New Jersey Department of Environmental Protection
Site Remediation Program

Report Certifications for RCRA GPRA 2020, CERCLA, and Federal Facility Sites

These certifications are to be used for reports submitted for RCRA GPRA 2020, CERCLA, and Federal Facility Sites. The Department has developed guidance for report certifications for RCRA GPRA 2020, CERCLA, and Federal Facility Sites under traditional oversight. The "Person Responsible for Conducting the Remediation Information and Certification" is required to be submitted with each report. For those sites that are required or opt to use a Licensed Site Remediation Professional (LSRP) the report must also be certified by the LSRP using the "Licensed Site Remediation Professional Information and Statement". For additional guidance regarding the requirement for LSRPs at RCRA GPRA 2020, CERCLA and Federal Facility Sites see http://www.nj.gov/dep/srp/srra/training/matrix/quick_ref/rcra_cercla_fed_facility_sites.pdf.

Document: "Summary Remedial Investigation Report and NFA Request for FTMM-61 Building 283 Former Gasoline UST"

PERSON RESPONSIBLE FOR CONDUCTING THE REMEDIATION INFORMATION AND CERTIFICATION

Full Legal Name of the Person Responsible for Conducting the Remediation: William R. Colvin
Representative First Name: William Representative Last Name: Colvin
Title: BRAC Environmental Coordinator
Phone Number: (732) 380-7064 Ext: Fax:
Mailing Address: P.O. Box 148
City/Town: Oceanport State: NJ Zip Code: 07757
Email Address: william.r.colvin18.civ@mail.mil

This certification shall be signed by the person responsible for conducting the remediation who is submitting this notification in accordance with Administrative Requirements for the Remediation of Contaminated Sites rule at N.J.A.C. 7:26C-1.5(a).

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein, including all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

Signature: William R Colvin Date: 04/04/2017

Name/Title: William R. Colvin / BRAC Environmental Coordinator

DEPARTMENT OF THE ARMY

OFFICE OF ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT
U.S. ARMY FORT MONMOUTH
P.O. 148
OCEANPORT, NEW JERSEY 07757

4 April 2017

Ms. Linda Range
New Jersey Department of Environmental Protection
Case Manager
Bureau of Southern Field Operations
401 East State Street, 5th Floor
PO Box 407
Trenton, NJ 08625

Re: Summary Remedial Investigation Report and NFA Request for FTMM-61 Building 283 Former Gasoline UST
Fort Monmouth, NJ

Figures:

Figure 1 – FTMM-61 Location
Figure 2 – Layout of Parcel 50 including FTMM-61 and Sample Locations
Figure 3 – FTMM-61 Layout and Sample Locations for UST 283A
Figure 4 – FTMM-61 Shallow Groundwater Contours – September 29, 2014
Figure 5 – FTMM-61 Shallow Groundwater Contours – October 1, 2015

Tables:

Table 1 – Detected Soil Sampling Results for Former UST 283A – Comparison to NJDEP Soil Remediation Standards

Attachments:

A. Previous FTMM-61 Correspondence
B. Previous Reports
C. 2010 to 2011 Regenox Injection Locations and Field Forms
D. 2016 UST 283A Soil Boring Logs

Dear Ms. Range:

The U.S. Army Fort Monmouth (FTMM) team has prepared this Summary Remedial Investigation (RI) Report to summarize the results of the supplemental RI field work performed at Installation Restoration Program (IRP) Site FTMM-61. This site is also known as Site 283 based on the proximity to Building 283 Squier Hall. FTMM has reviewed and summarized relevant information concerning environmental investigations for FTMM-61. This summary RI provides an overview of information for this site including groundwater remediation and monitoring activities, results of the 2016 investigation at UST 283A, and documentation of NJDEP's No Further Action (NFA)

approval for two other underground storage tanks (USTs) associated with Building 283. Based on this information, we request a NFA determination for FTMM-61.

FTMM- 61 is a petroleum, oil, or lubricants (POL) site comprised of three USTs at Building 283. Previous investigations indicate that a petroleum release from a gasoline UST occurred at FTMM-61. POL sites are exempt from the CERCLA process, in accordance with the Department of Defense (DOD) Defense Environment Restoration Program (DERP) Manual (March, 2012). Therefore, a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) risk assessment was not performed, and the New Jersey Department of Environmental Protection (NJDEP) soil cleanup standards and Ground Water Quality Criteria (GWQC) were used to evaluate the need for remediation.

1.0 SITE DESCRIPTION

FTMM-61 is located on the northern side of the central portion of the Main Post (MP) at FTMM at the intersection of Sherrill Avenue and Brewers Avenue, and approximately 200 feet south of Parkers Creek, as shown on **Figure 1**. FTMM-61 is associated with Building 283 which is adjacent to existing Buildings 145, 288, 291, and 295. Building 283 functioned as the Squier Laboratory from 1934 to 1954 and then as administrative offices until FTMM closure in 2011. FTMM-61 became an IRP site in response to contaminated soil and groundwater in the area of UST 283C. FTMM-61 occupies approximately 2.75 acres (**Figure 2**).

Additional information concerning the FTMM-61 background and environmental setting is provided in various reports provided in **Attachment B**.

2.0 PREVIOUS INVESTIGATIONS

Three historical USTs have been removed from FTMM-61, designated as 283A (NJDEP registration ID 81533-58), 283B (NJDEP registration ID 81533-59), and 283C (NJDEP registration ID 81533-229) (**Figure 3**). UST 283B was a 10,000-gallon UST used for #2 fuel oil storage (SMC, 1998 in **Attachment B**), and received an approval for NFA on 24 February 2000 (**Attachment A**). UST 283C was a 3,000-gallon UST used for gasoline storage (Versar, 2000 in **Attachment B**) and received NFA approval on 10 January 2003 (**Attachment A**). UST 283A was a 1,000-gallon UST used for #2 fuel oil storage; the justification for a NFA determination is presented in Section 4.0 of this Summary RI Report.

The Army evaluated groundwater at FTMM-61 through quarterly groundwater monitoring from September 1999 through February 2004, as reported in a RI Report/Remedial Action Work Plan (RIR/RAWP; Versar, 2005 [**Attachment B**]).The RIR/RAWP identified benzene, ethylbenzene, total xylenes, and lead as contaminants of concern (COCs) at Site 283, and recommended continued groundwater monitoring and sampling, the installation of additional monitoring wells, and an ORC Advanced™ injection program to reduce the concentrations of volatile organic compounds (VOCs) in groundwater. The injection program was implemented from 2009 to 2011 and is described in Section 3.0 below.

A Site Investigation (SI) (Shaw, 2008; see **Attachment B**) of Environmental Condition of Property (ECP) Parcel 50, which contains FTMM-61, was submitted to the NJDEP in 2008. The SI included

soil gas and indoor air samples at Building 283 to assess the potential for vapor intrusion (VI). Benzene and PCE were detected at concentrations exceeding the soil gas screening level, however, the indoor air screening levels were not exceeded. The SI recommended additional indoor air sampling to confirm the initial results. Additional VI sampling was conducted (Bureau Veritas, 2013; provided in **Attachment B**), which indicated that no VI was occurring. The NJDEP approved No Further VI action at Building 283 on 3 January 2013 (**Attachment A**).

3.0 REGENOX™/ORC ADVANCED™ INJECTION PROGRAM AND GROUNDWATER PERFORMANCE MONITORING

Groundwater monitoring was conducted from 1999 through late 2011 and, following the temporary suspension of groundwater sampling in late 2011, was resumed in August 2013 to re-establish baseline groundwater conditions for constituents of potential concern (COPCs). A final groundwater sampling event was performed in 2014 (Parson, 2015; provided in **Attachment B**). The following presents a summary of groundwater remediation and performance monitoring. Groundwater contour maps were previously provided to the NJDEP in the Final Annual (4th Quarter) 2014 Groundwater Sampling Report (Parsons, 2015), and are presented here as **Figures 4 and 5**.

