not to so		П	Depth of top of riser pipe	below ground surface	0.4 ft
-ASPHA	t ጥ	-CONCRETE-		Type of protective casing		Pondway Por
0.6	LI-	-CONCRETE-		Type of protective casing	· ·	Roadway Box
		0.7		Length		0.8 ft
		-FILTER SAND-		Inside diameter		6.0 in
-FILI		2.5		Depth of bottom of roadw	ay box	0.8 ft
-171				Seals:	Depth to Thickne	ss
			- -	Type	top (ft) (ft)	
		-BENTONITE-		Concrete Bentonite Seal	$\frac{0.0}{2.5} = \frac{0.7}{8.0}$	
						
7.5] 		Tues of sixual sixual		
				Type of riser pipe:	-	Sch 40 PVC Solid
		10.5		Inside diameter of ris	ser pipe	2.0 in
				Type of backfill arou	nd riser:	Seal
				→ Diameter of borehole		<u>6.0</u> in
			_	Depth of top of well scre	en	12.5 ft
-BEDRO	OCK-		4	Type of screen or manuf	acturer: Mac	chine Slotted PVC
		-FILTER SAND-		Screen gauge or siz	e of openings	0.010 in
				Diameter of well son	een	2.0 in
				Type of backfill arou	and screen	Filter Sand
				Depth of bottom of well	screen	22.5 ft
				Depth of bottom of silt tr	ар	
27_	.0	27.0	! L	Depth of bottom of bore	hole	27.0 ft
. Remarks:	Bottom of	f Exploration		(Depth	s refer to ground surfa	œ)

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o.toj.		MON	TOI	RIN	G W	ELL :	INST	ALLATIO	N AOC	ING REPOR					Bo		_		34-0)1-1	1X	(E
Jier Cont	nt M tractor	AASSD	EVI	ELC	M9(ENT/	DEVI	ENS COM	MERC	E CENTER INTHAM, MA				St	vee art nisl	•	No	ven		r 13	, 20 , 20		
				Cas	ing	San	ıpler	Barrel		Drilling Equipment	and Pro	ocedures			ille		140				, 20. 100d		
Туре	•			S	W	!	S	НQ	Rig M	ake & Model: Mobi	ic B-57	Truck		Нξ	ŝΑ	Re	p.			ore			
Insid	le Diar	neter (i	n.)	6.	.0	1:	3/8	2.5	Bit Ty						eva		n		62.				_
Ham	mer V	/eight (lb.	30	90	1	40	_		fud: None					atur				IGV Pla		192	9)	_
Ham	mer F	all (in.)	1	3	0	1 3	0	_	Casin Hoist	g: driven Hammer: Winch E	Youahau	t Unmmar			r-a	uUi	•	300	ria	n			
		o 🔾	لنا	Т	E		5	!	L		>ougidio	. Hannes		Gra	ivel	ı	San	a l		F	ield	Test	-
Depth (ft.)	SPT	Sample No. & Rec. (in.)	Sample	Din (II.)	Well Diagram	Elev./Depth (ft.)	SS Symbol	(Density	/consist	fanual Identification ency, color, GROUP N	IAME. m	av. natticie size*		_	T	-			% Fines	Dilatancy			
<u> </u>	S	S. A.	တို့ လ	ב ב			nscs	structure, c	dor, mo	isture, optional descrip	itions, ge	eologic interpreta	tion)	8	8	8	8	* F	%	Dilat	Š	Plastichy	L
	100/2" 33 15	S1 12	0.: 1.:		4	262.5 0.3	SP- SM	Very dense mps 1.25 i brick	e dark b in., no s	-Black ASPHA rown to black SAND w tructure, no odor, dry,	ith silt a	nd gravel (SP-SI and fragments o	d), f	5	10	20	30	20	10				
	44 39	S2 14	2.6				SP- SM	Same as a	bove			PID = 0.0/0. $PID = 0.0/0.$											
	66 52									T-01 T		110 - 0,000.	o bbit										
•	24	S3	4.			258.8 4.0	SP	h		-FILL-					20	20	40	10	\vdash		_		F
- 5 -	29 35 25	10	6.		//////////////////////////////////////			Very dens	e brown	le at 3.5 ft. to tan poorly-graded S ous, no odor, wet	AND wi		`		20	30	40	10					
	10 14	S4 18	6. 8.	0	West State		SP	_		-GLACIOFLUVIAL			••		10	30	50	10					
<u>.</u>	16 49					l		Dense to v mps 0.5 in	ery den homo	se light brown poorly-g geneous, no odor, wet	graded S.	AND with gravel $PID = 0.0/0$.			_								ļ
-									FF COL	TOP OF BEDROCK E BORING REPORT		FT.											
- 10 -					:				 co.		z OK KO	CK DEIAILS	,										
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- 20 -	<u>. </u>	Wa	ter i	eve	el Da	ta	1	<u> </u>	9-	mple Identification	1AL	all Diagram		<u> </u>	1	1		1	<u> </u>	1	<u> </u>		1
_	ata		7	ipse	d L	Der	oth (ft		1	Open End Rod		ell Diagram Riser Pipe	1				ma /Er						-
L	ate	Time		ie (t	I E	ottom Casing	Bott	om		Thin Wall Tube		Screen	4				(lit			11.(10.(
11/	14/01	1130		-	T	21.0	21.		U	Undisturbed Sample		Filter Sand Cuttings	1		les				., , C2		į		
1/1	1/02	1200	59	Day	z	-	17.	85 17.65	S G	Split Spoon Geoprobe		Grout Concrete Bentonite Seal									1X	BR	7
<u></u>	eld Tes	ts.	*	·	Dilat	ancy:	- R-	Rapid, S-S	love 61		<u> </u>	4-Nonplastic, L	. i										_

HALEY & ALDRICH

CORE BORING REPORT

Boring No. 32Z-01-11XBR File No. 10884-056

									File No. 10884-056 Sheet No. 2 of 2
'epth	Drilling Rate Min./ft	Run No.	Depth (ft)	Recover	ry/RQD %	Weath- ering	Well Dia- gram	Elev./ Depth (ft)	
***			(1.9)				3.0	(10)	
- 10 -	8	Cl	11.0	57	95	Fresh		254.8 8.0	SEE TEST BORING REPORT FOR OVERBURDEN DETAILS TOP OF BEDROCK AT 8.0 FT. C1: Very hard fresh to slightly weathered, gray with black streaks, medium
15	6 6 5		16.0	54	90	to Slight			C1: Very hard fresh to slightly weathered, gray with black streaks, medium to coarse-grained granitic GNEISS, few joints, horizontal to low angle, clos spacing, rough, undulating, fresh, open, minor garnet growth. -BEDROCK- (Possible Ayer Granite)
20 –	6 5 7 7	ប	16.0 21.0	58 58	97 97	Fresh to Slight			C2: Similar to C1.
	6							241.8	
								21.0	BOTTOM OF EXPLORATION 21.0 FT. INSTALLED PIEZOMETER AT 19.0 FT.

HALEY &			METER	Observation Well	32Z-01-11XBR
		INSTALLAT	ION REPORT	Test Boring	32Z-01-11XBR
Project	MONITO	RING WELL INSTALLAT	ION AOC32/43A	Installation Date	14-Nov-01
City/State	DEVENS,		·	Location	See Plan
Client		/ELOPMENT/DEVENS CO			
Contractor	EARTH E	XPLORATION SERVICES,	WRENTHAM, MA	H&A File No.	10884-056
Driller	R. EASTW	/OOD		H&A Rep.	J. Morey
Ground El.	262.8				
El. Datum	NGVD (192	29)	Type of protective cover	flock:	Bolted Cover
SOIL/R CONDIT (Numbers refer to	TIONS	BOREHOLE BACKFILL from ground surface in feet)	Depth of top of roadway Depth of top of riser pipe		
,					<u></u>
-ASPHL 0.3	ALT-	-CONCRETE-	Type of protective casing	g:	Roadway Box
· · ·		0.6	Length		0.8 ft
-FIL	.L-	-FILTER SAND- 3.0	Inside diameter		6.0 in
4.0			Depth of bottom of casir	ng	0.8 ft
-GLACIOF DEPC	1	-CEMENT GROUT-	Seals: Type Concrete	Depth to Thickn top (ft) (ft) 0.0 0.6	
8.0		-BENTONITE-	Cement Grout Bentonite Seal	3.0 4.0 7.0 2.0	
		9.0	Type of riser pipe:		Sch 40 PVC Solid
			Inside diameter of r	iser pipe	2.0 in
			Type of backfill aro	und riser:	Seal
		!	→ Diameter of borehole		6.0 in
-BEDR	ROCK-		Depth of top of well scr		9.0 ft
		-FILTER SAND-	Type of screen or man		achine Slotted PVC 0.010 in
			Diameter of well so	•	2.0 in
			Type of backfill arc	ound screen	Filter Sand
			Depth of bottom of wel	l screen	19.0 ft
			Depth of bottom of silt	trap	
2	1.0	21.0	Depth of bottom of bor	ehole	21.0 ft
Remarks:	Bottom o	f Exploration	. (Dep	ths refer to ground sur	face)

.

>roj:	ect	MONT	TOR	ING	w	ELL I				ING REPOR		•	F	ile	No	D.	1	088	4-0	56			
Clie	nt M	(ASSD)	EVE	LOP	М	ENT/I	DEVE	INS COM	MERC	CENTER									3				
Con	tractor	EAR	TH	EXP	LO	RATI	ON S	ERVICES	, WRE	NTHAM, MA				ita							, 20 , 20		
			١,	Casir	ıg	Sam	pler	Barrel		Drilling Equipment a	and Pro	cedures	,		ish le r		140				rood		
ype	 3		1	SW		5		HQ	Rig Ma	ake & Model: Mobile	B-57	Fruck	1	18.	A F	₹ep	p.				/W.		b
• •		neter (ir		6.0		13		2.5		pe: Roller Bit			1	Ξle	val	ioi	n	2	59.	1		-	_
		/eight (l	1	300		1	10	د.2		lud: None			<u> </u>		un						192	9)	_
	mer Fa		3.1	24		ł "	0	-		G: driven		. ve	1	.OC	æu	OH	1 2	see	Pla	Ŋ			
1021	······································					<u> </u>		-	LIOISIA	Hammer: Winch D	ougnne	: Hammer,		rav	الم		San	4			ield	Too	-
2	}	울글	é	·		ap	Symbol	٧	isual-M	lanual Identification a	and De	scription											T
Depth (ft.)	SPT	Sample No. & Rec. (in.)	Sample Cooth (#)	Copul (ii.)		Elev./Depth (ft.)	uscs sy			ency, color, GROUP Na isture, optional descript			n)	S Coarse	8 138	% Coars	% Medium	% Fine	% Fines	Dilatancy	Toughness	Piasticity	
0 -				1		258.7				ACDUALT				+		_	Ė	\equiv		니		<u> </u>	ł
	39	Si	0.4			0.4	SP-	Very dense	dark b	-ASPHALT- rown to black SAND wi		nd gravel (SP-SM).		5	15	20	30	20	10				t
	35 25	12	2.(目			SM			ucture, no odor, moist		PID = 0.3/0.3											l
	14	S2	2.0		1		SP	Medium 4	ense dari	k brown to black SAND	with m	_	-		10	15	40	30	5				
	13 10	3	4.0	SAME OF THE	11 649 11		31			no odor, moist	with g	PID = 0.3/0.3		-		13	40	30	J				
	6					255.1	<u> </u>			-FILL-			}	4	_		_						4
	6 8	\$3 6	6.0	Y E	711	4.0	SP	Medium d		wn to tan SAND with g	ravel (S	P), mps 4.0 mm.,	ВÓ		10	10	50	30					١
5 -	13 17			RELIGIO				suucuie,	no odor,			PID = 0.1/0.1	ppm										
	18 19 22	S4 20	8.				SP	Dense ligh		-GLACIOFLUVIAL I to tan SAND with grav dry		mps 4.0 mm., no			10	20	40	30					
	24 14	S5	8.		THE REAL PROPERTY.		SP			SAND with gravel (SP		PID = 0.1/0.1 $5.0 mra., no structu$.		15	20	40	20	5				
	18 23 40	3	10.	O	1000000			no odor, v	vet, cobi	He stuck in head of spo	Dfi	PID = 0.1/0.1	ppm										
10 -	13	S6	10	0			SP	Similar to	above				l		15	20	40	20	5				
	18 27 26	6	12									PID = 0.1/0.1	ppm										
	33 24	S7 12	12 13	0	SA 88 F.S.	12.0	SP			rown to tan SAND with wet, sand-gravel mix	a gravel		1	10	15	30	30	10	5	-	T -	-	-
	100/1*			141	183					-GLACIOFLUVIAL I	DEPOSI	PID = 0.1/0.3	ррпі										
	17	\$8	14	0	101		SP			orown SAND with grave			ied,	10	5	30	30	10	5				
15	21 49 50	10	16		HUBERGERS STREET, STRE			no odor,	wet, sand	l-gravel mix	,	PID = 0.1/0.1	ppm										
	57 100/6	\$9 6	16 17	0.0	TEXAMEN	242.1		Similar to	above			PID = 0.1/0.1		10	15	30	30	10	5				
					36.6	17.0	'			-GLACIAL T	ILL-												
				15,535,67	10.50			Note: Gr	ivel from	n 17.0 to 19.0 ft. Start 1	o core 1	1.5 ft. 3.5 ft. bould	ers.					-					
				5.00																			
-20		Wa	ater	eve	_				Sa	mple Identification	W	ell Diagram	`			St	ımı	nar	Y			<u> </u>	=
	ate	Time	1	apse		De Bottom		tomi	- 0	Open End Rod	冊	Riser Pipe Screen	Ove	dı€	urc	ler	n (li	n. f	t)	29.	5		
	-		Tin	e (h		Casin		tom Wate	т т	Thin Wall Tube		Filter Sand	i e							10.			
	/15/01	0730		40		-	į.	.5 23.3	ย	Undisturbed Sample	1 ×	Cuttings Grout	Sar	np	les	i		SE	2, C	2			_
1/	/17/01 /14/02	0650 1030	ŀ	Day:	s	-	38	3.2 24.0 3.0 34.2	S G	Split Spoon Geoprobe		Concrete Bentonite Seal	Во							01-	123	B	1
£	ield Te	sts:				tancy. ohnes		-Rapid, S-4 -Low, M-M				N-Nonplastic, L-L th:_N-None, L-Lo								122	·		.1

以	VLEY & DRUC	E H		1			TEST BORING REPORT	F	ile	No		108	84-	2Z-056	01-1 6	2X)	BĮ
S Depth (ft.)	SPT*	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)	% Coarse	% Fine	_	San Wedium %	% Fine	% Fines		Toughness A	Plasticity 3	ı
	29 57 70 38	S10 6	21.0 23.0	THE PERSONAL PROPERTY OF THE PERSONAL PROPERTY		SM	Very dense brown silty SAND with gravel (SM), mps 1.0 in., well-bonded, no odor, wet PID = 0.0/0.0 ppm -GLACIAL TILL-	5	10	20	20	30	15				
- 25 -	19 22 26 24	Si1 20				SM	Note: Casing stopped at 17.0 ft. on 11/15/01. Note: Removed 6" casing and replaced with 8" on 11/16/01. Dense brown silty SAND with gravel (SM), mps 5.0 mm., well-bonded, no odor, wet		15	15	20	35	15				
	57 116	S12 6	26.0 27.0			SM	PID = 0.0/0.0 ppm Very dense brown silty SAND with gravel (SM), mps 5.0 mm., bonded, no odor, wet PID = 0.0/0.0 ppm		10	5	5	60	20				-
							TOP OF BEDROCK AT 27.0 FT. SEE CORE BORING REPORT FOR ROCK DETAILS									;	
-30 -																	
`																	
- 35 -																	
																!	
							,										
				ļ.		-	•										
							·										
							·										
			<u> </u>		<u> </u>		give from he determined by direct observation within the limitations of sampler		_								



Boring No. 32Z-01-12XBR File No. 10884-056 Sheet No. 3 of 3

	Drilling			Recove	ny/RQD		Well	Elev./	Sneet No. 3 of 3
(ft)	Rate Min./ft	No.	Depth (ft)	in.	%	Weath- ering	Dia- gram	Depth (ft)	Visual Description and Remarks
									SEE TEST BORING REPORT FOR OVERBURDEN DETAILS
					1			232.1 27.0	TOP OF BEDROCK AT 27.0 FT
									Note: Advance borehole with roller bit to 29.5.
- 30 -	7 4 3	Cl	29.5 34.5	50 26	83 43	Slight to Fresh			C1: Hard to very hard, slightly weathered to fresh, mottled light gray to rusty-brown, aphanitic to fine-grained QUARTZITE. Foliation extremely thin at high angles, joints at low to high angles, extremely close to moderat smooth to rough, planar, oxidized, open, some with sandy silt in-filling.
	3					:			-BEDROCK-
- 35	3 2 2	CT.	34.5 39.5	57 27	95 45	Slight to Fresh			C2 to 38.7 ft.: Same as above, with thin oxidized shale layer. Note: Losing water while drilling, joints producing sandy silt.
	2				·			220.4 38.7 219.6 39.5	
							1		BOTTOM OF EXPLORATION 39.5 FT. INSTALLED PIEZOMETER AT 38.2 FT.
						-			
			,			·			