An ORC Advanced™ injection program was recommended in the 2005 RIR/RAWP (Versar, 2005; provided in **Attachment B**) to reduce the concentrations of benzene, ethylbenzene and total xylenes in groundwater. In May through July of 2009, ORC was injected into the subsurface, and the program successfully reduced concentrations of benzene by an order of magnitude (U.S. Army, 2010 in **Attachment A**). Injections were performed on 8 through 10 December 2010, 27 April through 2 May 2011, and 28 June through 1 July 2011, as shown on figures and field forms provided in **Attachment C**.

Subsequent groundwater monitoring occurred at FTMM-61 in August 2013 (VOCs and lead) and October 2014 (VOCs only) as documented in Parsons, 2015 (**Attachment B**). Benzene and lead concentrations decreased to non-detectable levels and the Army recommended the discontinuation of groundwater sampling at FTMM-61. The NJDEP approved this recommendation in a letter dated 26 January 2016 (**Attachment A**).

Based on the implementation of all planned remediation measures and the recent groundwater sampling results which indicate that VOCs have decreased to non-detect, the Army requests a NFA determination for groundwater at FTMM-61.

4.0 2016 SOIL INVESTIGATION FOR UST 283A

UST 283A was removed on 28 May 1990. A NFA designation was previously requested for UST 283A in a letter dated 30 January 2015 (**Attachment A**), but was denied by the NJDEP in a letter dated 16 November 2015 (**Attachment A**) due to the lack of analytical data. Further evidence supporting the location of the tank (shown on **Figure 3)** was presented in the 6 June 2016 Work Plan Addendum (**Attachment A**).

Sampling was performed in August 2016 as described in the NJDEP-approved (NJDEP, 2016) Work Plan Addendum (U.S. Army, 2016; both letters are provided in **Attachment A**). Two soil

borings (283A-SB-01 and 283A-SB-02) were advanced and sampled to assess soil contamination at the former location of UST 283A(**Figure 3)**. As proposed in the Work Plan, the copper tubing was further exposed using a hand shovel outside of the wall in the courtyard area prior to installing the soil borings; however, there was no further refinement of the former UST location. Boring logs are provided in **Attachment D**.

Groundwater was encountered at approximately 7 feet below ground surface (ft bgs), and as required by the work plan, each Geoprobe boring was completed to at least 4 feet below the water table (283A-SB-01 was completed to 15 feet bgs, and 283A-SB-02 was completed to 11 feet bgs) to assess current concentrations and vertical extent of extractable petroleum hydrocarbons (EPH). Soil samples were collected from the most contaminated intervals encountered based on field evidence (visual, olfactory, photoionization detector [PID] screening) and the location of the former tank. Two soil samples were collected from each boring. Samples were collected from approximately 5.0-5.5 ft bgs to provide a representative sample of the vadose zone below the removed tank, and from a deeper 6.5-7 ft bgs to sample just above the water table.

Each soil sample was analyzed for EPH, with additional contingency samples placed on hold for semivolatile organic compounds (SVOCs) analysis (25 percent) for naphthalene and 2-methylnaphthalene in the event that EPH concentrations exceed 1,000 mg/kg. These soil analyses are consistent with the requirements for No. 2 fuel oil in Table 2-1 of the NJAC 7:26E Technical Requirements for Site Remediation.

Soil sampling results are provided in **Table 1**. All samples had detected EPH concentrations of less than 20 mg/kg. Based on soil sampling results, contingency samples were not analyzed, and no additional sampling is required. The Army therefore requests a NFA determination for UST 283A.

5.0 SUMMARY

USTs 283B and 283C had previously received NFA designations. VI issues at Building 283 were investigated and the NJDEP approved No Further VI Action. FTMM-61 groundwater was remediated, VOC concentrations have been reduced to non-detect, and cessation of groundwater monitoring was accepted by the NJDEP. The results of the 2016 field investigation addressed UST 283A, which does not require any further action. Therefore, the Army requests a NFA determination for UST 283A and for all of FTMM-61.

Additionally, FTMM-61 is one of three IRP sites (in addition to FTMM-54 and FTMM-55) at Fort Monmouth that comprise ECP Parcel 50. FTMM-54 and FTMM-55 within Parcel 50 have been previously addressed, and Unrestricted Use designations were previously approved by the NJDEP. Therefore, the Army plans also to request a NFA letter for Parcel 50 upon approval of this submittal.

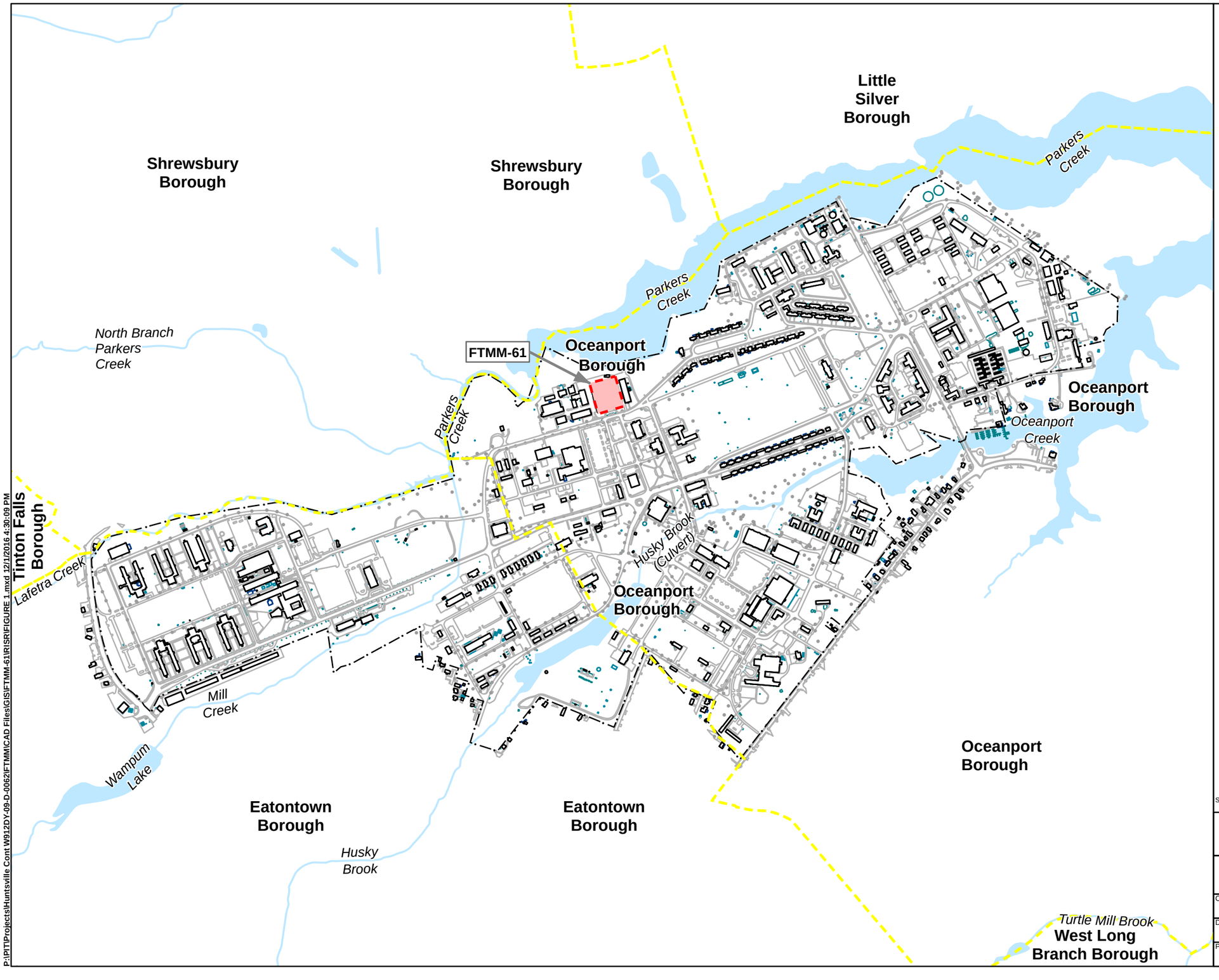
The technical Point of Contact is Kent Friesen; he can be reached at (732) 383-7201 or by email at kent.friesen@parsons.com. Should you have any questions or require additional information, please contact me by phone at (732) 380-7064 or by email at william.r.colvin18.civ@mail.mil.