Project MONITORING WELL INSTALLATION ACC 32/43A DEVENS, MA Client MASSDEWELOPMENT/DEVENS COMMERCE CENTER Contractor EARTH EXPLOYATION SERVICES, WERNTHAM, MA Classing Sampler Barrel Drilling Equipment and Procedures Street December 26, 2001 Driller Restrood	X.	ALEY DRIC	S H						TEST	во	RING REF	PORT	-				В	ori	ng	No	032	-MS	01-	13X	В
Casing Sampler Sampl	Clie	ent .	MASSI	ÞΥ	ELOF	MEN	T/I	DEV.	ENS COM	MER	CE CENTER		MΑ			SI	nee tart	et N	io. De	1 c	of 2 mbe	r 26			-
Type				_	Casin	ng S	am	pler	Barrel		Drilling Equip	oment ar	id P	rocedures)							-		
Annew Anne	Тур	e			sw		5	3	HQ	Rig	Make & Model:	Mobile	B-5'	7 Truck		H	<u> </u>	Re	p.						
Hammer Weight (b.) 300 140 - Casing: driven Location See Plan	Insi	de Dia	meter (i	in.)	6.0		1 3	3/8	2.5			it				1 -			n						~
Hammer Fall (in.) 24 30 - Hoist/Hammer Winch Doughnut Hammer			,	1		ì	- •	_		ſ								_	า				192	9)	
Visual-Manual Identification and Descriptions Secretary Secr	Han	nmer F	all (in.)		24		3	0	i - i	1	•	nch Dou	ıghn	nut Hammer								-44			
Comparison Com	_		ۼٛڿ	Γ,	_ E	<u> </u>	ĺ	夏	i .		3.5									ıd		F		Test	_
Section Sect	Depth (ft.	SPT.	Sample N & Rec. (ir	Sample	Deptn (It.	elev./Dep	(£.)	JSCS Sym	(Density	/cons	istency, color, GR	OUP NAN	ΛE, ι	max. particle size		% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines:	ilatanc"	oughnr ss	lasticity	Sirenath
			1		 _			· رـ			-CON	CRETE-								-		Ω	<u>- </u>	ماد	2
Section Sect					:		-										<u>L</u>	<u> </u>	<u> </u>	_			_		
17 S2 3.0		38 38			- 1.1			SP		e yello	•		?), m	рѕ 3.0 тт, по о	lor,	 		5	50	40	5			 	
S 23 18 5.0 254.6 4.5 ML Very dense yellow sandy SILT (ML), mps 0.25 in., well bonded, no odor, moist GLACIAL TILL- No recovery. TOP OF BEDROCK AT 7.0 FT SEE CORE BORING REPORT FOR ROCK DETAILS SEE CORE BORING REPO																Ļ		L			_	_			٠,
S 28 53 5.0		23						SP		gray	brown poorly grad	ded SANI) (S)	P), mps 0.25 in.,	no		5	20	50	20	5				
Mater Level Data Sample Identification Well Diagram Summary						N.V.		 	<u> </u>		-F	ILL-		······································									-	-	-
Water Level Data Water Level Data Depth (ft.) to: Sample Identification Well Diagram Summary Date Time Elapsed Depth (ft.) to: South Bottom Bottom Time (hr.) bf Casing of Hole Water T Thin Wall Tube Filter Sand Rock Cored (lin. ft.) 10.5 No recovery. TOP OF REDROCK AT 7.0 FT SEE CORE BORING REPORT FOR ROCK DETAILS Top Of REDROCK AT 7.0 FT SEE CORE BORING REPORT FOR ROCK DETAILS	5 -	47						ML			ow sandy SILT (M)	L), mps 0	.25	in., well bonded,	no		5	5	5	25	60	İ			
TOP OF BEDROCK AT 7.0 FT SEE CORE BORING REPORT FOR ROCK DETAILS 10 -						7.	·- ト		. N		-GLAC	IAL TILL	,-	•											_
Water Level Data Date Time Elapsed Depth (ft.) to: Bottom Filme (hr.) Bottom Time (10072"				7	0.	ļ	No recover	ry.											İ	ļ			
Water Level Data Depth (ft.) to: Time Elapsed Depth (ft.) to: Time (hr.) Bottom Bottom Time (hr.) Bottom Time (hr.) Bottom Time (hr.) Bottom Bottom Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.) Time (hr.)							İ	į														Ì	İ		
Water Level Data Water Level Data Sample Identification Well Diagram Summary Date Time Elapsed Depth (ft.) to: Time (hr.) Bottom Bottom Water of Casing of Hole T Thin Wall Tube T Thin Wall Tube Filter Sand Rock Cored (lin. ft.) 15.0			[ļ	SE	E CO	RE BORING REP	PORT FOI	R RO	OCK DETAILS									1	-	
Water Level Data Sample Identification Well Diagram Summary Date Time Elapsed Depth (ft.) to: O Open End Rod Time (hr.) Bottom Bottom of Hole Water To Thin Wall Tube	10 -			İ		-		Ì															1	l	
Water Level Data Sample Identification Well Diagram Summary Date Time Elapsed Depth (ft.) to: Time (hr.) Bottom Bottom of Hole Water To Thin Wall Tube To Depth Casing of Hole Water To Depth Casing of Hole Water To Thin Wall Tube To Depth Casing of Hole Water To Thin Wall Tube To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of			·													f 				 				ļ	
Water Level Data Sample Identification Well Diagram Summary Date Time Elapsed Depth (ft.) to: Time (hr.) Bottom Bottom of Hole Time (hr.) Bottom of Hole Time (hr.) Bottom of Hole Time (hr.) Bottom of Hole Time (hr.) Bottom Bottom of Hole Time (hr.) Bottom Bottom of Hole Time (hr.) Bottom Bottom of Hole Time (hr.) Bottom Bottom of Hole Time (hr.) Bottom Bottom of Hole Time (hr.) Bottom Bottom of Hole Time (hr.) Bottom Bottom Bottom of Hole Time (hr.) Bottom Bottom Of Hole Time (hr.) Bottom Of Hole Time (hr.) Bottom Bottom Of Hole Time (hr.) Bottom Of Hole			,					1																	
Water Level Data Sample Identification Well Diagram Summary Date Time Elapsed Depth (ft.) to: O Open End Rod Time (hr.) Bottom Bottom of Hole Water To Thin Wall Tube)														1						
Water Level Data Sample Identification Well Diagram Summary Date Time Elapsed Depth (ft.) to: Time (hr.) Bottom Bottom of Hole Water To Thin Wall Tube To Depth Casing of Hole Water To Depth Casing of Hole Water To Thin Wall Tube To Depth Casing of Hole Water To Thin Wall Tube To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of Hole Water To Depth Casing of							ļ												-				-		
Water Level Data Sample Identification Well Diagram Summary Date Time Elapsed Depth (ft.) to: O Open End Rod Time (hr.) Bottom Bottom of Hole Water To Thin Wall Tube																									
Water Level Data Sample Identification Well Diagram Summary Date Time Casing of Hole Time Casing of Hole Time Casing of Hole Time	15																		- {	1					
Water Level Data Sample Identification Well Diagram Summary Date Time Casing of Hole Time Casing of Hole Time Casing of Hole Time	- [ļ	j																l i	
Water Level Data Sample Identification Well Diagram Summary Date Time Elapsed Depth (ft.) to: O Open End Rod Elapsed Screen Overburden (lin. ft.) 10.5 Time (hr.) Bottom Bottom of Hole T Thin Wall Tube Elapsed Filter Sand Rock Cored (lin. ft.) 15.0 Riser Pipe Elapsed Overburden (lin. ft.) 10.5 Rock Cored (lin. ft.) 15.0								Ì										Ì	1	1	1		- [
Water Level Data Sample Identification Well Diagram Summary Date Time Casing of Hole Time Casing of Hole Time Casing of Hole Time			•					ĺ												İ			ļ	[
Water Level Data Sample Identification Well Diagram Summary Date Time Elapsed Depth (ft.) to: O Open End Rod Elapsed Screen Overburden (lin. ft.) 10.5 Time (hr.) Bottom Bottom of Hole T Thin Wall Tube Elapsed Filter Sand Rock Cored (lin. ft.) 15.0 Riser Pipe Elapsed Overburden (lin. ft.) 10.5 Rock Cored (lin. ft.) 15.0					ļ	-	}	i											1	ļ				ļ ‡	
Water Level Data Sample Identification Well Diagram Summary Date Time Elapsed Depth (ft.) to: O Open End Rod Elapsed Screen Overburden (lin. ft.) 10.5 Time (hr.) Bottom Bottom of Hole T Thin Wall Tube Elapsed Filter Sand Rock Cored (lin. ft.) 15.0 Riser Pipe Elapsed Overburden (lin. ft.) 10.5 Rock Cored (lin. ft.) 15.0						İ		}																	
Water Level Data Sample Identification Well Diagram Summary Date Time Elapsed Depth (ft.) to: O Open End Rod Elapsed Screen Overburden (lin. ft.) 10.5 Time (hr.) Bottom Bottom of Hole T Thin Wall Tube Elapsed Filter Sand Rock Cored (lin. ft.) 15.0 Riser Pipe Elapsed Overburden (lin. ft.) 10.5 Rock Cored (lin. ft.) 15.0	20				İ	ļ		ļ											-		-	<u>i</u>	<u> </u>		
Date Time (hr.) Bottom Bottom Water T Thin Wall Tube Screen Rock Cored (lint. 1c.) 10.3	20 -		Wat	er L	evel [S	ample Identificat				Ţ		S	Sun	ıma	ıгу					_
Thin Wall Tube Filter Sand Rock Cored (lin. ft.) 15.0	Da	ate	Time	Ela	psedl				-		•				1				•						
12/27/01 0700 16 7.0 25.5 20.0 U Undisturbed Sample Cuttings Samples S4, C3	רוכן	7/01	0700				ng	of Ho	le vvater				\Box	Filter Sand Cuttings	1			ed (5.0			
1/4/02 0755 9 Days 20.6 S Split Spoon Grout Grout Boring No. 32N/ 01 13YRP)	0755	91	Days	7.0		∠ɔ.5 -	1 1			Tiple	W/AE	Grout	-							1 77			
1/14/02 1220 19 Days - 23.5 21.1 G Geoprobe Bentonite Seal				19		-					•		<i>[</i>]	Bentonite Seal								1-1.	A		_
Field Tests: Dilatancy: R-Rapid, S-Slow, N-None Plasticity: N-Nonplastic, L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High SPT = Sampler blows per 6 in. **Maximum particle size (mm) is determined by direct observation within the limitations of sampler size (in millimeters)					Tor	ighne	SS.	_L-L	ow. M-Med	lium.	H-High	Dry Stre	ngti	h: N-None, L-La	<u>w, M-</u>	<u>Mec</u>	<u>ljun</u>	ກ <u>,</u> 🛚	<u>H-H</u>	<u>ligh</u> ,	<u>. V-</u>	Ve⊓	/ Hic	<u>h</u>	_

TIMESO
1411
ALDRICH

Boring No. 32M-01-13XBR File No. 10884-056 Short No. 2 of 2

		······	,			· · ·			She	eet No. 2 of 2
nth	Drilling Rate	Run	Depth	Recove	ry/RQD	Weath-	Well Dia-	Elev./ Depth	Visual Descript	lion
(ħ)	Min_fit	No.	(ft)	in.	%	ering	gram	(ft)	and Remarks	
									SEE TEST BORING REPORT FOR	OVERBURDEN DETAILS
									TOP OF BEDROCK	AT 7.0 FT
									Note: Advanced borehole with roller bit to	10.5 ft.
]							
- 10 -	· '									
	7	Ci	10.5 15.5	54 33	90 55	Slight			C1: Very hard, slightly weathered, gray, at QUARTZITE. Foliation extremely thin at I	phanitic to fine grained
	7								microfaulted. Primary joints set at high ang	gle, extremely close to moderate.
	7								smooth to rough, planar to stepped, oxidize Observed single horizontal joint, smooth, p	ed to disintegrated, tight to open. Islanar, oxidized, tight.
	7									•
	1								-BEDROC	
- 15 -	7								(Possible Vaughn Hill	is Pormation)
	7	C2	15.5 20.5	57 15	95 25	Slight			C2 to 17.5 ft: Same as above.	
	7			-			[清:	241.6		
	7					Slight	1書:	17.5	C2 from 17.5: Very hard, slightly weathers	ed, interbedded layers of gray
	7								aphanitic QUARTZITE and gray white, ap GNEISS. Foliation extremely thin to thin a	hanitic to coarse grained
									moderate to high angle, extremely close to	close, smooth to rough, planar to
- 20 -	7	C3	20.5					238.6	stepped, oxidized, tight to open.	
	7	L3	20.5 25.5	54	90 15	Fresh to	擂	20.5	C3: Very hard, fresh to slightly weathered.	, mottled gray white, fine to
	7					Slight	倡		coarse grained GNEISS. Gneissic foliation Joints at high angle, extremely close to close	extremely thin at high angles.
	7						[]		oxidized, tight to open.	se, silkotti to rough, pianat,
	7				İ				-BEDROC	·K-
- 25 -	7									
رد]		 	<u> </u>				233.6 25.5	BOTTOM OF EXPLOR	ATION 25 5 FT
ĺ									INSTALLED OBSERVATION	
									INSTALLED OBSERVATION	N WELL AT 25.7 FE
			1							
			1							
				1						
				1						•
			1							
									i	
									T. C. C. C. C. C. C. C. C. C. C. C. C. C.	
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HALEY & ALDRICH		OBSERV INSTALLA			<u> 34N</u>	<u>И-01-13X</u> И-01-13X
Project	MONITO	RING WELL INSTALLA	TION	OC32/43A Installation		Dec-01
City/State	DEVENS			Location	<u></u>	Plan
Client	414 Million VIII - 111 -	VELOPMENT/DEVENS C	OMME	RCE CENTER		
Contractor	•	EXPLORATION SERVICE			0. 108	84-056
Driller	R. EAST	WOOD		H&A Rep.	w.	Rubik
Ground El.	259.1					
El. Datum	NGVD (19	229)	Ē	Type of protective cover/lock:	E	Bolted Co
SOIL/R	ROCK	BOREHOLE	1	Depth of top of roadway box below gro	and surface	
CONDIT		BACKFILL				
(Numbers refer to	elevation/depth (not to so	from ground surface in feet)	П	Depth of top of riser pipe below ground	l eurfana	
	(NOT 40 SC	and f		Departor top or riser pipe below ground	- Sultace	
-CONC	RETE-	-CONCRETE- 0.7		Type of protective casing:	R	oadway
0.8		-FILTER SAND-		Length	-	<u></u>
*****	_			Inside diameter	_	····
-मा	ملہ	3.0		Depth of bottom of roadway box	_	
4.5				Seals: Depth to	Thickness	
**********				Type top (ft)	(ft)	
a a			ļ	Concrete 0.0	0.7	
-GLACIA		-BENTONITE-		Bentonite Seal 3.0	8.7	
7.0						0 mv.c
		·		Type of riser pipe:	Sch 4	0 PVC S
		11.7		. Inside diameter of riser pipe	_	
				Type of backfill around riser:		
				→ Diameter of borehole	-	
				Depth of top of welt screen	-	
-BEDR	COCK-			Type of screen or manufacturer:	Machine	Slotted I
	,			Screen gauge or size of openings	; _	0
		-FILTER SAND-		Diameter of well screen		
				Type of backfill around screen		Filter S
				Depth of bottom of well screen		
	,			Depth of bottom of silt trap		
25	5.5	25.5		Depth of bottom of borehole		
		Exploration		(Depths refer to grou	- und surface)	•

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HA ALI	LEY &						TEST	BOR	ING REP	ORT				E	30	ric	ıg	No	32	M-()1-1	4X	:01
oje <i>i</i> er Cont	at M	IASSDI	EVELO)PM	ENT/I	DEVI	ENS COM	MERC	C 32/43A DEVI E CENTER ENTHAM, MA	ENS, MA				Sh Sta	art	N	o. No	l o		r 26	, 20		
			Cas	sing	Sam	ıpler	Валгеі		Drilling Equipm	nent and P	oceo	dures			ist Ilei	•	140				, zu nelli		
Туре	:		S	W		3		Rig M	lake & Model: 1	Mobile B-5	7 ATV	V		H8	ΑI	Re	p.	1	L. N	lich	ols		
Insid	e Dian	neter (in	.) 6	.0	1:	3/8	_	Bit Ty					- 1		eve		n		55.				
Ham	mer W	eight (II	b.) 3	00	1.	40	-		Aud: None 19: driven				Ł.		tur		<u> </u>		Pla		(192	9)	
Ham	mer Fa	all (in.)] 3	0	3	0	-		/Hammer: Cat-I	Head Safe	ty Ha	mmer	- 1				•			44			
£		. (jr.)	(£)	agram) Pepth	Symbol	\	1	Manual Identifica				P		vel	-	Sar		e e		ield		
Depth (ft.)	SPT	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	scs s	(Density structure, o	/consist	tency, color, GRO pisture, optional de	UP NAME, escriptions,	max. geolo	particle size**, gic interpretati	on)	% Coarse	% Fine	% Coar	% Med	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
- 0 -	2	SI		1		SM	Very loose	brown	TOPSOIL with ro														
	2 3 15	14	2.0	4 4 4 4	0.5 253.2	SM	Loose bro	wn silty	SAND (SM), mps	<u>IL FILL-</u> s 1.0 in., no LL-	o odor,	, dry		5		5	10	60	20				
	15	S2 4	2.0		2.0	SM			ck silty SAND (Si	M), little ro	ots, m	ps 0.25 in.,			5		匚		30				
	14 14	S2A	2.5 2.5		252.7 2.5	ML	organic oc		-FORMER	TOPSOIL-	-		A				10	30	60			1	
	14	13	4.0		251.2		Medium d	ense bro	own sandy SILT (!	ML), mps 2 ESS-	.0 mm	, no odor, dry											
- 5 -	10 12 17	S3 4	4.0 6.0		253.2 2.0 252.7 2.5 251.2 4.0 246.2 9.0	SP	Medium d moist	ense bro	own poorly graded	SAND (SP	?), mp:	s 1.0 in., no od	lor,	5	5	10	30	50					
. }	14	S4	6.0	255		SP	Same as a	have e	xcept dense	•			}	5	_	10	20	50					
	15 16 15	10	8.0					5070, 0.	-GLACIOFLUY	IAL DEPO	SITS-			J									
	8 16	\$5 5	8.0 9.0		246.2	SP	Same as a	bove, e	xcept medium den	se													
	20 14	S5A 4	9.0 10.0	1123	9.0	SP	Dense gra	y-brown	n poorly graded SA	AND with g	gravel ((SP), mps 2.0	in.,	20	25	Γ		15	5	Γ			
- 10 -	21	S6				SP	Same as a						ļ	20	20)		15	5				
	16 15 12	11				1			-GLACIOFLUV	TAL DEPO	SITS-							'					
	15 15	\$7 5	13.0		242.2		Same as a	bove, e: 	xcept medium den	se				10	20	1		15	5			į	
	12 12	S7A 7	13.0 14.0		13.0	SM	Medium of partings,		llow-brown silty S , moist	SAND (SM)), mps	2.0 mm, in					5	80	15		Ī		-
	7 11	S8 13	14.0			SM	Same as a	bove									5	86	15				
- 15 - -	13 11	70							-GLACIOFLUV	IAL DEPO	osits-												
-	11	\$9 5	16.0 17.0		238.2		Same as a								L				L			_	_
	11 15	\$9A 5	17.0 18.0		17.0 237.2		Medium (mps	5	10	2	5 3	2	5				
	9	S10 12	18.0 20.0		18.0		Medium	iense ye	-GLACIOFLUV Blow-brown sandy	SILT (ML)), mps	1.0 mm, in	/		Τ		1	3	65			N	Γ
•	10 14						partings,		, moist -GLACIOLACUS	TRINE DE	POSIT	rs-											
- 20 -		Wa	ter Lev	el D.	ata	1	<u>t</u>	1 6	ample Identificat	tion 1	ا المالا	Diagram	1			6.	1		<u> </u>	1	1	1	<u>t</u>
, D	ate		Flans	ed	De	oth (fi	l.) to:	0	Open End Rod		R	iser Pipe	Ove	ert	วนเ			<u>mar</u> in. 1	γ t.)	28.	4		
			Time (hr.}	Casing	of 1	Wate	T	Thin Wall Tube		<u> </u>	creen ilter Sand	Ro						-		-		
	26/01	1225	0.5		19.0	21	.0 18.0	U	Undisturbed Sa	mple 📆	∃ c	uttings Frout	Sa	mp	les	3			314				
	26/01 12/02	1426 1345	0.3 44 Da		19.0	25 27		1	Split Spoon Geoprobe		ဥ္	oncrete	Во	ri	ng	N	lo.	32	М-	01-	142	(O)	В
	eki Tes		1	Dila	tancy:	R-	Rapid, S-	A wol	l-None	Plasticity	. N-N	entonite Seal Ionplastic, L-I	.ow, N	(-N	led	liun	n,	НН	igh				
192	r = 920	miar hlm	ve nar G	Tou	ghnes	i L	Low, M-M	edium.	H-High	Dry Stren	ngth:	N-None. L-Lo	W. M	M	edi:	um	<u>. </u>	-Hi	gh,	V-V	ery l	ligh	<u></u>