Sincerely,

William R. Colvin, PMP, CHMM, PG
BRAC Environmental Coordinator

cc: Linda Range (3 hard copies)
Delight Balducci, HQDA ACSIM (CD)
Joseph Pearson, Calibre (CD)
James Moore, USACE (CD)
James Kelly, USACE (CD)
Cris Grill, Parsons (CD)

FIGURES



LEGEND:

- FTMM-61 Boundary
- Municipal Boundary
- Installation Boundary
- Surface Water Feature

N

1 inch = 1,000 feet

0 500 1,000 2,000 Feet

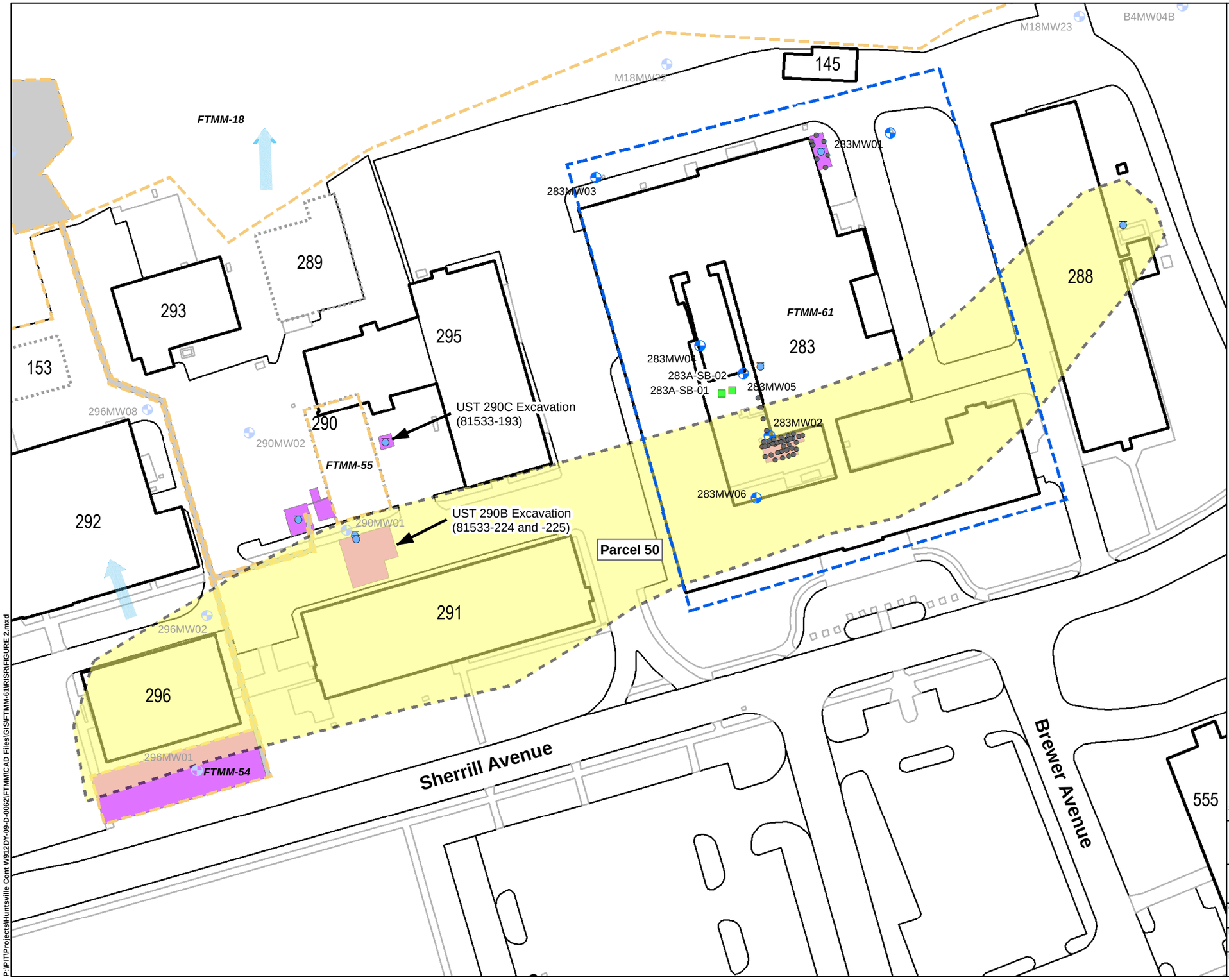
Source: FTMM Supplied CAD, 2013; ESRI Data and Maps, 2011; USGS NHD, 2012.

PARSONS 401 Diamond Drive NW, Huntsville AL	**Fort Monmouth New Jersey**

FTMM-61 LOCATION

CREATED BY: RR	REVIEWED BY: CM
DATE: DEC. 2016	FIGURE NUMBER: FIGURE 1
PROJECT NUMBER: 748810-02160	FILE: FIGURE 1.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\FTMM-61\RI\SRI\FIGURE 1.mxd 12/1/2016 4:30:09 PM



LEGEND:

- Soil Boring Location
- Previous Soil Sample Locations Associated with UST or Piping Excavations
- Former UST Location
- UST Excavation Area
- Former Fuel Distribution Piping Excavation Area
- Parcel 50 Boundary (Approximate)
- FTMM-61 Boundary (Approximate)
- FTMM-18, FTMM-54, FTMM-55 Boundaries (Approximate)
- Shallow Monitoring Well Associated with FTMM-61
- Shallow Monitoring Well not Associated with FTMM-61
- Inferred Groundwater Flow Direction
- Former Building (Demolished)