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	HA AL	LFY & DRICI						TEST BORING REPORT	F	Bor Tile She	No		108	84-	2M- 056 f 2		4X(ОВ
,	1		Š. Š.	€	gram	apth	Jupo Jupo	Visual-Manual Identification and Description	Gra	vel	0	San	rd_			leid se		L _
Ł	Depth (1-	SPT	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	(Density/consistency, color, GROUP NAME, max. particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)	% Coars	% Fine	% Coars	% Mediu	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
ľ	20 -					235.2 20.0		Note: Boulder from 20.0 to 22.0 ft.										
								-GLACIOLACUSTRINE DEPOSITS-										
		19 16 23	S11 9	22.0 23.5		231.7 23.5	ML	Dense yellow-brown SILT with sand (ML), mps $\theta.25$ in., in partings, no odor, moist		5	5	5	10	75				
ŀ		25 25	SIIA 3	23.5 24.0		23.5	GM GM	Dense yellow-brown silty GRAVEL with sand (GM), mps 2.0 in., well bonded, no odor, wet	15 15	35 30	5 5	10 10	15 20	20 20				
-	25 -	21 24	S12 11	24.0 26.0				Same as above										
ŀ		25 32	S13	26.0		1	GM	-GLACIAL TILL- Same as above										
\mathbf{I}		16 15	11	28.0														
-		53 12	S14	28.0			GM	Same as above										
١		100/5"	5	28.9	1	226.3 28.9		BOTTOM OF EXPLORATION 28.9 FT	┞	 	-	-						
								INSTALLED OBSERVATION WELL AT 27.3 FT										
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١																		
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ន្ទ																		
May 6, 02																		
28.QP																		
VOSEN.CA																		
G:11048410564.008.0PJ																		
Ę																		
								,										
No en																		
USCSLIB3,QLB																		
		<u>L</u>		<u></u>			<u> </u>		\perp		1							
S, TB3	*SP	T = Sam	pler blov	rs per 6	in. "A	Azximum	nartic	le size (mm) is determined by direct observation within the limitations of exercise	T	-				27	N 1	N 1.	4V/	1

HALEY & ALDRICH				M-01-14XOB
		INSTALLA	TION REPORT Test Boring 32	M-01-14XOB
Project	MONITO	RING WELL INSTALLA	TION AOC32/43A Installation Date 27	-Nov-01
City/State	DEVENS,	MA	Location Se	e Plan
Client	MASSDE	VELOPMENT/DEVENS C	OMMERCE CENTER	
Contractor	EARTH E	XPLORATION SERVICES	S, WRENTHAM, MA H&A File No. 10	884-056
Driller	T. MART	INELLI	H&A Rep A.	Nichols
Ground EL	255.2			
El. Datum	NGVD (19	29)	Type of protective cover/lock: C	over/Padlock
SOIL/R	OCK	BOREHOLE	Height of top of casing above ground surface	2.5 ft
CONDIT		BACKFILL		
(Numbers refer to	elevation/depth: (not to so	from ground surface in feet)	Height of top of riser pipe above ground surface	2.2 ft
			The state of the s	<u> </u>
-TOPS 0.5	OIL-	-CONCRETE-	Type of protective casing:	Guard Pipe
-FIL	ا اس		Length	5.0 ft
2.0		2.0	Inside diameter	<u>6.0</u> in
-FORMER T	ropsoil-		Depth of bottom of roadway box	2.0 ft
2.3		-GROUT-	Seals: Depth to Thickness	
	:		Type top (ft) (ft) Concrete 0.0 2.0 Bentonite Seal 12.0 3.3 Grout 2.0 10.0	
-GLACIOI DEPO		12.0	Type of riser pipe: Sch	40 PVC Solid
		-BENTONITE-	Inside diameter of riser pipe	2.0 in
			Type of backfill around riser:	Grout
		15.3	← Diameter of borehole	6.5 in
18.0			Depth of top of well screen	<u>17.3</u> ft
-GLA LACUS			Type of screen or manufacturer: Machine	e Slotted PVC
DEPC 23.5			Screen gauge or size of openings	0.010 in
		-FILTER SAND-	Diameter of well screen	in
OT 100	\		Type of backfill around screen	Filter Sand
-GLACE	AL TILL-		Depth of bottom of well screen	£7.3 ft
			Depth of bottom of sitt trap	
28	3.9	28.9	Depth of bottom of borehole	28.9 ft
		f Exploration	(Depths refer to ground surface)	
Remarks:	Ground E	l. reflects estimated ground sur	face at time of drilling, prior to gravel pad placement.	···

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		MASSD	EVEL	OPl	(ENT/)	DEVE ON S	NS COM	MER	OC 32/43A DEVENS CE CENTER CENTHAM, MA			s	ile i hec tart	et N	lo. No	088 i of	3 aber	27,	200 200	 I
		<u> </u>	C	asing	San	pler	Barrel		Drilling Equipment	and Pro	ocedures		ellin(***			artir		•
Тура	.		:	SW		s	HQ		Make & Model: Mob	ile B-57	ATV	Н	A&I	Re	p.				A.N	icl
Insid	de Dian	neter (i	n.)	6.0	1:	3/8	2.5		ype: Roller Bit				lev		n _		55.:			
Ham	nner V	Veight (lb.)	300	1	10	-		Mud: None ing: driven	•			oca		3 '	See			1929	<u>) </u>
Han	mer F	all (in.)		30	3	o			atives Winch	Doughnu	t Hammer				•		1 14	44		
		غ ف		E	£	8	l				,	Gr	ave	1	San	d	_	Fi	eld T	es
£,	•	를 (j	# je	lagre	Dep	Symbol	V	isual	-Manual Identification	and De	scription	9		\$ E	lт			2	. S	J
Depth (ft.)	SPT	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	93	(Density tructure, o	/consi dor, m	stency, color, GROUP to oisture, optional descri	VAME, m ptions, ge	ax. particle size**, sologic interpretati	on) %	% FJ36	% Coarse	% Medlum	% Fine	% Fines	Dilatancy	Toughness	riasticity
- 0 -				٥١٥	254.6	一			-TOPSOII	<u></u>			吉	=			=	=		
-				ا ا	0.5				,				1	†			7	\dashv	+	7
-				Sherring a	253.1 2.0		Note: Clus in overbure	ter we den so	ll with Boring 32M-01- ils.	14XOB. 1	No sampling requit	ed	-							
ļ								·····	-FILL		·····		ļ				ĺ			ļ
- 10 -				<u>n indicentaria de la companya de la calcata</u>																
- 15 -				ningastrikan dipantukassiki katolikan karanga karanga. Pantukan katolikan pantukan katolikan karanga karanga karanga karanga karanga karanga karanga karanga karanga					-GLACIOFLUVIAL	DEPOST	15-									
-20 -	<u></u>	Wa	ler Lev	-14	·	<u> </u>			ample Identification	1 121-	U Diocess		<u>_</u>	<u> </u>	1		[[_1
D	ate		Flans	24		th (ft.) Bottor	to: Nater	0	Open End Rod		ell Diagram Riser Pipe Screen	Overl	่อนเซ	den		. ft.)	_	0.4		
13/	17/01				Casing	of Hol	1	1	Thin Wall Tube		Filter Sand	Rock			(lin			15		
	17/01 2/02	0745 1400	18 Da 46 Da		-	- 42.5	24.4	U S	Undisturbed Sample Split Spoon		Cuttings Grout	Samp		_		C				
								G	Geoprobe		Concrete Bentonite Seal	Bori	ng	N	D. 3	32N	1-0	1-1	4XE	R
Fig	eld Tes	, c.		Dila	ancy:	R.R	apid, S-SI	our h	J. None Diss	tinihe N	l-Nonplastic, L-L	12 L	ind.		- Li	Lin	<u>-</u>			

H.	VLEY & DRIC	ř					TEST BORING REPORT	F	ile	No) N (08	84-1	2M-4 056		4 X)	BR
Depth (11)	.LdS	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS-Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)		% Fine		Sark Wedinm %		% Fines		Toughness &	Plasticity 2	Strength
- 20 - - - - 25 -				na volt. 18. objectiva semila i delikara i delikara i delikara i delikara i delikara i delikara i delikara i delikara i	•		-GLACIOFLUVIAL DEPOSITS-										
- -30 ·				\$			TOP OF BEDROCK 29.4 FT SEE CORE BORING REPORT FOR ROCK DETAILS										
-35																	
-40																	
-45																	مياسات ما يا يا يا يا يا يا يا يا يا يا يا يا يا
-Si	T=San	pler blov	vs per 6 k	n. **M	laximum	partic	le size (mm) is determined by direct observation within the limitations of sampler		<u> </u>	ئون		No.	321	MI-0	1-14	4XJ	J SR

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A-119 (4/63 - 5)	

Boring No. 32M-01-14XBF

rile No. 10884-056 Sheet No. 3 of 3

_										Sheet No. 3 of 3
-	Depth (ft)	Drilling Rate Min./ft	Run No.	Depth (ft)	Recove	ry/RQD	Weath- ering	Well Dia- gram	Depth	Visual Description and Remarks
-	(11)	MILLIAN	140.	(11)	1	/0	enng.	gram	(11)	SEE TEST BORING REPORT FOR OVERBURDEN DETAILS
	- 30 -	7	Cı	30.4 35.4	56 48	93 80	Presh		225.7 29.4	TOP OF BEDROCK 29.4 FT C1 to 33.3 ft: Very hard, fresh, gray, aphanitic QUARTZITE. Foliation extremely thin at high angle. Joints at low angle, close to wide, smooth, planar, fresh, tight.
		5								-BEDROCK-
-		5				}	Slight to		221.8 33.3	CI 33.3 to 35.4 ft: Hard, slightly to moderately weathered, brown, aphanitic OUARTZITE. Foliation extremely thin, highly disturbed, microfaulted.
	- 35 -	5					Moder- ate		219.7	Joints at low to high angle, extremely close to close, rough, stepped, oxidized to disintegrated, open.
		5 4	ස	35.4 40.4	59 58	98 97	Fresh		35.4	BEDROCK- C2: Very hard, fresh, gray, aphanitic to medium grained QUARTZITE. Foliation extremely thin at high angle. Joints at horizontal to low angle, close to moderate smooth, planar, exidized, right to open.
.		5		<u>.</u> !) }	-BEDROCK-
	- 40 -	6							214.7	(Possible Vaughn Hills Formation)
		5 6	СЗ	40.4 45.4	55 46	92 76	Fresh		40.4	C3: Very hard, fresh, light gray to white, aphanitic to medium grained QUARTZITE. Gneissic foliation extremely thin, moderately dipping. Joints at horizontal to moderate angle, very close to moderate, smooth, planar, fresh to oxidized, tight to open.
		7					 			-BEDROCK-
	- 45	4	<u> </u>						209.7	
			<u> </u>						45.4	BOTTOM OF EXPLORATION 45.4 FT
										INSTALLED OBSERVATION WELL AT 44.0 FT
							•			
Mar 27, 02	i I						:			
SS GPJ Ma							in .			
G 1108840564 OGS GPJ] []						:		
i I									•	
USCSTBC2		 								
11/83 GLB								} [
11-7 Him dama 11-7 1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-1-										
COPE-WE			<u> </u>					ļ Ē		
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HALEY&z ALDRICH			ION REPORT	2M-01-14XBR 2M-01-14XBR
Project	MONITO	RING WELL INSTALLAT		9-Nov-01
City/State	DEVENS.			≈ Plan
Client	MASSDEV	/ELOPMENT/DEVENS CO	MMERCE CENTER	
Contractor	EARTH E	XPLORATION SERVICES,	WRENTHAM, MA H&A File No. 10	0884-056
Driller	T. MART	NELLI	H&A Rep. A	. Nichols
Ground El.	255.1			
El. Datum	NGVD (192	29)	Type of protective cover/lock:	Cover/Padlock
SOIL/R	ROCK	BOREHOLE	Height of top of casing above ground surface	2.5 ft
CONDIT	-	BACKFILL		
(NUMBERS FEREN BO	elevation/aept/1 (not lo sc	from ground surface in feel) ale)	Height of top of riser pipe above ground surface	1.8 ft
mono			Time of australian and an	Guard Pina
-TOPS 0.5	OIL-	-CONCRETE-	Type of protective casing:	Guard Pipe
-FII	L-		Length	5.0 ft
2.0	SOIL-	2.0	Inside diameter	6.0 in
2.5LOI	ESS-		Depth of bottom of roadway box	2.0 ft
-GLACIO		-CEMENT GROUT-	Seals: Depth to Thickness	
-GLA	7CIO~	1	Type of riser pipe: Sch	40 PVC Solid
	STRINE DSITS-	i	Inside diameter of riser pipe	2.0 in
23.5			Type of backfill around riser:	<u>Seal</u>
-GLACI	AL TILL-	28.7	→ Diameter of borehole	<u>6.0</u> in
29.4		i	Depth of top of well screen	34.0 ft
		-BENTONITE-	→ Type of screen or manufacturer: Machin	ne Slotted PVC
-RED	ROCK-	32.0	Screen gauge or size of openings	<u>0.010</u> in
			Diameter of well screen	2.0 in
			Type of backfill around screen	Filter Sand
		-FILTER SAND-	Depth of bottom of well screen	
			Depth of bottom of silt trap	•
4	5.4	45.4	Depth of bottom of borehole	45.4 ft
	Bottom o	f Exploration	(Depths refer to ground surface)	
Remarks:	Soil condi	tions based on adjacent Cluster I	oring 32M-01-14XOB. Ground El. Reflects estimated ground surface at tin	ne of drilling.

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Pro Clie Cor	•	MASSI	EVE RTH	LOPM	IENT/ ORAT	ION :	ENS COM SERVICES	N AOC 32/43A D MERCE CENTER S, WRENTHAM, N	1A			Sh St	art nish	No. D	1 c	mbe		,
				Casing	San	npler	Barrel	<u> </u>	ipment and P			- -	iller				astw	
Тур	е		1	SW	ĺ	S	HQ	Rig Make & Mode		7 Truck				}ep.			Rubi	<u>k</u>
Insid	de Dia	meter (in.)	6.0	ı	3/8	2.5	Bit Type: Roller Drill Mud: None	Bit			•	evat itum			258. NGV	.7 VD (100
		Veight (all (in.)	1	300 24	1	40 30	-	Casing: driven Hoist/Hammer: W	inch Doughr	nut Hammer					See		·	
~		후급		am	듄	Symbol		/isual-Manual Identi	fication and C	escription		Gra		Sa				ield
Depth (ft.)	3PT	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Syn	(Density	//consistency, color, G	ROUP NAME.	max. particle size*	ition)	% Coarse	% Fine	% Coarse	% Fire	% Fines	Dilatancy	Toughnes
- 0 -				ه اد	258.2			-Black	ASPHALT-									\exists
, ;	29 49 80	S1 17	0.5 2.0			SM	Very dense odor, dry	e dark brown silty SAI	ID with gravel	(SM), mps 1.0 in.	, no	10		_	40			
	26 37 28 33	S2 9	2.0 4.0	12.5	2.0 254.7	SM		mottled yellow brown o odor, dry. Trace root		SM), mps 0.25 in.,	.— -		5	5 5	65	20		
·	3.1 100/3"	S3	4.0		4.0	SP		yellow brown poorly	graded SAND	(SP), mps 4.0 mm	, in							
- 5 -	100/3"		4. /- 	^^ ' '-1			partings, n		UVIAL DEPOS DROCK AT 4.7		; 							
							SE	EE CORE BORING RI	EPORT FOR R	OCK DETAILS								4
-10 -										•								
15 -													1					
					Ì									-				-
1																		
20 <u>-</u>			<u> </u>											_				
			Flans	vel Dat	Dept	th (ft.)		Sample Identific O Open End Roo		ell Diagram Riser Pipe	Ove	erbu		ımmı ı (lir	nary n. ft.)) ().5	
	ate		Time	(hr.) B	ottom Casing	Botto: of Ho	ie water	T Thin Wall Tube	9	Screen Filter Sand Cuttings	Roo		ore	d (lir	n. ft. S3,) 3.		
	1/02 1/02	0750 1035	4 Da 11 D	. 1	-	- 44.5	23.7	U Undisturbed S S Split Spoon G Geoprobe	ample Single	Grout Concrete Bentonite Seal							1-15	 5XI
	ld Test			Dilata	1			ow, N-None	Disabisitus I	N-Nonplastic, L-L	our M	-N/o	liver	ı H	Hin	h		

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 =		
 	_	

Boring No. 32M-01-15XBR File No. 10884-056 Sheet No. 2 of 3

Danish	Drilling	D	D - 45	Recove	ry/RQD	Macib	Well		Visual Description
(ft)	Rate Min./ft	No.	Depth (ft)	in.	%	Weath- ering	Dia- gram	Depth (ft)	and Remarks
- 5				•				254.0 4.7	SEE TEST BORING REPORT FOR OVERBURDEN DETAILS TOP OF BEDROCK AT 4.7 FT Note: Advance borehole with roller bit to 9.5 ft.
- 10 -	8 8	Ci	9.5 13.0	30 0	71 0	. ,			-BEDROCK- CI to 11.0 II. Very hard, fresh, mottled gray white, fine to very coarse grained GNEISS. Gneissic foliation extremely thin moderately dipping. Joints moderately dipping, extremely close to close, smooth, planar, oxidized, tight to open. CI from 11.0 ft. Very hard, slightly weathered, gray aphanitic to fine grained QUARTZITE. Foliation extremely thin at high angle. Joints at
- 15 -	15 7 8 8 7	C2	13.0 18.0	60 15	100 25	Slight to Moder- ate		245.7 13.0	moderate to high angle, extremely close to close, smooth to rough, planar to stepped, oxidized, open. -BEDROCK- C2: Very hard to hard, slightly to moderately weathered, gray brown, aphanitic to medium grained QUARTZITE. Foliation extremely thin, moderately dipping. Primary joints set at low angle, extremely close to moderate, smooth, planar, oxidized, open. Secondary joints set at vertical angle, close to moderate, smooth, planar to stepped, oxidized, tight to open. -BEDROCK-
- 20 -	7 7 7 7	C3	18.0 23.0	30 24	50 40	Fresh*		238.7 20.0	(Possible Berwick Formation) C3 to 20 ft*: Same as above, except fresh, joints not described due to overcoring and poor recovery. C3 from 20.0 ft*, depth estimated: Very hard, fresh, mottled gray white fine to coarse grained GNEISS. Gneissic foliation evident. Joints not described due to overcoring and poor recovery. -BEDROCK-
- 25 -	7 7 7 15	C4	23.0 27.5	54 24	100 44				C4: Very hard, fresh to slightly weathered, mottled gray white, aphanitic to very coarse grained GNEISS. Gneissic foliation extremely thin at high angles. Primary joints set at low angles, extremely close to close, rough, planar, oxidized, open to tight. Secondary joints set at high to vertical angle, close to moderate, smooth, planar, oxidized, tight.
6 108810261.005.0PJ http://oz	7 7 7	Cs	27.5 32.5	54 24	90 40	Fresh		27.3	C5 to 31.5 ft: Very hard, fresh, gray, aphanitic to fine grained hornfelsed GNEISS. Foliation extremely thin at high angles. Joints at high angles, very close to moderate, smooth, planar, oxidized, tight to open. -BEDROCKBEDROCK-
44A_CORE-WELL3 USCSLIB3GIB USCSTBCX-GDT G108	8 7 7 7 7 7	C6	32.5 37.5	60 45	100 75	Slight Fresh		31.5 226.2 32.5	C5 from 31.5 ft: Same as above, except slightly weathered, extremely fractured. -BEDROCK- C6: Very hard, fresh, gray, aphanitic to fine grained GNEISS. Foliation extremely thin at high angles. Primary joints set at high angles, close to moderate, rough, planar, oxidized, tight to open. Secondary joints set at low angles, smooth to rough, planar, oxidized, tight to open. -BEDROCK-
14 CORE+WELL3 USC:	7 6	C7	37.5 42.5	48 41	80 68	Fresh			(Possible Berwick Formation) C7: Same as above.