N

1 inch = 70 feet

0 35 70 140 Feet

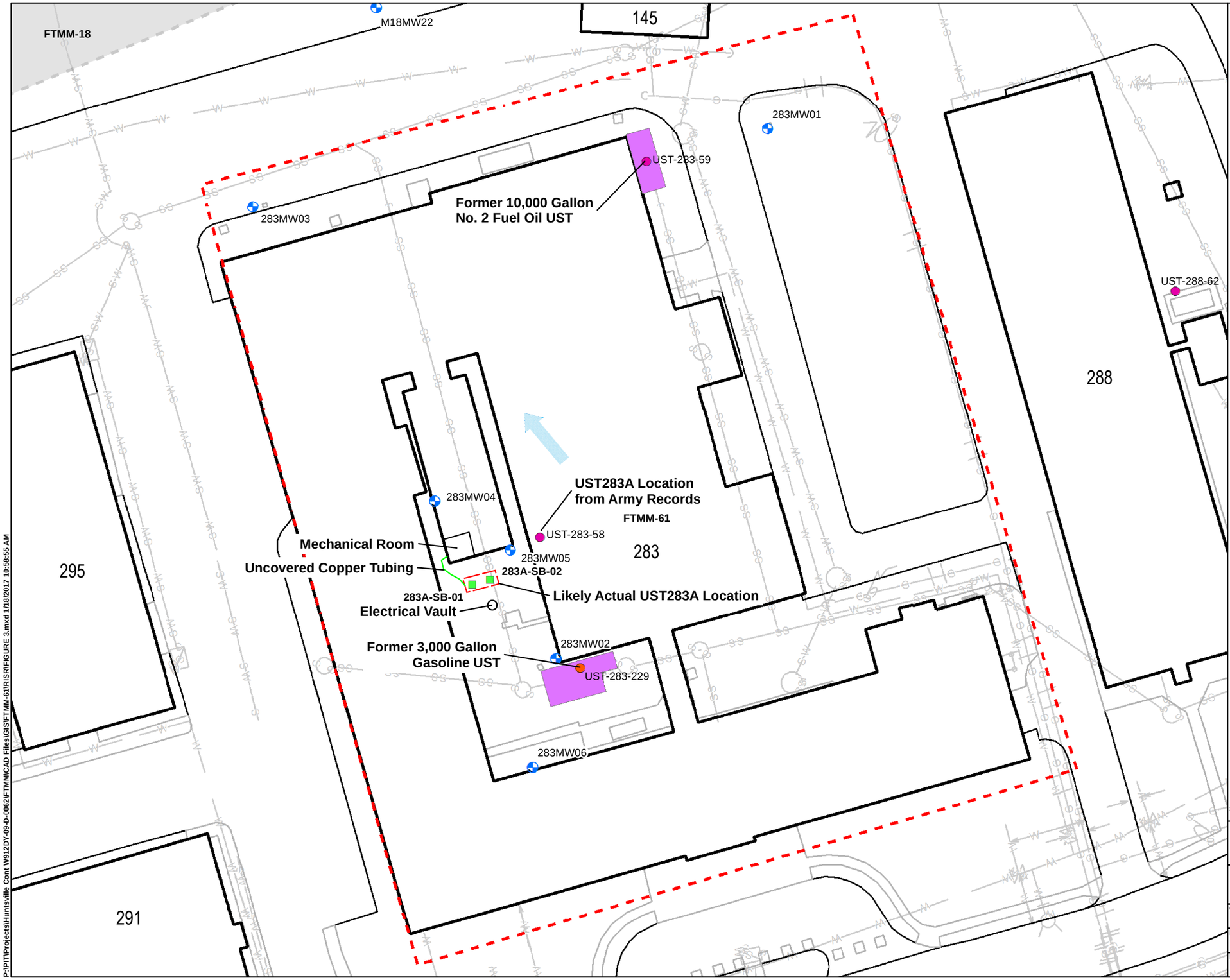
Source: FTMM Supplied CAD

PARSONS 401 Diamond Drive NW, Huntsville AL	**Fort Monmouth** **New Jersey**

LAYOUT OF PARCEL 50 INCLUDING FTMM-61 AND SAMPLE LOCATIONS

CREATED BY: RR	REVIEWED BY: RF
DATE: JAN. 2017	FIGURE NUMBER: FIGURE 2
PROJECT NUMBER: 748810-02160	FILE: FIGURE 2.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\FTMM-61\RISR\FIGURE 2.mxd



LEGEND:

- Soil Boring Location
- Shallow Monitoring Well
- Removed Gasoline UST associated with FTMM-61
- Other Removed UST
- UST Excavation Area
- FTMM-61 Boundary
- FTMM-18 Boundary
- W Water Line
- S Sanitary Sewer Line
- SW Storm Sewer Line
- G Gas Line
- Generalized Groundwater Flow Direction

N

1 inch = 40 feet

0 20 40 80 Feet

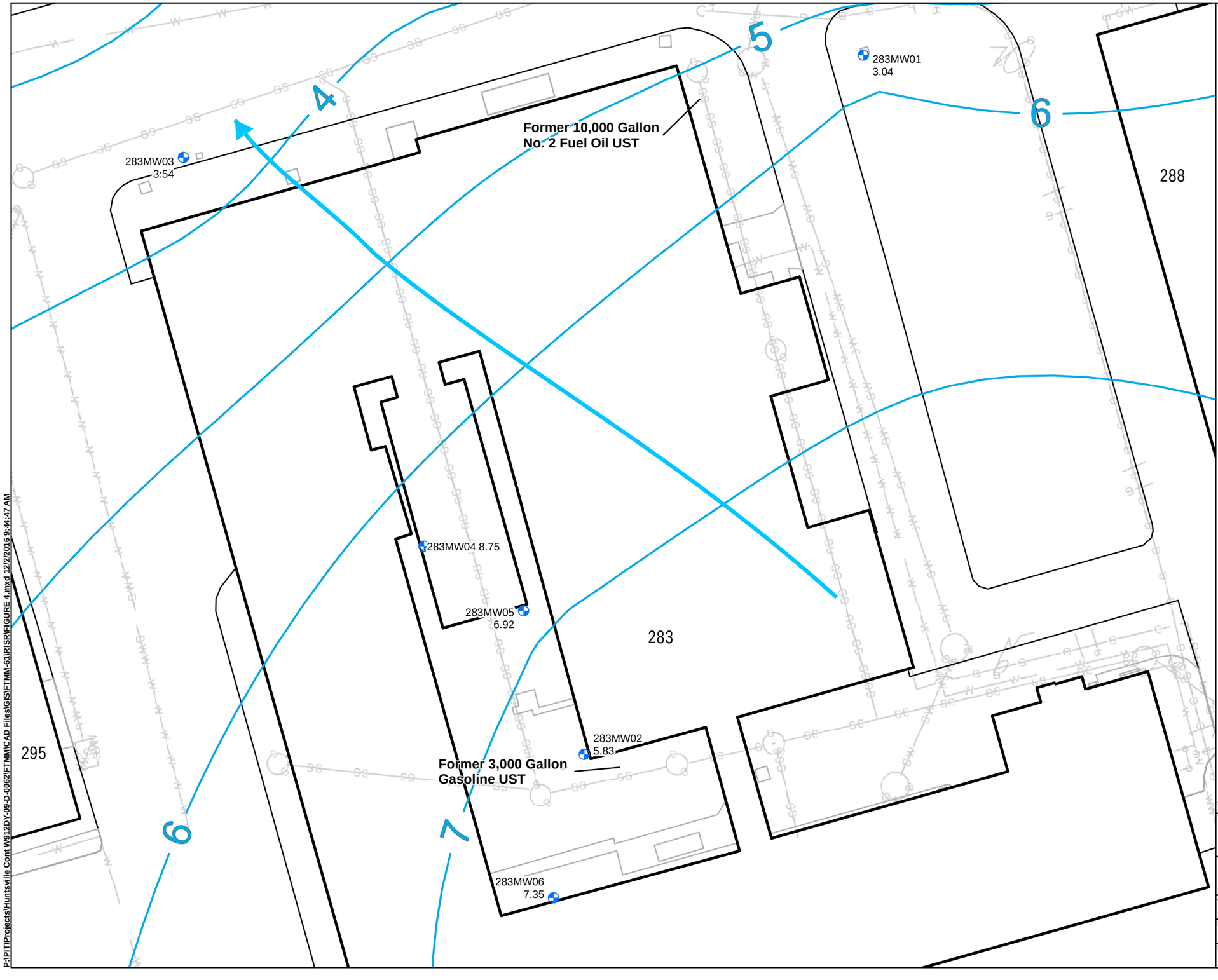
Source: FTMM Supplied CAD, 2013.

PARSONS 401 Diamond Drive NW, Huntsville AL	Fort Monmouth New Jersey

FTMM-61 LAYOUT AND SAMPLE LOCATIONS FOR UST283A

CREATED BY: RR	REVIEWED BY: RF
DATE: JAN. 2017	FIGURE NUMBER: FIGURE 3
PROJECT NUMBER: 748810-02160	FILE: FIGURE 3.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\FTMM-61\RIS\RI\FIGURE 3.mxd 1/18/2017 10:58:55 AM



LEGEND:

- Shallow Monitoring Well
- W Water Line
- S Sanitary Sewer Line
- SW Storm Sewer Line
- G Gas Line
- Groundwater Elevation Contour
- Inferred Groundwater Flow Direction

NOTE:

The groundwater elevation at monitoring well 283MW04 was considered anomalous compared to the fluid levels at neighboring wells.