22.0
14 A - 1 A - 2
A 15 5 6 7 7
3210D)&(01:8
. 22216611

Boring No. 32M-01-15XBR File No. 10884-056

							~		Sheet No. 3 of 3
pti	Dritting Rate Min./ft	Run No.	Depth (ft)	Recove in.	ry/RQD %	Weath- ering	Well Dia- gram	Elev./ Depth (ft)	Visual Description and Remarks
~ 40	6 6 5	C8	42.5 45.0	. 0	0			213.7	C8: No recovery. Rock pulled out from the core barrel.
45	3	一						45.0	BOTTOM OF EXPLORATION 45.0 FT
									INSTALLED OBSERVATION WELL AT 44.5 FT
CORE-WELLS USCRUBS. SCSTRCZ,GDT GNIOMMOSSLOGS.GPJ Mar 27,02									

Proj lie Jon		ASSDE	EVEL	OPM.	IENT/I	DEVE	ENS COM	MERCE	32/43A DEVENS, CENTER NTHAM, MA	MA		SI	ie N hee lart nist	t N	o. j	ol anu	ary	3, 2	2002		-
			С	asing	San	pler	Barrel		Drilling Equipment a	nd Proc	edures		rille				-		rood		
Гуре	.			sw		3	HQ	Rig Ma	ake & Model: Mobile	B-57 Ti	ruck	Н	&A	Re	ρ.	V	v.R	ubik	/D.	Vel	lo
nsic	le Diam	eter (in	u	6.0		3/8	2.5	Bit Typ				1	leva		n		58.				
	mer W	•	1	300		40			lud: None			ļ	atu				Pla		1929))	
	mer Fa			24		0	-		J: driven Hammer: Winch Do		T		700	u.	٠,	JUL	114	11			
1011				1				1101301	rtantifict. Winch De	jugitatit .	nammer	G	ave	i	San	u f			iekl i	Fac	
(#)	Visual-Manual Identification and Description Visual-Manual Identification and Description Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size**. structure, odor, moisture, optional descriptions, geologic interpretation)												% Fine				8		2		Γ
Depth (ft.)	SPT*	Samp & Rec	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	SSS	(Density structure, o	(Density/consistency, color, GROUP NAME, max. particle size**, acture, odor, moisture, optional descriptions, geologic interpretation)									% Fines	Dilatancy	Toughness	Plasticity	
0 -				1	258.0	=			-Black binuminous AS	PHALT.			丰	丰	F	F	F	\exists	$\dot{\dashv}$		F
	100/5°	Sl	0.5	11.	0.5	SM	Very dense	brown	silty SAND with gravel			r, 10	10	10	15	30	25		一		ŀ
		4	0.9				wet		-FILL-										. 1		l
	7	52	2.0	-:11	256.5 2.0						4 0 4 5 FP5 7-1 7E-		╀	Ļ	25	_		$\mid - \mid$			ŀ
	6 5 5	12	4.0			SP- SM			tiled yellow-brown poor mm, in partings, no odd -GLACIOFLUVIAL D	or, dry					25	60	10				
5	22 20	\$3 11	4.0 6.0		254.5 4.0	sw	Dense bro		graded SAND with grav	rel (SW)	, mps 1.0 in.,	5	20) 25	30	20				-	
•	20							-GLACIOFLUVIAL DEPOSITS-													ļ
	42	S4	6.0			sw	Same as a	-GLACIOFLUVIAL DEPOSITS- Same as above, except very dense								20					Ì
	29 38 36	14	8.0		250.5															!	
	22 16 20	S5 10	8.0 10.0		8.0		Dense ligi no odor, i		poorly graded SAND (SP), mps	2.0 mm, in partin	gs,			50	50					
- 10	22			_					GLACIOFLUVIAL I	DEPOSIT	rs-										
	10	S6 11	10.0		247.5	SP	Same as a	bove, ex	ccept medium dense				1	٦	5 30	1			1		
	34· 41				11.0		Poor reco	very of	GRAVEL				1	-	-		T	-	† -	-	_
•	33	S7	12.0			GP	١., .	•	-GLACIOFLUVIAL I				5	0 2	0 15	5 10	5				
•	100/0*	10	13.0				in., strati		n poorly graded GRAVE odor, dry	T Min 2	and (GP), mps 0.2	3									
-	39	S8	14.0			SP	Same as a	sbove, e	xcept mps 1.0 in.			1	5 4	0 1	5 1:	5 10	5				
- 15	44	10	15.											-							
	65 100/3				242.7										上	\perp					
•					15.8				-GLACIAL T	ILL-		7					1				
-	Corre	1	1		241.:		No recov	erv.				}	4	4	+	+	+	1		-	
	100/2	59 0	17.		17.0	'	1		TOP OF BEDROCK	<u>AT 17.0</u>	FT			Ì							
_		!						SEE CO	RE BORING REPORT	FOR RO	CK DETAILS										
20		<u> </u>											<u> </u>		<u>_</u>	<u>_</u>	<u> </u>	<u>_</u>			_
		Wa	1	evel l			4) 4	S	ample Identification	We	ell Diagram Riser Pipe				umi						
. 1	Date	Time	Ela	psed e (br	Botton	pun (1 1 Bo	t.) to:	- 0	Open End Rod	圕	Screen	Ove			-		-				
_		<u> </u>	1 833	₽ (Ar.	Botton of Casin	9 01	Hole Wate	⊣ '	Thin Wall Tube		Fitter Sand	Roc			:d (l		-		.0		
ľ	1/4/02 /11/02	0700 0935		16 Days	18.5	31	1.0 27.4 1.0 27.6	s	Undisturbed Sample Split Spoon		Cuttings Grout Concrete	San Boi	<u> </u>		Vo.		9, C 2M.		16		 ≹1
┖		! !	!			R		G	Geoprobe		Bentonite Seal	ow, M							-10/	(ILA	ارد —

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Boring No. 32M-01-16XBR File No. 10884-056 Sheet No. 2 of 2

File No. Sheet No.

Depth	Drilling Rate	Run	Depth	Recove		vveatn-	Well Dia-	Depth	Visual Description and Remarks
(ft)	Min./ft	No.	(ft)	in.	%	ering	gram	(ft)	
							<i>113 111</i>		SEE TEST BORING REPORT FOR OVERBURDEN DETAILS TOP OF BEDROCK AT 17.0 FT
									Note: Advanced borehole with roller bit to 21.0 ft.
	1								-BEDROCK-
- 20 -	ļ								
									C1 to 22.0 ft: Very hard, fresh, gray, aphanitic to fine grained
	10	CI	21.0 26.0	56 20	93 33	Fresh		236.5	OTTARTZITE Foliation extremely thin at high angle. Joints at moderate to
	6					Slight to		22.0	Now angle, close, rough, stepped, tight to open. C1 from 22.0 ft: Very hard to hard, slight to moderate weathering, mottle
	,					Meder-			gray-white, fine to coarse grained QUARTZITE. Gneissic foliation extremely thin at high angle. Primary joint sets at high angle, extremely
	6		}			ate			l glose to close, smooth to rough, planar to stepped, oxidized, open to close
25	5								Secondary joint set at moderate to low angle, extremely close to close, rough, planar to stepped, oxidized, tight to open.
– 25 –	5								
	6	C2	26.0	57	95	Slight			-BEDROCK- (Possible Vaughn Hills Formation)
	•		31.0	18	30	to Moder-			C2: Same as above.
	7					ate			
	6					İ			
	5					ļ			
- 30 -	7		ļ					007.5	·
	′		<u> </u>		<u> </u>	-		227.5 31.0	BOTTOM OF EXPLORATION 31.0 FT
									INSTALLED OBSERVATION WELL AT 31.0 FT
								i	
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3				1	[-			

HALFY & ALDRICH		OBSERV INSTALLA				Observation Well	32M-01-16XBR
Project	MONTES	RING WELL INSTALLA				Test Boring	32M-01-16XBR
City/State	DEVENS		LINO	IN AU	<u>32/43A</u>	Installation Date	4-Jan-02
Client	-	VELOPMENT/DEVENS C	'OMO	MEDC	E CENTED	Location	See Plan
Contractor		EXPLORATION SERVICE				H&A File No.	10884-056
Driller	R. EAST	WOOD				H&A Rep.	W. Rubik
Ground El.	258.5						
El. Datum	NGVD (19	729) -			Type of protective cover:		Bolted Cover
\$0IL/R	оск	BOREHOLE		¥	Depth of top of roadway b	oox below ground surfa	ice 0.0 ft
CONDIT		BACKFILL				•	
(MOLECEZ LEIGLE)	elevation/depth (not to si	from ground surface in feet)	í	П *	Depth of top of riser pipe	below around surface	0.2 ft
-ASPH	ALT-						
0.5		-CONCRETE- 0.7			Type of protective casing:		Roadway Box
-FIL 2.0	L-	-FILTER SAND-			Length		0.8_ft
	:	3.0			Inside diameter		6.0 in
					Depth of bottom of roadw	ay box	0.8 ft
-GLACIOF DEPOS					Seals: Type Concrete Bentonite Seal	Depth to Thickne top (ft) (ft) (ft) 0.0 0.7 3.0 16.0	
15.8	·····	-BENTONITE-			Minimum and the second and the secon		
-GLACIA	L TILL-			4	Type of riser pipe:		Sch 40 PVC Solid
17.0		19.0			Inside diameter of ris	er pipe	2.0 in
					Type of backfill arour	nd riser:	<u>Seal</u>
			i I		→ Diameter of borehole	,	6.0 in
		,	i i	-	Depth of top of well scree	en	21.0 ft
-BEDR	OCK-				Type of screen or manufa	acturer: Mac	chine Slotted PVC
	: :	-FILTER SAND-			Screen gauge or size	e of openings	0.010 in
	•		! !		Diameter of well scre	en	2.0 in
			! !		Type of backfill arous	nd screen	Filter Sand
			[4	Depth of bottom of well s	creen	<u>31.0</u> ft
			! [[Ц	Depth of bottom of silt tra	ар	
31.		.31.0	Ĺ.		Depth of bottom of boreh	oole	31.0 ft
Denisi	Bottom of	Exploration			(Depths	s refer to ground surfa	> 2)
Remarks:							

	X.	LEY & DRIC	Ç. H					TEST	BOF	RING REPOR	RТ			Boring No22M-01-17XB								
	Proj Clie Con	ject ent l etracto	MASSD	EVEL	.OPM	ENT/	DEVI	ENS COM	MERC	C 32/43A DEVENS E CENTER ENTHAM, MA	S, MA			Star	et N t	lo. N	I c		r 29	, 20		_
			•	С	asing	San	npler	Barrel		Drilling Equipment	t and Proc	ædures	1 .	Finis Orille		Ł				, 204 inell		
	Турс	е			SW		s	HQ	Rig M	fake & Model: Trac	k			- 4&⊦	Re	ep.		A. 1				
	•		meter (ir	n.1	6.0	1	3/8	2.5	Bit Ty					Elevation 257.1 Datum NGVD (1929)								
			Veight (I	1	300		40	_	1	Mud: None				Jail		n		Pla		(192	.9)	
			all (in.)	1	24		10	-	\$	ig: driven /Hammer: Cat-Head	i Safety F	- Hammer	ĺ									
				(£)	agram)epth	symbol	\	<u> </u>	Manual Identification			_	% Coarse % Fine								
	Depth (ft.)	SPT*	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	(Density structure, o	/consist	tency, color, GROUP histure, optional descri	VAME, max ptions, geo	x. particle size**, logic interpretati	on)		Charge	Wood	% Fire	% Fines	Dilatancy	Tough	Plastic	Streng·h
	- Q -	6	S1 4	0.0	4 4		SM	Medium de slight orga		y-brown silty SAND (SM), 10%	roots, mps 1.0 is	1.,	5	5	5	40	35			Į Į	_
ł	-	8 10	SIA	1.0		256.1 1.0	SM	\		-TOPSOIL		-00:		+	5	15	55	15			-	
	-	8	7	2.0				no odor, d	ry	low-brown silty SAND	(SM), mp	s 0.2 in., stratin	1	5 , 5		10	60	15				
	-	4 16 30 19	S2 22	2.0 4.0			SM	Same as al	bove, ex	cept dense												
	-	17	S3	4.0			SM	Same as al	bove				1	5	5	15	60	15				
- 1	- 5 -	27 20	12	6.0						-GLACIOFLUVIAL	DEPOSITS	S-										
ļ		20				251.1								_ _	_	_	_					_
	•	11 11	S4 24	6.0 8.0		6.0	SP-			low-brown poorly grad lified, no odor, dry	led SAND	with silty (SP-S)	VI),	5	5	15	65	10				
	-	9	-	8.0			SM	mps 0.25 i	ın., sıraı			_	Ì	İ								
	٠.	9	06	0.0			SP-	Same as ai	hava	-GLACIOFLUVIAL	DEPOSITS	5-		5	5	15	65	10				
		6 7	S5 11	8.0 9.0		248.1	SM	Same as at	DOVE								<u> </u>					
	•	8 10	S5A 10	9.0 10.0		9.0	ML	Medium de		low SILT with sand (N	AL), mps 2.	.0 mm, in partin	gs.			5	10	85	R	М	N	
	- 10 -	12	S6	10.0	日月		ML	Same as al								5	10	85	R	М	N	
	-	15 14	12	12.0	10 mar 10				-(GLACIOLACUSTRIN	E DEPOSI	TS-	}									
		20				245.1						<u></u>		<u> </u>								
	•	7	S7 4	12.0 13.0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	12.0	SM	Medium de odor, wet	ense bro	own silty SAND with g	ravel (SM)	, mps 1.0 in., no) [5	5 10	0 20	35	15	15				
1	-	15	S7A	13.0	स्वाप्तृत्वाद्वात् । स्वाप्तृत्वाद्वात्त्वा	244.1 13.0	ML	\		-GLACIOFLUVIAL	DEDOSTI	•	İ	+	\dagger	5	10	85	S	М	N	
	.	20	7	14.0	101		ML	Dense yeli	ow SIL	T with sand (ML), mps			ior,			5	10	85	s	м	N	
	46	12 16	\$8 16	16.0	431. B		1712	dry					ļ	İ	İ	Ì						
Mar 27, 02	- 15 -	14 15			1585	241.1		Same as al		GLACIOLACUSTRIN	E DEPOSI	TS-										
Ř	•	15	S9	16.0	相目	241.1 16.0	sw	Dense bro		graded SAND with gra	avel (SW),	mps 1.0 in., no	1	0 10	30	25	20	5		Ī		_
G _D	-	19	8 S9A	17.0 17.0		240.1 17.0		odor, wet		-GLACIOFLUVIAL				-		10	75	10		┝┥		
11.068		22	6 6	18.0	Barustinkardomi Enementario	11.0	SP- SM			wn poorly graded SAN odor, moist	D with silt	(SP-SM), mps 3	.0	Annual Property.	İ							
G-110884W56LOGS GPJ		21 20	S10 10	18.0 20.0	THE STATE OF		SP- SM	Same as at					;		5	10	75	10				ļ
540	•	24		_~~	Carrier of the contract of the					-GLACIOFLUVIAL	DEPOSITS	S-	ĺ									
1	- 20 -	21	<u> </u>		777 14-						1 1 1 1 1	Dia in a la	<u> </u>	-	<u> </u>		1					=
USCSTBC3.GDT		ſ		er Lev Elaps			th (ft.)) to:		mple Identification	□ F	Diagram Riser Pipe	Over	hur			nary n. ft.		11 5	·····		
USC	D	ate	Time	Time (hr.	Bottom Casing	Botto	m Water		Open End Rod Thin Wall Tube	1 =====	Screen Filter Sand	Rock			-						
GLB	12/0	04/01	0710	88		32.0	34.0) 26.7	ָ ָ ט	Undisturbed Sample		Cuttings	Sam					, C2				
USCSLIB3 GLB	1/1	2/02	1430	38 Da	i	-	51.3	26.3	s	Split Spoon		Grout Concrete	Bor	ing	N	o. ;	32N	/1- 0	1-1	7X	ВR	
	Fir	eld Tes	! ts:		Dilat	ancy:	R-F	Rapid, S-SI	G low, N-		ticity N.A	3entonite Seal Nonplastic, L-L	ow, M-l	Med	ium	, H	-Hig	jh ,	, , , , -	-, L1	iob	
USCS_TB3		_	plar blow	rs per f	Toug	nness:	L-L	ow. M-Me	dium. I	H-High Dry	Strength:	N-None, L-Love tion within the line	<u>v. M-N</u> nitations	of s	um. ami	H- oler	HIQI size	า. v	nillin	neter	2).	_
S.			Not	e: So	il ide	ntificat	ion_ba	sed on vis	<u>sual-ma</u>	inual methods of the	USCS as	practiced by h	łaley &	Ald	iricl	n, Ir	ıc.					