DRAFT

N

1 inch = 30 feet

0 15 30 60 Feet

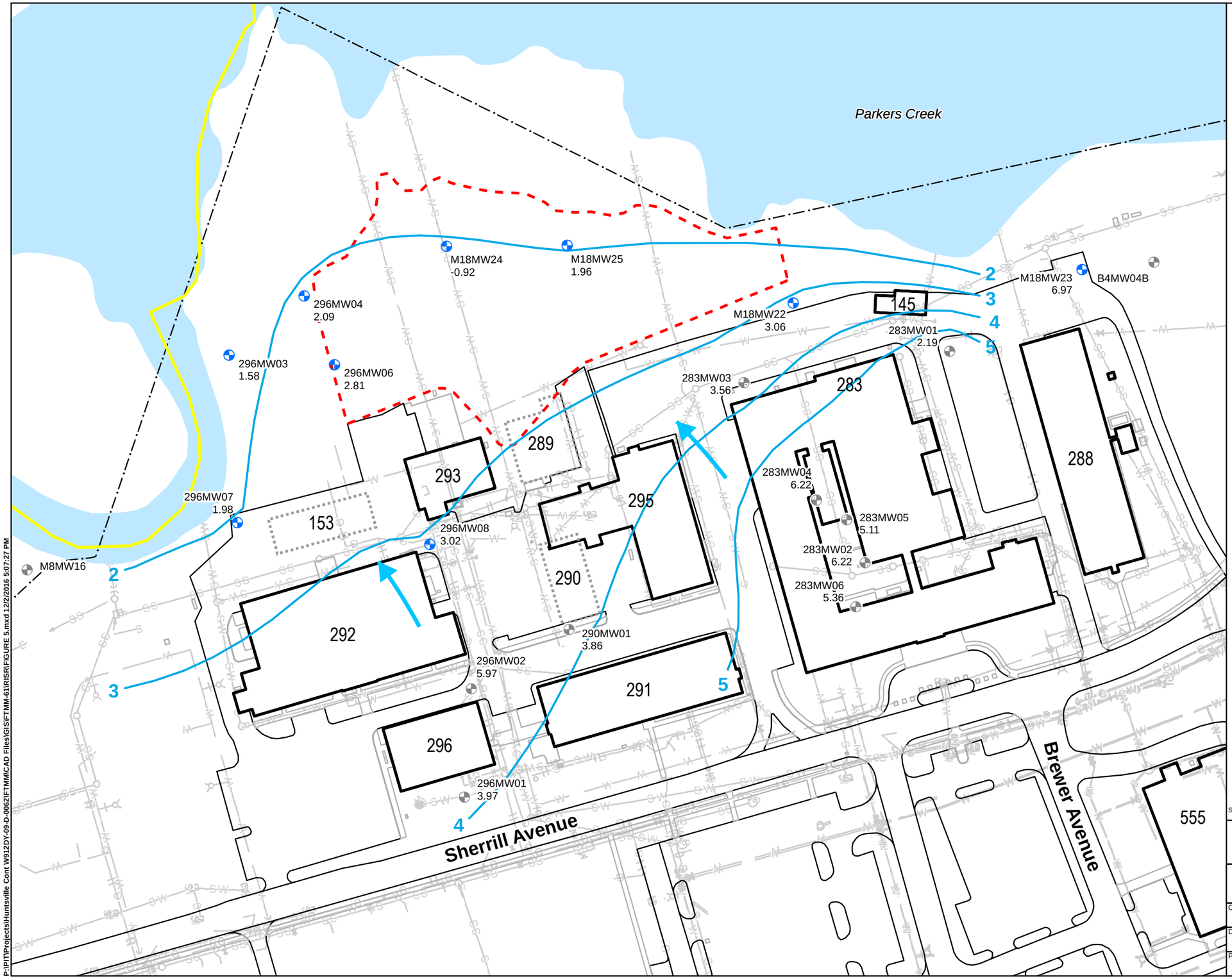
Source: FTMM Supplied CAD, 2013.

PARSONS 401 Diamond Drive NW, Huntsville AL	Fort Monmouth New Jersey

FTMM-61 SHALLOW GROUNDWATER CONTOURS - SEPTEMBER 29, 2014

CREATED BY: RR	REVIEWED BY: ME
DATE: DEC. 2016	FIGURE NUMBER: FIGURE 4
PROJECT NUMBER: 748810-01000	FILE: FIGURE 4.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\FTMM-61\RI\SRI\FIGURE 4.mxd 12/2/2016 9:44:47 AM



LEGEND:

- Shallow Monitoring Well
- Shallow Monitoring Well Associated with FTMM-54 / FTMM-55 / FTMM-61
- FTMM-18 Landfill Revised Boundary (2015)
- Municipal Boundary
- Installation Boundary
- W Water Line
- S Sanitary Sewer Line
- SW Storm Sewer Line
- G Gas Line
- Groundwater Elevation Contour
- Inferred Groundwater Flow Direction
- Former Building (Demolished)

NOTE:

The groundwater elevation at monitoring wells 296MW02, 296MW03, 283MW01, M18MW23, and M18MW24 were considered anomalous compared to the fluid levels at neighboring wells.

N

1 inch = 100 feet

0 50 100 200 Feet

Source: FTMM Supplied CAD, 2013.

PARSONS 401 Diamond Drive NW, Huntsville AL	**Fort Monmouth** **New Jersey**

FTMM-61 SHALLOW GROUNDWATER CONTOURS - OCTOBER 1, 2015

CREATED BY: RR	REVIEWED BY: RF
DATE: DEC. 2016	FIGURE NUMBER: FIGURE 5
PROJECT NUMBER: 748810-02160	FILE: FIGURE 5.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\FTMM-61R\SR\FIGURE 5.mxd 12/2/2016 5:07:27 PM

TABLES

TABLE 1
DETECTED SOIL SAMPLING RESULTS FOR FORMER UST 283A - COMPARISON TO NJDEP SOIL REMEDIATION STANDARDS
SITE FTMM-61 BUILDING 283
FORT MONMOUTH, NEW JERSEY

Loc ID	NJ Residential Direct Contact SRS	NJ Non-Residential Direct Contact SRS	NJ Impact to GW Soil Screening Level	BLD-283A-SB-01		BLD-283A-SB-02	
Sample ID				283A-SB-01-5.0-5.5	283A-SB-01-6.5-7.0	283A-SB-02-5.0-5.5	283A-SB-02-6.5-7
Sample Date				8/8/2016	8/8/2016	8/8/2016	8/8/2016
Extractable/Volatile Petroleum Hydrocarbons (mg/kg)							
C10-C12 Aromatics	NLE	NLE	NLE	**0.85 JB**	**1.1 JB**	**0.84 JB**	**0.96 JB**
C12-C16 Aliphatics	NLE	NLE	NLE	< 1.3 UJ	< 1.3 UJ	< 1.3 UJ	**0.85 J**
C12-C16 Aromatics	NLE	NLE	NLE	**0.29 J**	**0.35 J**	**0.26 J**	**0.37 J**
C16-C21 Aliphatics	NLE	NLE	NLE	< 1.3 UJ	< 1.3 UJ	**0.7 J**	**2.1 J**
C16-C21 Aromatics	NLE	NLE	NLE	**1.4 B**	**1.2 JB**	**1.2 JB**	**1.4 B**
C21-C36 Aromatics	NLE	NLE	NLE	**0.4 JB**	**0.41 JB**	**0.59 JB**	**0.47 JB**
C21-C40 Aliphatics	NLE	NLE	NLE	**3.8 B**	**0.72 JB**	**5.2 J**	**8.7 J**
C9-C12 Aliphatics	NLE	NLE	NLE	**0.52 J**	**0.63 J**	**0.63 J**	**0.53 J**
Total Aliphatics	NLE	NLE	NLE	**5 J**	**2.1 J**	**6.8 J**	**12.2 J**
Total Aromatics	NLE	NLE	NLE	**2.9 J**	**3.1 J**	**2.9 J**	**3.2 J**
Total EPH	5100	54000	NLE	**7.9 J**	**5.2 J**	**9.7 J**	**15.4**

Footnote:

NLE = no limit established.

Chemical dectections are bolded

For EPH, the Protocol For Addressing Extractable Petroleum Hydrocarbons, (Version 5.0, August 9, 2010) was used to determine the applicable standards. Based on the protocol FTMM-61 EPH results are considered category 1, and Category 1 screening criteria are used.

Chemical result qualifiers are assigned by the laboratory and are evaluated and modified (if necessary) during the data validation.

J = Estimated detected value due to a concetration below the reporting limit or due to discrepancies in meeting certain analyte-specific quality control.

B = Compound detected in the sample at a concentration less than or equal to 5 times (10 times for common lab contaminants) the blank concentration.

U = non-detect, i.e. not detected at or above this value.

ATTACHMENT A

Previous FTMM-61 Correspondence

1. NJDEP, 2016. *Re: Additional Information on UST 283A and Work Plan Addendum, Fort Monmouth, Oceanport, Monmouth County, New Jersey PI G00000032.* June 28.
2. U.S. Army, 2016. *SUBJECT: Additional Information on UST 283A and Work Plan Addendum, Fort Monmouth, New Jersey.* June 6.
3. NJDEP, 2016. *Re: Annual (Fourth Quarter) 2014 Groundwater Sampling Report dated December 2015, Fort Monmouth, Oceanport, Monmouth County, PI G000000032.* January 26.
4. NJDEP, 2015. *Re: Underground Storage Tanks within Parcels 49 & 50, Fort Monmouth, Oceanport, Monmouth County, PI G000000032*. November 16.
5. U.S. Army, 2015. *Re: Underground Storage Tanks Within Parcels 49 and 50, Fort Monmouth, NJ.* January 30. (Letter provided without Attachments)
6. NJDEP, 2013. Re: *Vapor Intrusion Site Investigation Report, Fort Monmouth – Main Post and Charles Wood Area, Monmouth County.* July 22.
7. NJDEP, 2013. *Re: Vapor Intrusion Site Investigation Report, Fort Monmouth – Main Post and Charles Wood Area, Monmouth County.* January 3.
8. U.S. Army, 2010. *Subject: Request for Permit-by-Rule for Regenox/ORC Advanced Injection, Fort Monmouth – Site 283 (FTMM-61) Main Post Area, Fort Monmouth, New Jersey 07703.* September 16. (Letter and figures provided without other Attachments)
9. NJDEP, 2010. *Re: Approval of Discharge to Groundwater Permit-by-Rule, Site 283 – Injection of Regenox/ORC Advanced, Fort Monmouth, New Jersey.* October 28.
10. U.S. Army, 2009. *NJDEP Correspondence (Dated October 24, 2007), Remedial Investigation Report and Remedial Action Workplan, Site 283, Fort Monmouth, NJ*. May 22.
11. NJDEP, 2007. Re: *Remedial Investigations Report and Remedial Action Work Plan, Site 283, Fort Monmouth, NJ*. October 24.
12. NJDEP, 2003. *Re: UST Closure Approval/NFA, Fort Monmouth Main Post, Monmouth County*. January 10.
13. NJDEP, 2000. *Re: UST Closure Reports – Closure Approvals, Fort Monmouth Army Base, Fort Monmouth, Monmouth County*. February 24.

State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Case Management
401 East State Street
P.O. Box 420/Mail Code 401-05F
Trenton, NJ 08625-0028
Phone #: 609-633-1455
Fax #: 609-633-1439

BOB MARTIN
Commissioner

June 28, 2016

William Colvin
BRAC Environmental Coordinator
OACSIM – U.S. Army Fort Monmouth
PO Box 148
Oceanport, NJ 07757

Re: *Additional Information on UST 283A and Work Plan Addendum*
Fort Monmouth
Oceanport, Monmouth County
PI G000000032

Dear Mr. Colvin:

The New Jersey Department of Environmental Protection (Department) has completed review of the referenced submittal, received June 8, 2016, prepared by the Department of the Army, to perform additional evaluation of UST 283A, an UST that was removed in 1990 in the vicinity of Building 283 (Squier Hall). The proposal, which includes soil sampling, is acceptable.

Please contact this office with any questions.

Sincerely,

Linda S. Range

C: Joe Pearson, Calibre
James Moore, USACE
Kent Friesens, Parsons
Rick Harrison, FMERA
Joe Fallon, FMERA

New Jersey Department of Environmental Protection
Site Remediation Program
Report Certifications for RCRA GPRA 2020, CERCLA, and Federal Facility Sites

These certifications are to be used for reports submitted for RCRA GPRA 2020, CERCLA, and Federal Facility Sites. The Department has developed guidance for report certifications for RCRA GPRA 2020, CERCLA, and Federal Facility Sites under traditional oversight. The "Person Responsible for Conducting the Remediation Information and Certification" is required to be submitted with each report. For those sites that are required or opt to use a Licensed Site Remediation Professional (LSRP) the report must also be certified by the LSRP using the "Licensed Site Remediation Professional Information and Statement". For additional guidance regarding the requirement for LSRPs at RCRA GPRA 2020, CERCLA and Federal Facility Sites see http://www.nj.gov/dep/srp/srra/training/matrix/quick_ref/rcra_cercla_fed_facility_sites.pdf.

Documents:

- "Additional Information on UST 283A and Work Plan Addendum, Fort Monmouth, New Jersey" (June 2016)

PERSON RESPONSIBLE FOR CONDUCTING THE REMEDIATION INFORMATION AND CERTIFICATION

Full Legal Name of the Person Responsible for Conducting the Remediation: William R. Colvin
Representative First Name: William Representative Last Name: Colvin
Title: Fort Monmouth BRAC Environmental Coordinator (BEC)
Phone Number: (732) 380-7064 Ext: Fax:
Mailing Address: P.O. Box 148
City/Town: Oceanport State: NJ Zip Code: 07757
Email Address: william.r.colvin18.civ@mail.mil

This certification shall be signed by the person responsible for conducting the remediation who is submitting this notification in accordance with Administrative Requirements for the Remediation of Contaminated Sites rule at N.J.A.C. 7:26C-1.5(a).

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein, including all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

Signature: William R Colvin Date: 06 June 2016

Name/Title: William R. Colvin, PMP, CHMM, PG
BRAC Environmental Coordinator

DEPARTMENT OF THE ARMY

OFFICE OF ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT
U.S. ARMY FORT MONMOUTH
P.O. 148
OCEANPORT, NEW JERSEY 07757

June 6, 2016

Ms. Linda Range
New Jersey Department of Environmental Protection
Bureau of Case Management
401 East State Street
PO Box 420/Mail Code 401-05F
Trenton, NJ 08625-0028

SUBJECT: Additional Information on UST 283A and Work Plan Addendum
Fort Monmouth, New Jersey

Attachments:

A. Location Figure 1.2 and Layout Figure 1.7 (Parcel 49)
B. UST 283A Tank Location Figures
C. 1935 Drawing of Squier Hall Vicinity
D. Site Photographs
E. Summary Table and Figure of Proposed UST 283A Sampling

Previous Correspondence and Reports (not attached):

1. U.S. Army letter to NJDEP dated January 30, 2015, re: *Underground Storage Tanks Within Parcels 49 and 50, Fort Monmouth, NJ.*
2. NJDEP letter to the U.S. Army dated November 16, 2015, re: *Underground Storage Tanks Within Parcels 49 and 50, Fort Monmouth, Oceanport, Monmouth County, PI G000000032.*
3. U.S. Army letter to NJDEP dated April 4, 2016, re: *Response to NJDEP's November 16, 2015 Comments on the January 30, 2015 Underground Storage Tanks Within Parcels 49 and 50, Fort Monmouth, NJ.*

Dear Ms. Range:

Fort Monmouth has performed additional evaluation of the location of an underground storage tank (UST) at Fort Monmouth designated as UST 283A. We are proposing additional soil sampling and analysis, and we request your concurrence on the proposed approach to site closure. The intent of this sampling is to support a No Further Action (NFA) determination or to identify additional data needs for UST 283A.

As reported earlier (Correspondence 1), UST 283A (registration ID 81533-58) was a 1,000 gallon steel No. 2 fuel oil tank in the vicinity of Building 283 (Squier Hall) that was removed in 1990. Samples for chemical analyses were not collected during closure because a contaminant release was not noted during tank removal. From our file search, there is no record of an NFA determination from the New Jersey Department of Environmental Protection (NJDEP) for UST 283A.

There have been no historical drawings or field notes verifying the UST 283A tank location, and therefore there was some uncertainty regarding the actual location of this removed tank. In Correspondence 2 the NJDEP indicated that a NFA determination could not be approved without appropriate sampling. Although Correspondence 3 indicated there would be no further submittals from the Army concerning this tank, we have recently found additional physical evidence of the previous location of UST 283A.