HA	LEY É DRICI			1		7	TEST BORING REPORT	Boring No. 32M-01-1 File No. 10884-056 Sheet No. 2 of 3 Gravel Sand Field							7X	BR	
Depth v.	SPT	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	Visual-Manual Identification and Description Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)											Strength
20 -	10 19	Si1 6	20.0 21.0		236.1	SP- SM	Same as above, except medium dense -GLACIOFLUVIAL DEPOSITS-			5	15	70	10	Dilatancy		Plasticity	
	19 20	S11A 10	21.0 22.0		21.0 235.1	sw	Dense brown well graded SAND (SW), mps 0.5 in., no odor, wet	5	5	40	30	20					
	15 13 21 24	S12 14	22.0 24.0	The state of the	22.0	SM	Dense yellow-brown silty SAND (SM), mps 1.0 rum, in partings, no odor, wet			5	5	75	15				_
- 25 -	23 23 18 26	S13 17	24.0 26.0		236.1 21.0 235.1 235.1 22.0 231.1 26.0 229.1 28.0 229.1 34.0	SM	-GLACIOFLUVIAL DEPOSITS- Same as above, except with a single layer of well graded sand			5	5	75	15				
	10 11 25	S14 10	26.0 28.0	STRIKE END	231.1 26.0	ML	Dense red-brown SILT with sand (ML), mps 1.0 mm, in partings, no odor, wet			_		20	80	S	М	N	
.	15 21	S15	28.0		229.1 28.0	SP	GLACIOLACUSTRINE DEPOSITS- Very dense red-brown poorly graded SAND (SP), mps 0.25 in., no	╀	5	45	35	15	5				H
	33 32 30	15	30.0				odor, wet -GLACIOFLUVIAL DEPOSITS-										
-30 -	12 10	S16 18	30.0 32.0		227.1 30.0	ML	Medium dense red-brown SILT (ML), mps 0.1 mm, in partings, no	╁	-	_		5	95	s	М	N-L	H
	17 17		32.0	1033340			-GLACIOLACUSTRINE DEPOSITS-										
	15 14 21 30	S17 25	32.0 34.0	zeren interitetakingan engantuan	223.1	ML	Same as above, except dense					10	90	\$	М	N	
-35 -	15 20 21	S18 12	34.0 36.0	77 LU 18	34.0		Dense yellow-brown silty SAND with gravel (SM), mps 1.0 in., moderately bonded, no odor, wet	5	10	16	20	25	30				
	34 23	S19	36.0	appara		SM	-GLACIAL TILL- Same as above	_	4.0		20	30	25				
	22 19 22	16	38.0		219.1								23				
	100/0	S20 0	38.0]"	38.0		TOP OF BEDROCK AT 38.0 FT SEE CORE BORING REPORT FOR ROCK DETAILS	1			l						f
-40 -																	
-45 -																	
	<u></u>	<u> </u>	<u> </u>			<u> </u>	le size (mm) is determined by direct observation within the limitations of sampler	<u> </u>		1	1	_	_	<u> </u>	<u> </u>	L	_

HALI ALDI	NCH UCH		· · · · · · · · · · · · · · · · · · ·		СО	RE B			EPORT	Boring No. 32M-01-17XBF File No. 10884-056 Sheet No. 3 of 3						
'oth	Drilling Rate	Run	Depth	Recove	ry/RQD	Weath-	Well Dia-	Elev./ Depth	Visual Des	scription						
()	Min./ft	No.	(ft)	in.	%	ening	gram	(ft)	and Rer	and Remarks						
									SEE TEST BORING REPORT I	PORT FOR OVERBURDEN DETAILS						
45 -	- 5 4 5 4 5 4 5	Cı	41.5 46.5 51.5	56 42 58 46	93 70 97 77	Fresh to Slight Fresh		219.1 38.0 205.6 51.5	TOP OF BEDRO Note: Water loss noted below 38.0 ft. -BED C1: Very hard, fresh to slightly weath QUARTZITE. Foliation extremely thi occasionally microfaulted. Primary joi wide, smooth to rough, stepped, oxidi at high angle, close to wide, smooth, j -BED (Possible Vaught C2: Same as above, except fresh Note: Water loss in Bedrock during d	Advanced with roller bit to 41.5 ft. ROCK- mered, gray, aphanitic to fine grained in, at high angle, disturbed, int set at low angle, extremely close tized, tight to open. Secondary joint seplanar, oxidized, tight to open PROCK- n Hills Formation)						

HALEY & ALDRICH		OBSERV/	ATION WELL ON	oservation Well	32M-01-17XBR
		INSTALLA	TION REPORT Te	et Borina	32M-01-17XBR
Project	MONITO	RING WELL INSTALLAT	FION AOC32/43A Ins		5-Dec-01
City/State	DEVENS,			-	See Plan
Client	MASSDE	VELOPMENT/DEVENS CO	DMMERCE CENTER	-	
Contractor		EXPLORATION SERVICES		LA File No.	10884-056
Driller	T. MART	TNELLI	. H8	LA Rep.	A. Nichols
Ground El.	257.1		<u> </u>		
El. Datum	NGVD (19	29)	Type of protective cover/lock:		Cover/Padlock
SOIL∕R	OCK	BOREHOLE	Height of top of casing above	e ground surface	2.9 ft
CONDIT		BACKFILL			
(Numbers refer to	elevation/depth	from ground surface in feet)	Height of top of riser pipe abo		245
·	(100.00	200)	Figigit of top of reset hipe and	ove ground sunace	2,4 ft
-TOPS	OIL-	-CONCRETE-	Type of protective casing:		Guard Pipe
1.0	l	-CONCRETE- 1.8	Length		5.0 ft
		-FILTER SAND-	Inside diameter		6.0 in
-INTERB	1	4.0			
GLACIOF AN	4	-BENTONITE-	Depth of bottom of casing		ft
GLAC		8.0	Seals: De	epth to Thickness	
LACUS				p (ft) (ft)	
DEPOS	SITS-		Concrete Bentonite Seal	0.0 1.8 4.0 4.0	
	ļ	-CEMENT GROUT-	Cement Grout	8.0 27.0	
34.0	1	i	Bentonite	35.0 4.5	
			Type of riser pipe:	Sci	h 40 PVC Solid
-GLACIA	L TILL-	35.0	Inside diameter of riser p		2.0 in
38.0		-BENTONITE-		•	
		39.5	Type of backfill around ri	iser:	Scal
<u> </u> 			→ Diameter of borehole		6.0 in
		1	Depth of top of well screen		41.4 ft
		I.	Type of screen or manufactu	uer: Machi	ne Slotted PVC
		l 1	Screen gauge or size of	openings	0.010 in
-BEDR	OCK-	-FILTER SAND-	Diameter of well screen	•	2.0 in
	•	Ĭ			
	-	•	Type of backfill around s	screen	Filter Sand
			Depth of bottom of well screen	en	51.4 ft
			Depth of bottom of silt trap		
51	.5	51.5	Depth of bottom of borehole	.	51.5 ft
	Bottom of	Exploration .	(Depths rei	fer to ground surface)	
Remarks:	Ground	El. reflects estimated gro	und surface at time of drilling, prior to pla	acement of gravel	pad

Proj iei Con		LASSDE	VEL	OPM	ENT/I	NST. DEVI	ALLATIO	BORING REPORT N AOC 32/43A DEVENS, MA MERCE CENTER , WRENTHAM, MA Boring No32M- File No. 10884-056 Sheet No. 1 of 2 Start January 2, Finish January 2,	2002	_
			C	asing	Sam	pler	Barrel	Drilling Equipment and Procedures Finish January 2, 1		
vpe	·· ···			SW	-	<u> </u>	HQ	Rig Make & Model: Mobile B-57 Truck H&A Rep. W. Rub		
nsid	le Dian	neter (in		£	13	118	2.5	Bit Type: Roller Bit Elevation 259.4		_
		/eight (II	1	300		#0	ر.ير	Drill Mud: None Datum NGVD Casing: SW to 10.0 ft Location See Plan	1929)	
		all (in.)	1	24	-	0		Casing: SW to 10.0 ft. Hoist/Hammer: Winch Doughnut Hammer		
	1							The state of the s	ield Tes	_
<u>=</u>		울을		l le	eptt	Symbol	٧	isual-Manual Identification and Description	92	Ī
Depth (ft.)	SPT*	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS S)	(Oensity structure, o	risual-Manual Identification and Description /consistency, color, GROUP NAME, max. particle size**, dor, moisture, optional descriptions, geologic interpretation)	Toughness Plasticity	
0 -				م م			·	-Gray CONCRETE SLAB-		f
	31 40 46	Si 17	1.0 3.0		258.5 0.9	SM	Very dense dry	brown silty SAND with gravel (SM), mps 1.5 in., no odor, 20 20 15 15 15 15		
•	53 46 57	S2 9	3.0 4.5			SM	Same as al	-FILL-		-
5 -	100						Note: Free	quent cobbles from 4.5 ft.		-
	141	S3	5.5			SM	Same as a	bove, except wet		
	110 100/1	9	6.6				Note: Mos	et of material appears to be blasted/crushed Bedrock.		
	26	S4	9.0		250.9 8.5	ML	Very dens	e yellow sandy SILT with gravel (ML), mps 1.0 in., well 10 10 5 10 15 50		
10 -	37 100/2*	9	10.1			-	bonded, n	-GLACIAL TILL- TOP OF BEDROCK AT 10.0 FT		
				,			s	EE CORE BORING REPORT FOR ROCK DETAILS		
					-					
15 -										
=										
. 20										
20		Wa	er Le	vel C				Sample Identification Well Diagram Summary		=
C	ate	Time	Elap Time	thet	Deg Bottom f Casing	Bot		O Open End Rod T Thin Wall Tube Riser Pipe Screen Filter Sand Rock Cored (lin. ft.) 14.		
1/	1/02	1100	9 D	U Undisturbed Sample Grout Samples S4, C2		_				
								G Geoprobe Concrete Boring No. 32M-01.	18XB	I
	ield Tes	10-		Dil	tancy:	R	Rapid, S-S			-

HA	-	-
3 4 5 7	9.68	4.3
ALI		CII
	11	(-1
Constitution of the Consti		

Boring No. 32M-01-18XBR File No. 10884-056 Sheet No. 2 of 2

Ţ		Drilling			Bassia	/BOD		Well	Elev./	Sheet No. 2012
	pth	Rate	Run	Depth	Recove		weath-	Dia-	Depth	Visual Description
3	(ħ)	Min./ft	No.	(ft)	in.	%	ering	gram	(ft)	and Remarks
										SEE TEST DODDIS DEDONT FOR OUTDOUR DESIGNATION
r	10 -							M M	249.4	SEE TEST BORING REPORT FOR OVERBURDEN DETAILS TOP OF BEDROCK AT 10.0 FT
									10.0	10. 01 mm2.0046111 10.01 1
										Note: Advanced borehole with roller bit to 14.0 ft.
ı										
1				ĺ						
1										
ı		7	CI	14.0	39	55	Fresh			C1: Very hard, fresh to slightly weathered, gray, aphanitic to fine grained
┢	15 -			19.0	16	27	to Slight	::目:]	QUARTZITE. Foliation extremely thin at high angle, disturbed. Joints at high angle, extremely close to close, smooth, planar, oxidized, tight to open.
-		7			}		Sugm			ingu angle, extremely close to close, smooth, planar, oxidized, tight to open.
		7					ļ	4:		-BEDROCK-
					1	1	ł	[语:		(Possible Berwick or Vaughn Hills Formation)
1		7				ĺ				
ļ						ļ		温:	j	
1		7						[·丰·		
		7	C2	19.0	57	95	Fresh]	C2: Same as above, except fresh. Joints close to wide.
L	20 -	'	l	24.0	57	95		:目:		, , , , , , , , , , , , , , , , , , , ,
-		7		į.	İ]				
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-		7	l		1		}		1	
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-		1]					(温)	‡	
		7				ļ ·	1]	
•				 	ļ	 	-		235.4 24.0	BOTTOM OF EXPLORATION 24.0 FT
						1			24.0	BOTTON OF EXPENSATION 24,0 FT
				ļ					1	INSTALLED OBSERVATION WELL AT 24.0 FT
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HALEY& ALDRICH		OBSERVA INSTALLAT			Observation Well	32M-01-18XBR
					Test Boring	32M-01-18XBR
Project		RING WELL INSTALLAT	TON AOC	32/43A	instaliation Date	2-Jan-02
City/State	DEVENS,			AD1 1700	Location	See Plan
Client Contractor	4.1	VELOPMENT/DEVENS CO EXPLORATION SERVICES.			H&A File No.	10884-056
Oriller	R. EASTV		·		H&A Rep.	W. Rubik
Ground El.	259.4					
El. Datum	NGVD (19	29)		Type of protective cover:	***************************************	Bolted Cover
SOILF	ROCK	BOREHOLE	<u> </u>	Depth of top of roadway b	ox below ground surf	ace 0.0 ft
CONDIT (Numbers refer to		BACKFILL from ground surface in feet)	i			
	(not to so	- · ·		Depth of top of riser pipe	below ground surface	0.3 ft
-CONC	RETE-	-CONCRETE-		Type of protective casing	:	Roadway Box
0.9		0.7		Length		0.8 ft
		-FILTER SAND-		Inside diameter		6.0 in
		2.0		Depth of bottom of roadw	ay box	0.8 ft
-FN	Lib			Seals: Type Concrete Bentonite Seal	Depth to thicker top (ft) (ft) (ft) 0.0 0.7 2.0 10.0	· ·
8.5		-BENTONITE-		4		<u> </u>
-GLACIA	AL TILL-			Type of riser pipe:		Sch 40 PVC Solid
10.0		12.0		Inside diameter of ris	ser pipe	in
		12.0		Type of backfill arou	nd riser:	Seal
				Diameter of borehole		<u>6.0</u> in
		1		Depth of top of well scre	en	14.0 ft
-REDI	ROCK-	i		Type of screen or manuf	facturer: Ma	achine Slotted PVC
-555.	ROCK -	-FILTER SAND-	-	Screen gauge or siz	e of openings	0.010 in
				Diameter of well son	een	2.0 in
		1		Type of backfill arou	ind screen	Filter Sand
	;			Depth of bottom of well :	screen	24.0 ft
	:			Depth of bottom of silt to	ар	
2	4.0	24.0		Depth of bottom of bore	hole	24.0 ft
		f Exploration		(Depth	s refer to ground surf	ace)
Remarks:		,				•

Boring No43M-01-16XOB TEST BORING REPORT MONITORING WELL INSTALLATION AOC 32/43A DEVENS, MA Project 10884-056 File No. MASSDEVELOPMENT/DEVENS COMMERCE CENTER **Hient** Sheet No. 1 of 2 EARTH EXPLORATION SERVICES, WRENTHAM, MA Contractor December 11, 2001 Start December 14, 2001 Finish Sampler Casing Barrel **Drilling Equipment and Procedures** Driller R. Eastwood Rig Make & Model: Mobile B-57 Truck H&A Rep. Type SW W. Rubik Bit Type: Roller Bit Elevation 257.9 Inside Diameter (in.) 6.0 13/8 Drill Mud: None Datum NGVD (1929) Hammer Weight (lb.) 300 140 Location See Plan Casing: driven Hammer Fall (in.) 24 30 Hoist/Hammer: Winch Doughnut Hammer Sand Gravell Field Test Well Dlagram Elev./Depth (ft.) Sample Depth (ft.) € Visual-Manual Identification and Description Coarse Medium Sample ! & Rec. (i Toughness Dilatancy Plasticity SPT nscs (Density/consistency, color, GROUP NAME, max. particle size**. structure, odor, moisture, optional descriptions, geologic interpretation) જ æ 257.4 -Black bituminous ASPHALT-8 Si 0.2 0.5 SM Dense black-brown silty SAND with gravel (SM), trace asphalt specks. 1.7 10 15 10 20 25 25 12 mps 1.0 in., no odor, wet 20 g 2.0 255.4 14 4.0 2,5 OL/ Black ORGANIC SOIL (OL/OH) 5 15 45 30 14 255.2 OH -FORMER TOPSOIL-14 2.7 SM Medium dense red-brown silty SAND (SM), mps 0.25 in., no odor, dry 253.9 8 S3 17 4.0 SP 10 15 15 40 15 5 4.0 22 6.0 Very dense yellow poorly graded SAND with gravel (SP), mps 2.0 in., 42 no odor, dry 31 39 \$4 15 6.0 SP Same as above, except yellow-brown 10 15 20 40 15 8.0 38 32 -GLACIOFLUVIAL DEPOSITS-30 20 **S**5 8.0 SP Same as above, except gray-brown 15 20 15 40 10 22 10.0 34 34 10 11 **S6** 10.0 SP Same as above, except dense 14 19 12.0 22 31 \$7 17 12 12.0 SP Same as above 16 14.0 18 26 243.9 9 14.0 58 14.0 SP Dense gray poorly graded SAND with gravel (SP), mps 1.0 in., 5 40 40 15 11 14 16.0 stratified, no odor, wet 15 17 Mar 28, 20 17 16.0 SP Same as above, except very dense 10 40 40 10 23 18.0 GN108841056NOGB,GPJ 29 -GLACIOFLUVIAL DEPOSITS-36 22 S10 18.0 SP 10 40 10 10 Same as above, except dense 10 22 20.0 20 23 뎡 Water Level Data Sample Identification Well Diagram Depth (ft.) to: Riser Pipe Elapsed Overburden (lin. ft.) 35.0 Date O Open End Rod Bottom Bottom Time (hr. of Casing of Hole Screen ä Water Thin Wall Tube T Rock Cored (lin. ft.) Filter Sand 12/13/01 0830 Cuttings - in cluster hote 28.5 **Undisturbed Sample** Samples Grout 1/12/02 1705 29 Days 28.9 33.8 S Split Spoon Boring No. 43M-01-16XOB Concrete Geoprobe Bentonite Seal Dilatancy: Plasticity: N-Nonplastic, L-Low, M-Medium, H-High Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High Field Tests: R-Rapid, S-Slow, N-None Toughness: L-L-Low, M-Medium, H-High SPT = Sampler blows per 6 in

ALI	DRIC						TEST BORING REPORT		Boi File She	No).		884	3M -056 of :		16X	(C
Depth (n.)	SPT	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)	% Coarse	ave eul	% Coarse	Sa military	14 Elne	% Fines		Toughness a		T
-20 -	26 19 21 37	S11 8	20.0 22.0	>	237.9 20.0	SP	Dense gray poorly graded SAND with gravel (SP), mps 1.0 in., stratified, no odor, wet	+	1		T-	10	_	ō	To	ä	
	12 18 18 18	S12 8	22.0 24.0			SP	-GLACIOFLUVIAL DEPOSITS- Same as above	10	10	35	35	10					
25	30 20 20 20 20	\$13 0	24.0 26.0				No recovery. Attempted twice.										
	12 18 20 23	S14 11	26.0 28.0			SP	Dense gray poorly graded SAND (SP), mps 5.0 mm, stratified, no odor, wet		5	15	65	15					
30	19 24 23 23	\$15 0	28.0 30.0		227.9		No recovery										
30					30.0 225.9		Note: See Boring Log 43M-01-16XBR for soil description below 30.0 ft. -GLACIOLACUSTRINE DEPOSITS-										
					32.0		-GLACIAL TILL-										
-35					222.9 35.0		BOTTOM OF EXPLORATION 35.0 FT	_	_				_				-
	•						INSTALLED OBSERVATION WELL AT 34.0 FT.									i	
والمرابعة والمرابعة والمرابعة والمرابعة والمرابعة والمرابعة والمرابعة والمرابعة والمرابعة والمرابعة والمرابعة																;	*
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HAL	EY& IRICI			•		TE	EST E	BOR	ING REPORT	Γ			Во	rin	ıg N	loi	43N	l-01	-16	ΧĐ
roje Slien Contr		IASSDE	EVELO	MENT	ľ/DI	EVENS	COM	ÆRCI	32/43A DEVENS, CENTER NTHAM, MA	MA		St	art	N	o. 1 Dec	of em	ber :	12, 2		
	······		Casi	ng Sa	mp	ler E	Barrel		Drilling Equipment a	ind Pro	cedures		nist rille:	•	Dec		ber : Eas			
ype			SW	,	S		HQ	Rig M	ake & Model: Mobile	B-57 T	Truck		&A		р.		. Rı			
	e Dian	neter (in			1 3/	8	25	Bit Ty			·		eva		n		7.8		•	
amr	ner W	/eight (li			140		-	Drill M Casin	lud: None 3: driven				atur		S		GVI Plan		29)	_
		ail (in.)	24		30		_		g. unven Hammer: Winch D	oughnut	Hammer				_					
T		0.		E s		ᅙ	!.					Gr	avel		Sanc	П		Fiel	d Te	st
3		Z =	<u>.</u> €	agra Oep		Symbol	V	isual-N	lanual Identification a	and Des	scription	88		Coarse	Medlum		20	3 2	2	
nebin (iir.)	SPT	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	E	တ္က	(Density/ ucture, o	consist for, mo	ency, color, GROUP No isture, optional descript	ME, ma lons, ge	ax. particle size**, ologic interpretation	Coarse	% Fine	8	% Mec	% Fine	% Fines	Tournoage	Plasticity	
)				44::::					required to 30.0 ft. Sees from 0.0 to 30.0 ft de		Log 43M-01-16X	ОВ								
ĺ									-FILL-							Ì				l
				255 2	.3 .5				-FORMER TOPS	OIL-		\Rightarrow	1	+	H	+	+	=	+	‡
Ì				255 2	.1				-LOESS-											1
				253									╁	╁	H	十	\dashv	+	+	+
10 -									-GLACIOFLUVIAL	DEPOSI	TS-									
15 - -20 -			ater Lev	i Data	Den	th (ft.)	to:		ample Identification	·	ell Diagram Riser Pipe				umn					
C	ate	Time	Elapse Time (I	, { Bott	OM:		18/010	0	Open End Rod		Riser Pipe Screen	Ove						18.3		
	112101	00.0	 	" of Ca	sing	of Hote	vvate	┥ .	Thin Wall Tube		Filter Sand Cuttings	Roc			ed (li					
	/13/01 13/02	0815 0900	17,5 31 Day	ys -	•	38.0 57.2	28.5 28.8	S	Undisturbed Sample Split Spoon Geoprobe		Grout Concrete Bentonite Seal	Bo			····		, C2 M-(EXI	BI
	ield Te	ete.	-	Dilatan	CY:	R-Ra	apid, S⊰	Slow. I	I-None Pla	sticity	N-Nonplastic, L-	my M	Me	diu	m ł	Н	nh			-

H	MEY & DRICI				7 · · · · · · · · · · · · · · · · · · ·		TEST BORING REPORT	F	lori ile hec	Νo		108	84	5M- 056 f 3		ex.	Bi
S Depth (· .,	SPT	Sample No. & Rec. (In.)	Sample Depth (ft.)	Well Diagram	Efev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)	% Coarse	% Fine	% Coarse	% Medium		% Fines		Toughness @	Plasticity 5	1
25 -				建设设置设置设置设置设置设置设置设置设置设置设置设置设置设置设置设置设置设置设			-GLACIOFLUVIAL DEPOSITS-										
30 -	45 44 62 90	S1 17	30.0 32.0			SM	Very dense light brown silty SAND (SM), mps 3.0 mm, in partings, no odor, moist -GLACIOLACUSTRINE DEPOSITS-			5	5	65	25				
35	-24/4" 100/0"	- \$2 2	33.5 33.8	THE THE PROPERTY OF THE PROPER	3		Note: Boulder 32.0 to 33.5 ft. Poor recovery of GRAVEL lodged in tip of the samples Note: Numerous cobbles and boulders from 33.8 to 39.0 ft. Unable to obtain sample. -GLACIAL TILL-						•				
·40 ·	93 30 29 63	S3 16	39.0 41.0	204 15	216.8 41.0	SM		5	10	10	10	40	25	N	Н	N	
	82 91 100/3	S4 10	41.0 42.2		41.0				5	5	10	60	25	N	Н	N	A
-45	***************************************						TOP OF BEDROCK AT 45.5 FT SEE CORE BORING REPORT FOR ROCK DETAILS) -									

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Boring No. 43M-01-16XBR File No. 10884-056 Sheet No. 3 of 3

				r					Sheet No. 3 of 3
ļ ,44.	Drilling	D	D = 1144	Recove	ry/RQD	14444-	Well	Elev./	Viewal Danada Can
	Min./fr	Kun No	nebtu	in.	%			Depth (A)	visual Description
			(1.7)			U.I.I.g	grant	(4)	
- 50 -	7 6 7 7 7 7 7 7 7	CI C2	48.3 53.3 58.3	55 45	92 75	Fresh Fresh	Dia- gram	Depth (ft) 212.3 45.5	Visual Description and Remarks SEE TEST BORING REPORT FOR OVERBURDEN DETAILS TOP OF BEDROCK AT 45.5 FT Note: Advanced borehole with roller bit to 48.3 ft. C1: Very hard fresh gray aphanitic to fine grained QUARTZITE. Foliation extremely thin at high angles. Joints at high angles, parallel to foliation, extremely close to moderate, smooth to rough, planar, fresh to oxidized, tight to open. Observed numerous calcite veins parallel to foliation. -BEDROCK- (Possible Berwick Formation) C2: Same as above
CORE-WELL3 USCSLIB3.									

City/State Client Contractor Driller Ground El.	DEVENS, MASSDEV EARTH EX R. EASTW 257.8 NGVD (192 DCK ONS	RING WELL INSTALLAT MA TELOPMENT/DEVENS CO KPLORATION SERVICES, TOOD	MERCE CENTER	Installation Date Location H&A File No. H&A Rep.	43M-01-16XBR 14-Dec-01 See Plan 10884-056 W. Rubik
City/State Client Contractor Driller Ground El. El. Datum SOIL/RO CONDITIO	DEVENS, MASSDEV EARTH EX R. EASTW 257.8 NGVD (192 DCK ONS	MA TELOPMENT/DEVENS CO KPLORATION SERVICES, TOOD TOO	IMERCE CENTER WRENTHAM, MA	Location H&A File No.	See Plan 10884-056
Client Contractor Driller Ground El. El. Datum SOIL/RC CONDITIO	MASSDEV EARTH EX R. EASTW 257.8 NGVD (192 DCK ONS	TELOPMENT/DEVENS CO KPLORATION SERVICES, TOOD	WRENTHAM, MA	H&A File No.	10884-056
Contractor Driller Ground El. El. Datum SOIL/RO CONDITIO	EARTH EX R. EASTW 257.8 NGVD (192 DCK ONS	KPLORATION SERVICES, COOD .	WRENTHAM, MA		
Ground El. El. Datum SOIL/RO CONDITIO	R. EASTW 257.8 NGVD (192 DCK ONS	YOOD .			
Ground El. El. Datum SOIL/RO CONDITIO	257.8 NGVD (192 OCK ONS	9)	Type of protective	H&A Rep.	W. Rubik
SOIL/RO CONDITION (Numbers refer to el	NGVD (192 DCK ONS		Type of protective		
SOIL/RC CONDITION (Numbers refer to ele	OCK ONS		Type of protective		4
CONDITION (Numbers refer to elements) -ASPHA	ONS	BOREHOLE	,	cover/lock:	Bolted Cover
(Numbers refer to el			Depth of top of roa	dway box below ground su	rface 0.0 ft
-ASPHA	evation depth is	BACKFILL			
	(not to sca		Depth of top of rise	er pipe below ground surfac	∞ 0.3 ft
0.5				•	
· · · · · · · · · · · · · · · · · · ·		-CONCRETE-	Type of protective	casing:	Roadway Box
	1	0.6	Length		0.8 ft
-FILI	٠.	-FILTER SAND-			
	1	2.0	Inside diamete	er	6.0 in
2.5_ -FORMER T	OPSOH ~		Depth of bottom of	fcasing	0.8 ft
2.7		ļ			
-LOES	SS-	1	Seals:	Depth to Thick	
4.0		į	Type Concrete	top (ft) (ft) (ft) 0.0 0.	
-GLACIOF	LUVIAL	Į	Cement Gro		.5
DEPOS	its-	-CEMENT GROUT-	Bentonite Se	eal 41.5 4.	.0
30.0		1			
-GLAC	יייי	į	Type of riser pipe:		Sch 40 PVC Solid
LACUST	- · · - I	·	Inside diamet	er of riser pipe	2.0 in
DEPOS	sits-	i	Time of beats	Eli araund ringer	Seal
32.0		<u>,</u>	Type of back	fill around riser:	Dear
CTACTA	r 1777 Y	41.5	→ Diameter of borel	noie	<u>6.0</u> in
-GLACIA	r 11rr-	-BENTONITE-	Depth of top of w	ell screen	47.5 ft
45.5		45.5 .	Type of screen or	r manufacturer: N	Machine Slotted PVC
			Screen gaug	e or size of openings	<u>0.010</u> in
			Diameter of v	well screen	2.0 in
-BEDR	оск-	-FILTER SAND-	Type of back	fill around screen	Filter Sand
			Depth of bottom		57.5 ft
			Depth of bottom		
58	.3	58.3 ·	Depth of bottom	of borehole	58.3 f
- 38.		f Exploration	n man man 8≪-3	(Depths refer to ground su	rface)

盆	LEV & DRICH	ì				•	TEST F	30F	RING REPOR	Τ			Во	rit	ıg	No	431	M-C	11-1	17X	ОВ
iei	ect nt M tractor	LASSD	EVELO)PMI	ent/i	DEVE	ENS COM	MERC	C 32/43A DEVENS, CE CENTER ENTHAM, MA	MA		s	ie N hee tart	t N	o. I De		2 aber	r 20 ,	, 200		
			Cas	ing	Sam	oler	Barrel		Drilling Equipment a	and Proc	edines		inisi		De				, 200		
Time					 		-	Rio M	Take & Model: Mobile		•		rille &A		n			astw Rubi	ood/ الم	i	1
Туре		· - #-	ST		5	- 1	- 1		/pe: Roller Bit	5 B-3/ 11	nuck	 	leva		<u> </u>		v. x 59.4		K		\dashv
		neter (in	1	.0	1	3/8	-		Mud: None				atu						(192	9)_	
		eight (#	1	00	1	10	-	Casir	19: driven	,		L	oca	tior	7 ;	See					
Ham	mer Fa	all (in.)	2	4	3	0	-	Hoist	/Hammer: Cat-Head	Doughn	ut Hammer										ı
Depth (ft.)		Sample No. & Rec. (In.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	Symbol	V	isual-l	Manual Identification	and Desc	cription	-	ave	-	San		88		ield sg		
o Dept	SPT	Sam & Re	Sam	Well D	(f.)	nscs	(Density/ structure, or	consis dor, mo	tency, color, GROUP No histure, optional descript	AME, max tions, geo	x. particle size**, logic interpretatio	n) %	% Fire	% CO %	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
ר" ד				114	258.9 0.5				-Black ASPHA	LT-			上								
- 5 -					253.4		Note: No s description	amplin s.	g required. See Boring I -FILL-	Log 43M-4	01-17XBR for soi	1								•	
10 -									-GLACIOFLUVIAL I	DEPOSIT	'S -			and the second s							
-15 -					241.5 17.9				-GLACIOLAĊUSTRIN	E DEPOS	SITS-										
20 -	<u>-</u>	Wa	ter Leve	el Da	ita			S	ample Identification	Wei	Il Diagram		<u> </u>	<u>-1</u> Si	Imr	nary	;	<u> </u>	<u> </u>	<u></u>	<u>.</u>
.D	ate	Time	Elapse	ed	Der	oth (ft		0	Open End Rod		Riser Pipe	Ove	rben					34.0			
L	ale	1 11 11 11	Time (I	h-{ E	Bottom Casino	Bott of H	om ole Water	1	Thin Wall Tube	. ==	Screen Filter Sand	Rod						.,4.(
1/0	04/02	0848	15 Da		•	<u> </u>	30.0	U	Undisturbed Sample	<u> </u>	Cuttings	Sam			fet	. ** *1	-1	•			
	14/02	1105	25 Da	ys	•	33.	.5 30.5	S G	Split Spoon Geoprobe		Grout Concrete Bentonite Seal	Bor	ing	j N				01-	 173	KO:	B
. [eld Tes	its: voler blov		Touc	tancy: inness	. L	Rapid, S-S Low, M-Me	dium.	H-High Dry	Strength:	Nonplastic, L-L N-None, L-Lo	W. M-N	ledi	ium	. H	Hin	h. ۱	V-V	ery I	-ligh	

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	Ni	LEY'd DRIC	Sz H ≣	·	·			TEST BORING REPORT	F	ile	No		108	84	3M- 056 f 2	;	17X	OB
	Depth 1,	SPT	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)	Ţ	avel	7	San	d			Toughness &		1
	- 20 -							-GLACIOLACUSTRINE DEPOSITS-										
	- 30 -			e e e e e e e e e e e e e e e e e e e		231.4 28.0		-GLACIOFLUVIAL DEPOSITS-										
ngot qarquaqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqq	•					34.0		BOTTOM OF EXPLORATION 34.0 FT INSTALLED OBSERVATION WELL AT 33.5 FT										
SETES USCSUBIGLE UF	*SPT	* Sam	pier blow	t per 6 in.		kimum (partici	size (mm) is determined by direct observation within the limitations of sampler						123	I-01	17	X.O.	R

OBSERVATION WELL Observation Well 43M-01-17XOB HALEY & ALDRICH **INSTALLATION REPORT Test Boring** 43M-01-17XOB **Project** MONITORING WELL INSTALLATION AOC32/43A Installation Date 20-Dec-01 City/State DEVENS, MA Location See Plan Client MASSDEVELOPMENT/DEVENS COMMERCE CENTER Contractor EARTH EXPLORATION SERVICES, WRENTHAM, MA H&A File No. 10884-056 Driller R. EASTWOOD H&A Rep. W. Rubik Ground El. 259.4 El. Datum NGVD (1929) Type of protective cover/lock: **Bolted Cover** SOIL/ROCK BOREHOLE Depth of top of roadway box below ground surface 0.0 ft CONDITIONS BACKFILL (Numbers refer to elevation/depth from ground surface in feet) -Depth of top of riser pipe below ground surface 0.5 ft -ASPHALT- 0.5_{-} -CONCRETE-Type of protective casing: Roadway Box 0.7 Length 0.8 ft -FILL--FILTER SAND-Inside diameter 6.0 in 3.0 Depth of bottom of roadway box 0.8 ft 6.0 Seals: Depth to Thickness top (ft) Type (ft) Concrete $\overline{0.0}$ 0.7 Bentonite Seal 3,0 18.0 -GLACIOFLUVIAL DEPOSITS--BENTONITE-Type of riser pipe: Sch 40 PVC Solid Inside diameter of riser pipe 2.0 in 17.9 Type of backfill around riser: Seal -GLACIO-Diameter of borehole 6.5 in LACUSTRINE DEPOSITS-Depth of top of well screen 23.5 ft 21.0 Machine Slotted PVC Type of screen or manufacturer: 28.0 Screen gauge or size of openings 0.010 in Diameter of well screen 2.0 in-GLACIOFLUVIAL -FILTER SAND-**DEPOSITS-**Type of backfill around screen Filter Sand Depth of bottom of well screen 33.5 ft Depth of bottom of silt trap Depth of bottom of borehole 34.0 ft 34.0 **Bottom of Exploration** (Depths refer to ground surface) Soil conditions based on adjacent Cluster Boring 43M-01-17XBR. Remarks:

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o _{roje} Jier Cont		(ASSD	EVE	LOP	ME	NT/I	EVE	INS COM	MERC	232/43A DEVENS E CENTER ENTHAM, MA	, MA			she Sta	ırt	No	De	l of	ber	56 17,			_
				asin	g	Sam	pler	Barrel		Drilling Equipment	and Pro	edures			ish Iler		De			ıstw astw			
Туре	:			sw		S	;	но	Rig M	ake & Model: Mobil	le B-57 T	nick	- 1	18.	A F	₹eŗ	٥.			tubi			
		neter (ir		6.0	ł	1 3	/8	2.5	Bit Ty				1		va		ה		59.:				
		/eight (I	1	300			10	2.3		lud: None	•		ļ		tun cat				IGV Pla	<u>D (</u>	1929	9)	_
		all (in.)	-1	24		3	1	_		9: driven Hammer, Winch I	Youghnut	Unmmar	[_01	J-(21)	ЮН	•	300	ria	ш			
				7 -	<u> </u>					THE THE PERSON AND ADDRESS AND	200gunar		c	rav	/el		San	d		F	ield 1	Tes	ī
£		걸드	€	i la		<u> </u>	Symbol	٧	'isual-N	fanual Identification	and Des	cription	ľ	9					_		*		Γ
Depth (ft.)	SPT.	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Disoram	9	(ft.)	8	(Density	/consist	ency, color, GROUP N Isture, optional descrip	IAME, ma	x. particle size**, plogic interpretation	(nc	% Coarse	% Fine	6 Coar	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	
0		(), a ₀		+-			3	`		-Black ASPHA			.,	+	•		- a	6	6	٩	1-	Ġ.	
-	19	SI	0.5	-[4	2	58.8 0.5	SM	Very dense	grav-h	rown silty SAND with		MO. mps 1.0 in 1	10	+	10	15	25	30	15	\dashv	\dashv		-
	27 38	14	1.7					odor, mois			S (O	A4 widen as a seed t											-
İ	10	S2	2.0				SM	Same as at	ove, ex	cept dense				5	10	15	25	30	15				
	14 19 16	10	4.0							-FILL-													-
	7	S3	4.0	_	100		SM	Same as al	bove, ex	cept medium dense, we	et		***************************************								-		
5 -	6	3	6.0						,				1								1		
	9 11	<u></u>			2	53.3								_									
	12 12 13	S4 17	6.0 8.0			6.0	SP	Medium d stratified,		ht brown poorly graded , moist	I SAND (SP), mps 2.0 in.,				5	30	60	5				
	12									-GLACIOFLUVIAL		'S-											
	26 21	\$5 13	8.0 10.0				SP	Same as al	bove, ex	ксерк dense, mps 5.0 m	រវា				5	5	30	55	5				١
	27 24												.	ļ									
- 10 -	20	\$6	10.0					Same as a	bove				1										
	20 22	10	12.6)				-		•			1										
	26 26					47.3																	
	17 27	S7 16	12.6				sw			ray well graded SAND	with gra	vel (SW), mps 1.0) in.,	10	10	25	25	25	5	$\lceil \rceil$			1
	38	-	24.					stratified,	no odor	,													
,	29				7		<u></u>	C		-GLACIOFLUVIAL	DEPOSIT	.Z-		ا		_	-	_					
	25 32	S8 9	14.0				SW	Same as a	oove, e	ccept gray-brown	,	•	ĺ	10	10	30	30	20					
- 15 -	28 24																						
	34	S9	16.		N. P.		sw	Same as a	bove					10	10	25	30	20	5				
	32	16	18.		2	42.3	L_			- 					L			Ļ	_	L.		_	_
	28 24				2	17.0 241.4	SP.	Very dens stratified,		orown poorly graded Sa	AND (SP)	, mps 2.0 mm,					30	65	5				
	20	510	18.	0		17.9	SM	1		-GLACIOFLUVIAL				-		Γ	Τ	80	20	Γ		·	-
•	. 21	9	20.	V 📳				odor, moi		ht gray silty SAND (SI	m), mps i	.v mm, in parting	s, no										
- 20 -	26	<u> </u>	<u> </u>							GLACĮOLACUSTRIN	E DEPO	SITS-	<u> </u>			L	L						
		Wa	7	evel	1				Sa	mple Identification		ll Diagram				Su	mn	nan	_				_
. D	ate	Time	Ela	psed e (hr.	80		th (ft Bott	~	0	Open End Rod		Riser Pipe Screen	Ove										
204	10/01	6 ~~~	1 -		1		i	ole vvater	-l `	Thin Wall Tube	靐	Filter Sand Cuttings	Roc)		
	19/01 4/02	0700 0855	ł	l6 Days	1	4.0 -	45.		S	Undisturbed Sample Split Spoon	25%	Grout	Sar	·					<u>. C</u>				-
	4/02	1100		Days		_	57.	5 26.8	G	Geoprobe		Concrete Bentonite Seal	Во							01-	17X	B	I
Fi	eld Tes	ts:		Di		ncy: ness	R- L-	Rapid, S-S	low N	-None Pla	eficite N	-Nonplastic, L-L	ow M	-14	edi	un	ı. I	1-Hi	ah				