1. BACKGROUND ON TANK LOCATION

Building 283 is located within the boundary of Environmental Condition of Property (ECP) Parcel 49, which is located in the northern central portion of Main Post (see Figures 1.2 and 1.7 of Attachment A). As previously described in Correspondence 1, there were three USTs formerly located at Building 283 (see Attachment B): the subject UST 283A 1,000 gallon No. 2 fuel oil tank; the UST 283B 10,000 gallon No. 2 fuel oil tank; and the UST 283C 3,000 gallon gasoline tank that was also referred to as Installation Restoration Program (IRP) site FTMM-61.

As presented in Attachment B, Army records typically show UST 283A as located near the edge and under the eastern wing of Building 283. This location is adjacent to the courtyard within Building 283. However, the location of the former tank directly under Building 283 is unlikely based on the following:

- There is no physical evidence of a former tank removed from within the building, such as former cut-outs of the floor area or exterior brick walls, or service piping at this location.
- The numerous other fuel oil tank sites at Fort Monmouth are located adjacent to buildings, not below them.
- This eastern wing of Building 283 (historically referred to as "The Shop") was constructed early in the Fort's history (prior to 1935; see Attachment C), and so there would have been adequate land available adjacent to the east wing, and within the current courtyard area, for placement of the tank.
- Based on recent observations, the actual locations of several monitor wells within the Building 283 courtyard area is slightly shifted from the map locations; applying a similar shift to UST 283A would place the actual tank location outside of the building perimeter and within the courtyard.
- Mr. Joseph M. Fallon, who was the contact person on the Standard Reporting Form submitted to NJDEP for this tank in 1991, was recently contacted and had no knowledge of the removal of a tank from under the building.
- There was a larger 10,000 gallon No.2 fuel oil UST servicing Building 283, so it seems likely that the smaller 1,000 gallon UST 283A was installed to service the small cafeteria area extension of the building within the courtyard area (shown in Attachment B).

Photographs from a May 31, 2016 site visit to the Building 283 courtyard area are presented in Attachment D. Photograph 1 shows the doors to a mechanical room on the south side of the small cafeteria building extension that opens into the courtyard area. Copper tubing (possibly indicating service lines for a former fuel oil tank) and a fuel oil level gauge are present within the southeast corner of this mechanical room (see Photograph 2). From inside the mechanical room, the copper tubing extends outside the wall and below ground. Hand excavation of a shallow trench outside of the mechanical room in May 2016 indicated that two lines of copper tubing extend towards the south,

and the end of one line was found approximately 10 feet from the mechanical room door (the end of the second copper tubing line has not yet been uncovered), suggesting that a fuel oil UST was nearby. Also, labeling on the level gauge within the mechanical room was rated for either a 550 gallon or 1,000 gallon tank (UST 283A was reported to be 1,000 gallons). Both the tubing and the gauge provide additional physical evidence that a fuel oil tank may have been present in the vicinity south of the cafeteria area within the Building 283 courtyard, and we believe that these items were associated with the former UST 283A fuel oil supply system.

As shown on Photographs 1, 3 and 4 (Attachment D), two prospective sampling locations are marked with pin flags in the courtyard for further evaluation of UST 283A. These locations correspond to the area outside the mechanical room of the small cafeteria building extension into the courtyard, which is near the previous mapped location of UST 283A.

2. PROPOSED SAMPLING LOCATIONS AND ANALYSES

Two proposed soil borings (283A-SB-01 and 283A-SB-02) will be advanced and sampled to assess UST 283A for soil contamination, as shown on Attachment E. Prior to advancing the borings, the copper tubing may be further exposed using a hand shovel outside of the wall in the courtyard area, to further refine the former UST location. The final boring locations may be adjusted in the field based on observations of the extent of the copper tubing.

Each Geoprobe boring will be completed to at least 4 feet below the water table (estimated at approximately 7 feet below ground surface) to assess current concentrations and vertical extent of extractable petroleum hydrocarbons (EPH). Two soil samples will be collected from each boring. Samples will be collected from approximately 5.0-5.5 ft bgs (or another interval representative of the vadose zone below the removed tank), and from a deeper 6-inch interval that is near the water table. Soil samples will be collected from the most contaminated intervals encountered based on field evidence (visual, olfactory, photoionization detector [PID] screening).

Each soil sample will be analyzed for EPH, with additional contingency semivolatile organic compounds (SVOCs) analysis (25 percent) for naphthalene and 2-methylnaphthalene in the event that EPH concentrations exceed 1,000 mg/kg. These soil analyses are consistent with the requirements for No. 2 fuel oil in Table 2-1 of the NJAC 7:26E Technical Requirements for Site Remediation. The need for future groundwater analyses will be assessed based upon the soil results; since several existing monitor wells are located within the Building 283 courtyard, the previous monitoring results may be utilized or additional sampling may be performed as needed.

3. SUMMARY

We look forward to your review and approval of or comments on this submittal. The technical Point of Contact (POC) is Kent Friesen at (732) 383-7201 or by email at kent.friesen@parsons.com. Should you have any questions or require additional information, please contact me by phone at (732) 380-7064 or by email at william.r.colvin18.civ@mail.mil.

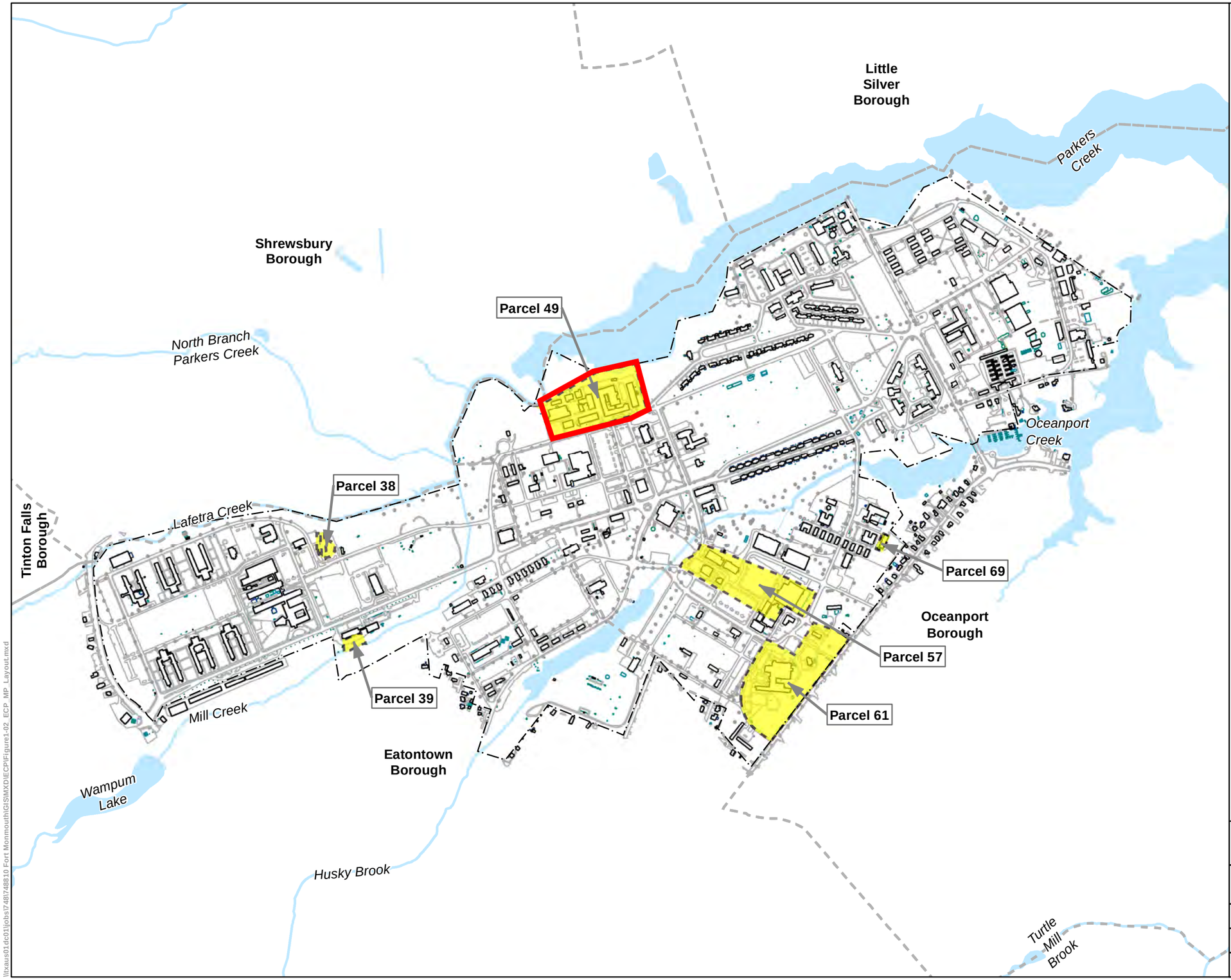
Sincerely,

William R. Colvin, PMP, PG, CHMM
BRAC Environmental Coordinator

cc: Linda Range, NJDEP (e-mail and 3 hard copies)
Delight Balducci, HQDA ACSIM (e-mail)
Joseph Pearson, Calibre (e-mail)
James Moore, USACE (e-mail)
Jim Kelly, USACE (e-mail)
Cris Grill, Parsons (e-mail)