XA E	LEY & DRICE		-	·	· · · · · · · · · · · · · · · · · · ·	7	TEST BORING REPORT	ا	File She	Net	o. No		884 2 C	of 3	; }		
(F)	į	e No. (in.)	(ft.)	gram	epth	Symbol	Visual-Manual Identification and Description		ave	9	Sa		1.		ield S		
Depth (ft.)	SPT*	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Sy	(Density/consistency, color, GROUP NAME, max. particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)	% Coarse	% Fine	% Charee	W. Modium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	1
-20 -	21 22 23 31	S11 15	20.0 22.0			SM	Same as above, except dense						20			i	-
,	30 30 30 29	S12 13	22.0 24.0		235.3	SM	Same as above, except light gray-brown, very dense					80	20				
- 25	30 32 30	S13 9	24.0 26.0	3 200	24.0	ML	Very dense ian sandy SILT (ML), mps 1.0 mm, in partings, no odor, dry to moist					30	70	s	Н	N	
	31 31 33 30	S14 0	26.0 28.0				-GLACIOLACUSTRINE DEPOSITS-) design of the second					
	30 31 22	S15 13	28.0 30.0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	231.3 28.0	sw	Very dense brown well graded SAND (SW), mps 1.0 in, stratified, no odor, moist	5	5	30	30	30					
-30	27 10 14 21 26	S16 10	30.0 32.0			sw	-GLACIOFLUVIAI. DEPOSITS- Same as above	5	5	30	30	30				-	
	13 19 22 27	\$17 11	32.0 34.0		227.3 32.0	SP	Dense tan poorly graded SAND (SP), mps 1.0 in., no odor, wet -GLACIOFLUVIAL DEPOSITS-	5	5	10	30	50					-
35 -	26 29 25 34	\$18 15	34.0 36.0			SP	Same as above, except very dense	5	5	20	30	40					
	28 30 36 45	S19 14	36.0 38.0	1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	223.3 36.0	SP	Very dense tant poorly graded SAND (SP), mps 0.25 in., in partings, no odor, wet -GLACIOFLUVIAL DEPOSITS-		5	10	15	70					
	24 38 104	S20 9	38.0 40.0	10 CANAGE	221.3 38.0	SP	Very dense tan poorly graded SAND with gravel (SP), mps 3.0 in., in partings, no odor, wet	20				80		<u> </u>	 		-
40	39 57 125	S21 3	40.0 41.0	100000	219.3 40.0	SM	-GLACIOFLUVIAL DEPOSITS- Very dense yellow-brown silty SAND with gravel (SM), mps 2.0 in., well bonded, no odor, wet	10	10	15	20	20	25				<u>_</u>
	- Lead -			11111111111111111111111111111111111111		•	-GLACIAL TILL- Note: Boulder from 41.0 to 43.4 ft.			The state of the s							
45	195	\$22 4	44.0 44.5			SM	Same as above TOP OF BEDROCK AT 44.5 FT			<u> </u>			_			_	
				*			SEE CORE BORING REPORT FOR ROCK DETAILS										
							size (mm) is determined by direct observation within the limitations of sampler mual methods of the USCS as practiced by Haley & Aldrich, Inc.		Во	rin	ıg l	No.	! 43N	1-01	-17	XBI	R



Boring No. 43M-01-17XBR File No. 10034 005 Sheet No. 3 of 3

Depth Rate (t) Min.A No. (t) Exp. (t) In. % ering gram (t) SEE TEST BORNG REPORT FOR OVERBURDEN DET. - 45 -		Sheet No. 3 of 3	-									
10 C1 48.0 60 100 Fresh 9 10 53.0 60 100 Fresh 9 10	_			Depth	Dia-	Weath- ering			Depth (ft)	Run No.	Drilling Rate Min./ft	Depth (ft)
214.8 44.5 TOP OF BEDROCK AT 44.5 FT Note: Advanced borehole with roller bit from 44.5 to 48.0 ft in be C1 48.0 60 100 53.0 60 100 Fresh 53.0 60 100 Presh 10 9 10 9 10 9 8 C2 53.0 57 95 58.0 54 90 Fresh 9 9 9 9 9 9 9 9 9 9 9 9 9 100 BEDROCK AT 44.5 FT Note: Advanced borehole with roller bit from 44.5 to 48.0 ft in be C1: Very hard, fresh, gray, aphanitic to fine grained QUARTZITI Foliation extremely thin at high angles, disturbed along joint axes, joint at high angle, moderately close to wide, smooth, planar, oxid Observed possible vugs above joints, possibly separation on a heal C2: Same as above, except joints at low angles, close to wide, smooth, planar to stepped, oxidized, tight to open. C2: Same as above, except joints at low angles, close to wide, smooth, planar to stepped, oxidized, tight to open. BOTTOM OF EXPLORATION 58.0 FT	AILS	OR OVERBURDEN DETAI	SEE TEST BORING REPORT I				-					
Note: Advanced borehole with roller bit from 44.5 to 48.0 ft in be 10	<u> </u>			214.8 44.5								45 -
9 201.3 58.0 BOTTOM OF EXPLORATION 58.0 FT	edrock.	it from 44.5 to 48.0 ft in bedro	Note: Advanced borehole with roller h	100								
9 201.3 58.0 BOTTOM OF EXPLORATION 58.0 FT	. Single dized, tigl	, disturbed along joint axes. Si wide, smooth, planar, oxidize	Foliation extremely thin at high angles joint at high angle, moderately close to	-		Fresh	100	60 60	48.0 53.0	C1	9	50 -
9 201.3 58.0 BOTTOM OF EXPLORATION 58.0 FT		ick Formation)	(Possible Berw								10	
9 201.3 58.0 BOTTOM OF EXPLORATION 58.0 FT	ooth,	v angles, close to wide, smoot en.	C2: Same as above, except joints at lo planar to stepped, oxidized, tight to ep			Fresh				C	9	55 -
INSTALLED OBSERVATION WELL AT 57.5 FT		ORATION 58.0 FT	BOTTOM OF EXP								1	
		TION WELL AT 57.5 FT	INSTALLED OBSERVA						:			

Boring No43M-01-20XOB **TEST BORING REPORT** 10884-056 **Project** MONITORING WELL INSTALLATION AOC 32/43A DEVENS, MA File No. MASSDEVELOPMENT/DEVENS COMMERCE CENTER Sheet No. 1 of 2 Hient EARTH EXPLORATION SERVICES, WRENTHAM, MA November 21, 2001 Contractor Start Finish November 26, 2001 Sampler Barrel **Drilling Equipment and Procedures** Casing Driller R. Eastwood Rig Make & Model: Mobile B-57 Truck H&A Rep. L. Baerga Type SW S Bit Type: Roller Bit Elevation 258.7 Inside Diameter (in.) 6.0 13/8 Drill Mud: None Datum NGVD (1929) Hammer Weight (lb.) 300 140 Location See Plan Casing: driven Hammer Fall (in.) 24 30 Hoist/Hammer. Winch Doughnut Hammer Ş.E Elev./Depth (ft.) Symbol Gravel Sand Field Test Well Diagram Sample Depth (ft.) Visual-Manual Identification and Description Sample N & Rec. (ir Toughness Fines Dilatancy Plasticity Depth 문 USCS 5 SPT (Density/consistency, color, GROUP NAME, max. particle size** structure, odor, moisture, optional descriptions, geologic interpretation) * 3 æ ፠ æ × -ASPHALT-0.1 27 0.5 SP Very dense light brown poorly-graded SAND (SP), mps 30.0 mm., no 5 110 20 60 13 33 2.0 odor, dry 14 10 SP-Medium dense red-brown poorly-graded SAND with silt (SP-SM), mps S2 16 2.0 5 5 40 40 10 4.0 SM 13.0 mm., no odot, dry 7 11 -FILL-7 254.7 15 **S**3 4.0 4.0 SP 6 2 3 80 Dense tan poorly-graded SAND (SP), mps 21.0 mm., faint partings, no 16 6.0 29 odor, dry 5 10 11 -GLACIOFLUVIAL DEPOSITS-15 54 18 6.0 SP Dense tan poorly-graded SAND (SP), mps 22.0 mm., no odor, dry 2 3 5 5 85 8.0 16 20 24 250.7 E ALL 16 8.0 8.0 SW 30 35 30 Dense light brown well-graded SAND (SW), mps 16.0 mm., no odor, 10 10.0 17 21 19 -GLACIOFLUVIAL DEPOSITS-248,7 6 S6 12 10.0 10.0 SP 10 10 10 35 35 Dense light brown poorly-graded SAND with gravel (SW), mps 20.0 13 12.0 num., no structure, no odor, dry 19 20 -GLACIOFLUVIAL DEPOSITS-S4 14 19 12.0 17 14.0 19 24 244.7 22 14.0 **S**8 14.0 SW 15 30 30 25 Very dense light brown well-graded SAND with gravel (SW), mps 21.0 16.0 24 mm., no structure, no odor, dry 15 8 32 Har 27. 28 -GLACIOFLUVIAL DEPOSITS-30 16.0 SW Dense light brown well-graded SAND with gravel (SW), mps 20.0 mm., **S**9 15 25 30 30 14 19 18.0 no structure, no odor, dry GNOBMOSKLOGS.GPJ 21 26 240.7 14 **S10** 18.0 18.0 SP Dense light brown poorly-graded SAND (SP), mps 8.0 mm., no 10 45 45 17 10 20.0 structure, no odor, dry 20 74 -GLACIOFLUVIAL DEPOSITSgot Water Level Data Sample Identification Well Diagram Summary Depth (ft.) to: Riser Pipe Elapsed Open End Rod Date Time Overburden (lin. ft.) Bottom | Bottom Screen Time (hr. 5 Water f Casing T Thin Wall Tube Rock Cored (lin. ft.) of Hote Filter Sand USCSURT.GLB Cuttings 11/21/01 1400 24.0 **Undisturbed Sample** Samples 24.0 19.9 SI7 51.5 Grout 11/26/01 1500 121 ell screen 34.0 29.5 S Split Spoon Concrete Boring No. 43M-01-20XOB 1/11/02 1250 46 Days 30.2 G Geoprobe 34.0 Bentonite Seal R-Rapid, S-Slow, N-None

Plasticity: N-Nonplastic, L-Low, M-Medium, H-High

Dry Strength: N-None, L-Low, M-Medium, H-High, V-Very High

Field Tests:

*SPT = Sampler blows per 6 in

Dilatancy:

Toughness:

L-Low, M-Medium, H-High

Digic	ř.					TEST BORING REPORT	F	ile	No).	10	884	3:VI- -056 if 2		XUX	OB
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	e N	ole (ft.)	agra	Dep	Symbol	Visual-Manual Identification and Description	Coarse	یوا	arse	1 19	يو	ies Si	ncy	nes	Sit.	띪
SPT*	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	uscs	(Density/consistency, color, GROUP NAME, max. particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)	ပိ %	%	-	,	÷		Dilatancy	Toughness	Plasticity	Strength
20 28	S11 14	20.0 22.0			sw	Very dense light brown well-graded SAND (SW), mps 18.0 mm., no structure, no odor, dry		10	30	30	30					
34 39	i			1		-GLACIOFLUVIAL DEPOSITS-			ļ						·	ļ I
26 31 40	S12 12	22.0 24.0			sw	Very dense light brown well-graded SAND with gravel (SW), mps 42.0 mm., no structure, no odor, dry	25	15	 	20	20	5				
36 35 26 22	S13 18	24.0 26.0			sw	Dense light brown well-graded SAND with gravel (SW), mps 25.0 mm., frequent partings, sweet odor, dry	10	10	2	25	25	5				
20			圕	232.7			ļ_	L	L	. _	. _		L		_	
66 33 23 34	\$14 15	26.0 28.0		26.0	SP	Very dense light brown poorly-graded SAND (SP), mps 21.0 mm., frequent partings, faint sweet odor, dry		5	111	5'4() 40 					
27 17	\$15 6	28.0 30.0			SP	Medium dense light brown poorly-graded SAND (SP), mps 5.0 mm., no structure, faint sweet odor, wet			1	38	5 50)				
10 13		j	圕	228.7		-GLACIOFLUVIAL DEPOSITS-					L	L	L.			
17 18 24	S16 10	30.0 32.0		30.0	sw	Dense brown well-graded SAND with gravel (SW), mps 20.0 mm., no structure, no odor, wet	10	30	3	20	10					
34 44 23	S17	32.0 34.0		4	sw	Dense light brown well-graded SAND with gravel (SW), mps 30.0 mm., no structure, no odor, wet	20	2	5 3	20	5					
15 16				224.7		-GLACIOFLUVIAL DEPOSITS-						_	_			
A	 			34.0		BOTTOM OF EXPLORATION 34.0 FT.	ļ									
						INSTALLED OBSERVATION WELL AT 34.0 FT.	The state of the s			, trademining and the second of the second o		The state of the s			Addition of the control of the contr	
				!		le size (mm) is determined by direct observation within the limitations of sampler								1-20		<u></u>

NOTE: Soll identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HALEY & ALDRICH		OBSERVA			Observation Well	43M-01-20XOB
		INSTALLA	I ION R	PORT	Test Boring	43M-01-20XOB
Project	MONITO	RING WELL INSTALLA	TION AOC	32/43A	installation Date	26-Nov-01
City/State	DEVENS,	MA	····		Location	See Plan
Client	MASSDE	VELOPMENT/DEVENS C	OMMERCE	CENTER		
Contractor	EARTH E	XPLORATION SERVICES	, WRENT	IAM, MA	H&A File No.	10884-056
Driller	R. EASTV	VOOD			H&A Rep.	L. Baerga
Ground Et.	258.7					The sources
El. Datum	NGVD (19	29)		Type of protective cover/le	ock:	Bolted Cover
SOILIR	OCK	BOREHOLE	<u> </u>	Depth of top of casing bel	ow ground surface	0.0 ft
CONDIT		BACKFILL from ground surface in feet)				
(12.12.12.12.12.12.12.12.12.12.12.12.12.1	(not to so	- '		Depth of top of riser pipe	below ground surface	0.2 ft
-ASPH	ALT-					
0.1	<u> </u>	-CONCRETE- 0.6		Type of protective casing:		Roadway Box
-FIL	, .	-FILTER SAND-		Length		ft
		2.0		Inside diameter		<u>6.0</u> in
4.0		-CEMENT GROUT-		Depth of bottom of casing	}	0.8 ft
		18.0		Seals:	Depth to Thicknes	ss
		1		Туре	top (ft) (ft)	
1	j	-BENTONITE-		Concrete Cement Grout	$\frac{0.0}{2.0}$ $\frac{0.6}{16.0}$	
1		-DENTONIXE		Bentonite	18.0 3.0	-
		21.0				
				I Type of riser pipe:	S	Sch 40 PVC Solid
				Inside diameter of ris	er pipe	2.0 in
-GLACIOF DEPO:				Type of backfill arour	nd riser: Benton	ite/Grout/Cement
				■ Diameter of borehole		6.5 in
		-FILTER SAND-	₹	Depth of top of well scree	en	24.0 ft
		- TIDIDA SAND	₹ —	Type of screen or manufa	acturer: Mac	hine Slotted PVC
			8-3 8-4 8-4	Screen gauge or size	e of openings	<u>0.010</u> in
				Diameter of well scre	en	2.0 in
				Type of backfill arou	nd screen	Filter Sand
			₩.	Depth of bottom of well s	creen	<u>34.0</u> tt
	į			Depth of bottom of silt to	ар ,	
34	.0	34.0	<u></u>	Depth of bottom of borel	nole	34.0 ft
Remarks:	Bottom of	Exploration		(Depth:	s refer to ground surfac	æ)

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Ä	TRY ATEX	# <u>:</u>				-	rest	BOF	RING RE	POF	?T				В	orii	ng	No	43	M-0)1-2	20)	(BR
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			Ças	ing	Sam	pler	Barrel		Drilling Equ	uipment	and P	rocedures			Finis Orille		יענ				ىى ood/		
Туре			sv	v	S		HQ	Rig M	lake & Mode	l: Mobi	le B-57	7 Truck			I&A	Re	p.				a/W		bik
Insid	le Dia	meter (in.) 6.	0	13	/8	2.5	Bit Ty	/pe: Roller Mud: None	Bit					Elev Datu		ח		58.		192	<u>ር</u> ኒ	}
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Han	mer F	fall (in.)	24	ţ	3()	-		/Hammer: V	Vinch I	Doughn	ut Hammer	•						_				
Depth (ft.)	-	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	(ft.)	S Symbol			Manual Identi			•	e size**.	⊢	% Fine	% Coarse	% Medium		% Fines		Toughness a	Plasticity sal	Strength
	SPT*	Sar	Sar	M N N]€	nscs	tructure, o	dor, mo	isture, optiona	al descrip	otions, g	geologic inte	erpretati	on)	8 %	8	8	%	38	E		Plas	Stre
0			4.0000000000000000000000000000000000000	25	4.7		ft.		with 43M-01- ng Log 43M-0					4.0				***************************************					
					4.0	1				-FILL-									1	ļ			
5			4.5.5.4.6.5.6.5.4.6.5.4.6.6.6.6.6.6.6.6.	ZZZ	1 1111111111111111111111111111111111111	The second secon			-GLACIOFL	UVIAL .	DEPOS	SITS-											-
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- 20 -			1	nest 8																			
		Wa	ter Level	1				Sa	mple Identific	cation		ell Diagrar					mm						\exists
D.	ate	Time	Elapsed Time (hr	Botto	ow i	h (ft.) Botton	Mater	1	Open End Ro			Riser Pip Screen	ļ	Over									
13/	6/01	0700	160	of Cas 64.		of Hole	15.4	T	Thin Wall Tut		? . .	Filter San Cuttings	id	Rock Sam				. π., 14,					
12/ 1/1	7/01 1/02	1245	- 37 Days	64.	- 1	68.3 78.3 78.3	28.5± 30.0	S	Split Spoon Geoprobe			Grout Concrete Bentonite	Seal	Bori	ng	No	>. 4	3N	1-0		0X)	BR	
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SPT	= Sair	pler blov	vs ner 6 in		****	aximu	m particle :	size (mn	n) is determine inual method	d by dire	ct obse	rvation withi	n the lim	<u>itations</u>	of sa	gmp	<u>ler s</u>	ize ((in m	<u>rillim</u>	eters	<u>s).</u>	\exists

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_		9 .	Ţ	E S	£.	loqu	Visual-Manual Identification and Description	7	avel	_	Sar	nd		F	ield	Tes	2
Depth (ft.)	<u>*</u>	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	S Symbol		% Coarse	<u>a</u>	% Coarse	% Medium	je Pe	% Fines	ancy	Toughness	icity	
	SPT*	Sar & R	San	Well	(#)	nscs	(Density/consistency, color, GROUP NAME, max, particle size**, structure, odor, moisture, optional descriptions, geologic interpretation)	%	% Fine	% %	%	% Fine	% F	Dilatancy	190	Piasticity	-
20 -				Sales and the sa	The state of the s		-GLACIOFLUVIAL DEPOSITS- Note: Cluster Well with 43M-01-20XOB. No sampling required to 34.0										
25 -				The state of the s	المُوالِيةِ مِنْ مِنْ مُوالِيِّةٍ مِنْ مُوالِيَّةِ مِنْ مُوالِيّةِ مِنْ مُوالِيّةٍ مِنْ مُوالِيّةٍ مُنْ مُنْ م		ft.								a de la companya de l		
30 -					ACTOR STATE OF THE		·						100000000000000000000000000000000000000				. !
35 -	25 14 10 15	S1 0	34.0 36.0	The second secon	The state of the s	GW	No recovery. Drilling action indicates cobbles from 34.0 to 36.0 ft. Dense brown well graded GRAVEL with sand (GW), mps 2.0 in., no	30	30	20	10	10					
	27 15 20 29	S2 6	38.0	1 2 4			odor, wet Note: Drilling action indicates cobble from 37.0 to 38.0 ft.		! 				,				
	20 34 15 15	S3 5	38.0 40.0	Total Paris Cont	218.7	GW	Same as above -GLACIOFLUVIAL DEPOSITS-	35	35	15	10	153					
40 -	20 23 19 20	\$4 11	40.0 42.0		40.0	SP	Dense light brown poorly graded SAND (SP), mps 2.0 mm, faint and frequent partings, no odor, wet -GLACIOFLUVIAL DEPOSITS-					10	90	-			
	16 20 25 21	S5 12	42.0 44.0	Taring Strains		SP	Same as above					10	90	:		ı	
45 -	12 12 13	S6 14	44.0 46.0	STANKS LEADER	214.7 44.0	SP	Medium dense light brown poorly graded SAND (SP), mps 2.0 mm, frequent partings, no odor, wet	-		-		5	95				1
	16 10 9 14	S4 14	. 46.0 48.0	As especial	ESCHACESTAL	SP	Same as above -GLACIOFLUVIAL DEPOSITS-						100				
	15 13 11 13	S8 15	48.0 50.0			SP	Same as above						100				
		ier blows	per 6 in	±ai_L` Mare	aximum p	article	size (mm) is determined by direct observation within the limitations of sampler		Boi	rin	<u> </u>	lo.	13IV	I-01	-202	(B)	Į

H Ai	ALEY C DRIC	& 		1 "	.,		TEST BORING REPORT	İ	ile	No	_		884	3M- -056 of 4	;	20X	BR
Depth (ft.)	SpT	Sample No. & Rec. (in.)	Sample Depth (ft.)	Well Diagram	Elev./Depth (ft.)	USCS Symbol	Visual-Manual Identification and Description (Density/consistency, color, GROUP NAME, max. particle size**.	$\overline{}$	Line		Sampaw	Fine	% Fines		Toughness a	Plasticity at	Strength
Ğ	S	ഗ്ഷ		1	;	S	structure, odor, moisture, optional descriptions, geologic interpretation)	8	88	8	8	8	%	置	ĕ	급	Stre
50 -	17 15 17 22	S9 10	50.0 52.0	abbariteten van Antonio in de Barten en Antonio in de Antonio in de Barten en Antonio in de Antonio	208.7 50.0	SP	Dense light brown poorly graded SAND (SP), mps 1.0 in., frequent faint partings, no odor, wet		10	10	20	60	-	_		-	
	27 10 12 38	S10 10	52.0 54.0	-2.7		SP	-GLACIOFLUVIAL DEPOSITS- Same as above, except very dense		5	10	30	55	<u> </u>			ĺ	I
	29 50 69	S11 6	54.0 55.3	ene entratationer entrates de la constante de	204.7 54.0	GM	Very dense yellow-brown silty GRAVEL with sand (GM), mps 1.5 in., well bonded, no odor, moist	40	30	5	5	5	5			- 1	
55 -	100/3"		<u> </u>	18 3.1 .			-GLACIAL TILL- Note: Boulder from 55.3 to 58.0 ft.					 . 				***************************************	
	32 93 70	S12 18	58.0 60.0	**************************************	200.7 58.0	SM	Very dense yellow silty SAND with gravel (SM), mps 2.0 in., no odor, moist	19	20	10	15	20	25		-	_	-
60 -	52 38 35	S13 16	60.0 62.0	WAS SERVED		SM	-GLACIAL TILL- Same as above	10	15	5	20	25	15				
	44		<u>,</u>				Note: Boulder from 62.0 to 63.5 ft.									1	
65 -	100/3" *50/3"	S14 6	64.0 64.5			SM	Very dense yellow silty SAND with gravel (SM), mps 1.0 in., no odor, dry TOP OF BEDROCK AT 64.5 FT	5	10	10	15	30	30			-	
,	77.79						SEE CORE BORING REPORT FOR ROCK DETAILS							CONTRACTOR AND ADDRESS OF THE PERSON NAMED IN CONTRACTOR ADDRESS OF THE			
70 ~				· · · · · · · · · · · · · · · · · · ·												روان بالمراجعة والمراجع والمراجعة والمراجعة والمراجعة والمراجعة والمراجعة والمراجعة وا	
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75 -	and the second s									i							
SOT	# Sampl	er blows	per 6 in.	**Ma	a mumix	article	size (mm) is determined by direct observation within the limitations of sampler	<u> </u>	20.		- A	- 4	3M	-01-	20X	BR	

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HALEY & ALDRICH

Boring No. 43M-01-20XBR File No. 10884-056 Sheet No. 4 of 4

										Sheet No. 4 of 4
ı		Drilling	.	D 44	Recove	ry/RQD	181 - 44	Well	Elev./	16 D
٠,	ft)	Rate Min./ft	No.	Depth (ft)	in.	%	Weath- ering	Dia- gram	Depth (ft)	Visual Description and Remarks
- (65 -								194.2 64.5	SEE TEST BORING REPORT FOR OVERBURDEN DETAILS TOP OF BEDROCK AT 64.5 FT Note: Advanced borehole with roller bit to 68.3 ft prior to coring.
	70 –	4 4 3 3	СІ	68.3 73.3	39 16	65 27	Fresh Slight to High		189.1 69.6 186.0	C1 to 69.6 ft: Very hard, fresh, light gray, aphanitic to very coarse grained CONGLOMERATE. Bedding or gneissic foliation extremely thin at high angle, disturbed. Joints at low angle, extremely close to close, smooth, planar, oxidized with clayey coating, tight to open -BEDROCK- C1 from 69.6 to 72.7 ft: Same as above, except very hard to hard, slightly to highly weathered, rusty brown, extremely fractured with joints at various orientations, oxidized, disintegrated to decomposed, some with up to 1.0 in thick claves infillings over 1 set of core recovery.
*CSTBC2.QDT Q:(IGBAV55UCGS.GPJ M#*27, Q2	75 -	6 5 6 7 8	CZ	73.3 78.3	58 29	97 48	Slight to Fresh		72.7 180.4 78.3	thick clayey infillings, open. Loss of core recovery. -BEDROCK- C1 from 72.7 and C2: Very hard, slightly weathered to fresh, gray, aphanitic to coarse grained CONGLOMERATE. Bedding or gneissic foliation extremely thin at high angle, disturbed, sometimes microfaulted. Primary joints set at low angle, extremely close to moderate, smooth to rough, planar to stepped, oxidized, tight to open -BEDROCK- Note: Total water loss approximately 1200 gallons. BOTTOM OF EXPLORATION 78.3 FT INSTALLED OBSERVATION WELL AT 78.3 FT
COREAWELLS USCBLIBLY . *CSTBC2.401										

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oject	MONITO	RING WELL INSTALLAT		-Dec-01
ity/State	DEVENS,		· · · · · · · · · · · · · · · · · · ·	See Plan
lient		ELOPMENT/DEVENS CO	IMERCE CENTER	
ontractor		XPLORATION SERVICES,		0884-056
riller	R. EASTV	700D	H&A Rep.	Bacrga/W.Rubik
round El.	258.7			
i. Datum	NGVD (197	29)	Type of protective cover/lock:	Bolted Cover
SOIL/R	юск	BOREHOLE	Depth of top of casing below ground surface	0.0 ft
CONDIT		BACKFILL		
numberz teser so	(not to sca	rom ground surface in feet) sle)	Depth of top of riser pipe below ground surface	0.6 ft
-ASPH	ALT-			•
0.1		-CONCRETE- 0.6	Type of protective casing:	Roadway Box
-FIL	I-	-FILTER SAND-	Length	ft
4.0		2.0	Inside diameter	<u>6.0</u> in
4.0		-BENTONITE- 6.0	Depth of bottom of roadway box	<u>0.8</u> ft
-GLACIO	l l	, and the two two two two two two two two two two	Seals: Depth to Thickness	
		-CEMENT GROUT-	Type of riser pipe: Sc	h 40 PVC Solid
	İ	Į.	Inside dlameter of riser pipe	2.0 in
		I	Type of backfill around riser:	Seal
54.0			Diameter of borehole	<u>6.0</u> in
.GI ACI	AL TILL-		Depth of top of well screen	<u>68.3</u> ft
GLACE	IL III.	61.0	Type of screen or manufacturer: Mach	ine Slotted PVC
64.5		-BENTONITE- 66.0	Screen gauge or size of openings	0.010 in
		00.0	Diameter of well screen	2.0 in
\$cbaker	noce '	Editation or rain [Type of backfill around screen	Filter Sand
-BEDI	ROCK-	-FILTER SAND-	Depth of bottom of well screen	78.3 ft
			Depth of bottom of silt trap	•
7:	8.3	78.3	Depth of bottom of borehole	78.3 ft
		f Exploration	(Depths refer to ground surface	

APPENDIX J

Response to Comments on Draft Report

DEVENS, MASSACHUSETTS

DEVENS, MASSACHUSETTS

Massachusetts DEP Comments Dated November 9, 2006

(Note: The following comments are excerpted from the text of MassDEP's letter.)

DEP Comment No. 1. The 2006 Annual Report for AOC 32 and 43A highlights maintenance activities performed on monitoring wells, repair of road boxes, replacing one riser, and redeveloping three wells that attended to earlier concerns raised by EPA and MassDEP. However, the recommendations listed in this Annual Report on page ES-2 and Section 6, do not address other key points made in the EPA Technical Memorandum and a MassDEP comment letter dated January 12, 2006.

Response: The Army provided responses to MassDEP's January 12, 2006, comments on the 2004 Annual Report in February 2006. In addition, comments on USEPA's Technical Memorandum were provided in September 2006, and the CSM was updated in the updated LTMP for the site (HGL, 2006). All three of these documents have considered and responded to MassDEP's comments.

DEP Comment No. 2. The recommendations in this AR are to continue with the sampling plan, whereas both EPA and MassDEP have emphasized the need to monitor groundwater closer to the source areas and to expand the network of monitoring wells. MassDEP recommend including areas abutting the property and improve the capacity to track contaminant load in bedrock (letter Jan 12th, 2006).

Response: The adequacy of the existing monitoring well network was assessed during the preparation of comments on the USEPA's Technical Memorandum and development of the updated CSM in the LTMP for this site; however, it was concluded that additional monitoring wells were not needed.

DEP Comment No. 3. Construction of the Webvan building has changed groundwater level and flow at AOC 32 and 43A. Blasting, filling, paving parking lots, storm-water detention and drainage alterations, have altered (generally raised) groundwater elevations. Shifted groundwater flow paths due to building construction mean that wells are no longer in the primary flow paths and that adjustments need to be made. With the exception of well 32Z-09XOB there is a lack of monitoring points located along primary flow lines.

Response: Although the earthwork and regrading at AOCs 32 and 43A were thought to have the potential to affect groundwater flow patterns, comparison of groundwater elevation contours plotted and presented in the Remedial Investigation Report Functional Area II, (E&E, 1994), the Monitored Natural Attenuation Assessment Report, AOC 43A POL (Stone & Webster, 2000), and in the 2003 and 2004 Annual Reports show consistent groundwater flow potential. At the UST 13 location, groundwater flow potential is to the east with slight variations to the northeast and southeast. Near the AOC 43A source area, groundwater flow potential is to the southwest with slight variations to the north and south of southwest. This southwest trend is consistent with the distribution of TPH contamination in soil as mapped in the RI. The TPH would have

DEVENS, MASSACHUSETTS

migrated downgradient along the water table, and mapped TPH contamination provides confirmation of historical groundwater flow patterns.

Figures prepared as part of the Army's comments on USEPA's Technical Memorandum show overburden and bedrock aquifer groundwater contours based on April 1999, July 1999, June 2005, October 2005, and July 2006 which support the conclusion that there have not been significant changes in groundwater flow directions as a result of redevelopment activities. The figures do not show significant changes in flow paths. Based on these figures, monitoring well 32Z-09XOB appears to be cross-gradient to historical sources at AOC 43A.

DEP Comment No. 4. In addition to well location issues, there is also the concern of well performance. As stated in the EPA Technical Memorandum May 2006 "none of the wells in close proximity to the former source area are screened across the top of the water table." Water tables are periodically above the top of the screens at wells 32M-01-13XBR and 32M-01-18XBR, and 32M-01-15XBR is screened below the water table. Under these conditions and given the chemical nature of the contaminants, groundwater contamination may go undetected.

Response: Comparison of screened interval elevations for 32M-01-13XBR (235.4 to 245.4 feet) and 32M-01-18XBR (235.4 to 245.4 feet) to tabulated water level data shows that the water table was within the screened interval at each well for 12 of 13 measuring events spanning January 2002 through June 2006, indicating that these two wells are screened to monitor the water table. In March 2003 groundwater elevations were slightly above the screened intervals for these wells.

The screened interval for monitoring well 32M-01-15XBR (214.2 to 224.2 feet) is screened approximately 14 to 24 feet beneath the water table. This well monitors bedrock groundwater east of the UST area.

DEP Comment No. 5. The overall LTMP for AOC 32 and 43A must incorporate new locations for monitoring wells. Please refer to locations for proposed new monitoring wells in Figure 25 of the EPA Technical Memorandum, Analysis of Bedrock Structure, Implications to LTM Optimization for AOC 32-43A, May 2006.

Response: Please refer to the response to MassDEP Comment No. 2.

DEP Comment No. 6. On page 2-2 of the CSM section in this AR, it is stated that "Impacts to the bedrock competency as a result of blasting and excavation are unknown" and "mechanical fracturing due to blasting may have increased the local permeability." The 4th recommendation in this AR, pages ES-2 and 6-2, is to prepare an updated LTM Plan for the combined sites to reflect post-warehouse conditions. This should involve an updated Conceptual Site Model that addresses warehouse construction site alterations as described in Section 2 of this report.

Response: The updated LTMP contains an updated CSM for this site.

DEVENS, MASSACHUSETTS

DEP Comment No. 7. Earlier recommendations for AOC 32 and 43A made by EPA and MassDEP include removing obsolete wells, installing monitoring wells in both source areas and along abutting property, and analyzing for perchlorate; a potential residual contaminant the result of blasting and the redevelopment of this parcel. However, perchorate sampling is still not included in the list of recommendations made in this report. Likewise, the recommendation to discontinue sampling for chemical analysis at SHL-15 and 32M-92-01X needs to be discussed with the BCT.

Response: The Army agrees that wells that do not provide useful data should not be sampled, and the updated LTMP contained recommendations to streamline the LTM program. Wells that are no longer considered useful for monitoring groundwater elevations and/or characteristics will ultimately be removed from the LTM program. The adequacy of the existing monitoring well network was assessed during the development of the CSM in the LTMP for this site; however, it was concluded that additional monitoring wells were not needed.

As stated in response to MassDEP comments on the 2004 Annual Report,

"...the Army is aware of the potential perchlorate and related constituents issue related to blasting agents, this activity postdates the DOD related activity that is being monitored by the LTM activities and is not the DOD's responsibility. The Army is authorized to sample for perchlorate only under specific circumstances, which are not met at this site."

Monitoring well 32M-92-01X is located approximately 600+ feet upgradient of the historical source areas at AOC 43A and 500+ feet cross-gradient of the UST 13 excavation and is unlikely to be influenced by either of these historical source areas. In addition, LTM data do not indicate groundwater contamination at this well. SHL-15 was installed as part of the Shepley's Hill Landfill RI and is located in a separate flow regime at greater distances from AOCs 32 and 43A than 32M-92-01X. It is unlikely to be influenced by either of these historical source areas. Elevated concentrations of arsenic and manganese in samples from this well are attributed the influence of Shepley's Hill Landfill and not to AOCs 32 and 43A. These wells seem to fit the description of "obsolete wells" mentioned in the comment, and the Army sees no reason to continue chemical monitoring at these wells as part of the LTMP for AOCs 32 and 43A.

The recommendations to discontinue monitoring will continue to be discussed with the BCT.

DEP Comment No. 8 Many questions remain concerning the adequacy of the monitoring well network, gaps and coverage, and well integrity.

Response: The Army continues to monitor groundwater and assess conditions at AOCs 32 and 43A. This assessment will continue as new data become available (e.g., data from small-diameter points installed by USEPA).