ATTACHMENT A

Location Figure 1.2 and Layout Figure 1.7 (Parcel 49)



Legend

- Parcel Boundary
- Surface Water Feature
- Municipal Boundary
- Installation Boundary

N

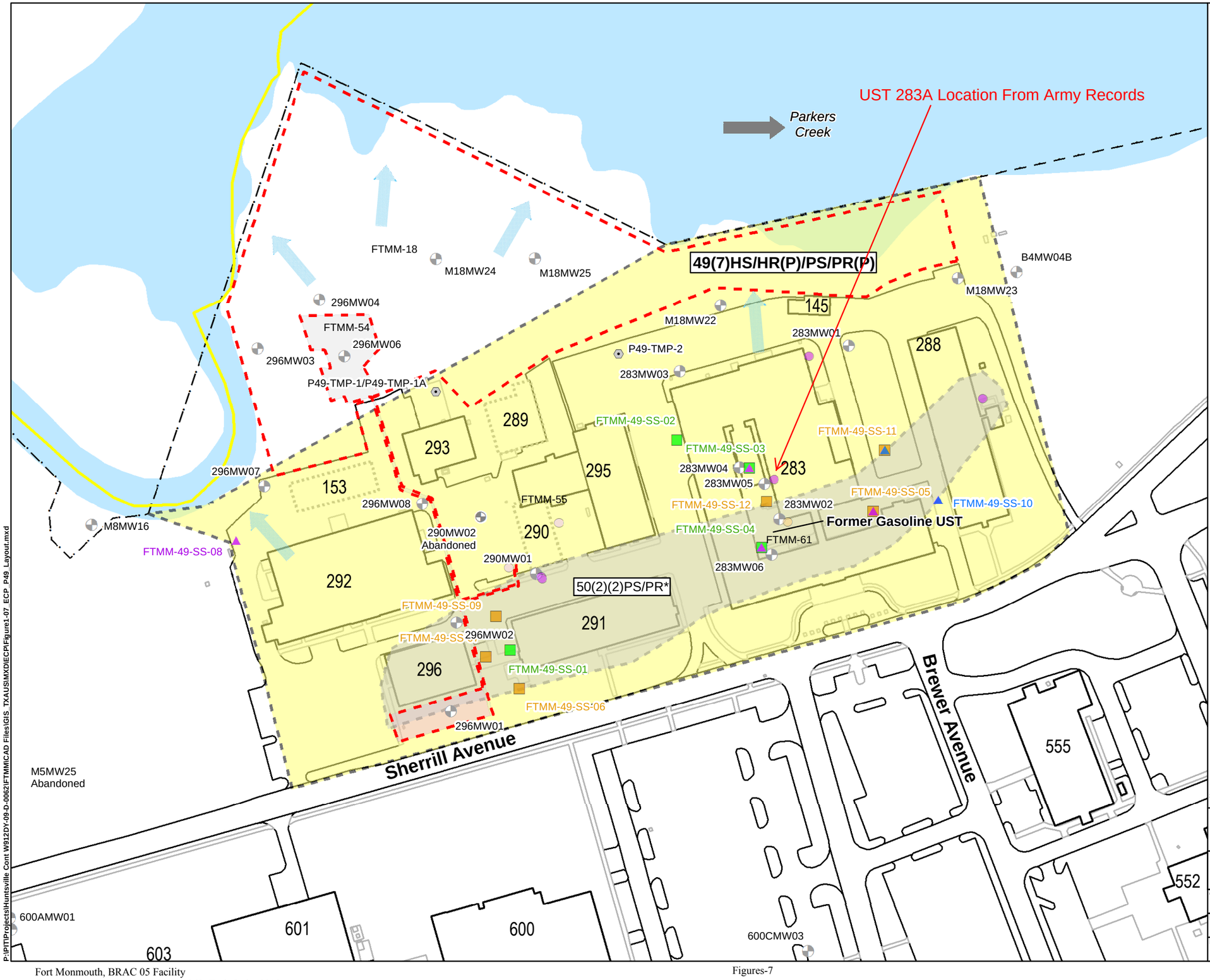
1 inch = 1,000 feet

0 250 500 1,000 1,500 2,000 2,500 Feet

Source: FTMM Supplied CAD, 2013; U.S. Army BRAC, 2008; ESRI Data and Maps 2011; USGS NHD, 2012.

PARSONS 401 Diamond Drive NW, Huntsville AL	**Fort Monmouth** **New Jersey**
Main Post Layout	
CREATED BY: TS	REVIEWED BY: CC/CG
DATE: December 2014	FIGURE NUMBER: Figure 1.2
PROJECT NUMBER: 748810.01000	FILE: Figure1-02_ECP_MP_Layout.mxd

\\txaus01dc01\jobs\748\748810 Fort Monmouth\GIS\MXD\ECP\Figure1-02_ECP_MP_Layout.mxd



LEGEND:

- Temporary Monitoring Well Location (2010)
- Proposed Surface/Subsurface Soil Sample Location (for analysis of polychlorinated biphenyls PCBs)
- Proposed Surface/Subsurface Soil Sample Location (for analysis of polycyclic aromatic hydrocarbon [PAHs])
- Proposed Surface/Subsurface Soil Sample Location (for contingent analysis of PCBs)
- Proposed Surface/Subsurface Soil Sample Location (for contingent analysis of PAHs)
- Former Gasoline UST
- Removed Fiberglass UST associated with FTMM-55 (Building 290)
- Removed Steel UST associated with FTMM-55 (Building 290)
- UST Excavation Area (FTMM-54)
- Former Fuel Distribution Piping Excavation
- Parcel 49 Boundary
- Parcel 50 (not included in Site Investigation)
- Shallow Monitoring Well
- FTMM-18 / FTMM-54 Boundary
- Municipal Boundary
- Installation Boundary
- Generalized Groundwater Flow Direction
- Surface Water Flow Direction

NOTES:

1. Sample locations are approximate and are subject to change based on field conditions.
2. The locations of M18MW22 & M18MW23 were field verified 08/26/2014 and revised.

BRAC Parcel Label Definitions

8(2)PS
- Contaminant Description: HS – Hazardous Substance Storage; HR – Hazardous Substance Release; PS – Petroleum Storage; PR – Petroleum Release; (P) – Possible Release or Disposal
- Category Number
- Parcel Number

N

1 inch = 120 feet

0 60 120 240 Feet

Source: FTMM Supplied CAD, 2013; U.S. Army BRAC, 2008; USGS NHD, 2012.

PARSONS 401 Diamond Drive NW, Huntsville AL	Fort Monmouth New Jersey
LAYOUT OF PARCEL 49 AND PROPOSED SAMPLING LOCATIONS	
CREATED BY: RR	REVIEWED BY: ME
DATE: NOV. 2015 REVISED	FIGURE NUMBER: FIGURE 1.7
PROJECT NUMBER: 748810-06015	FILE: Figure1-07_ECP_P49_Layout.mxd

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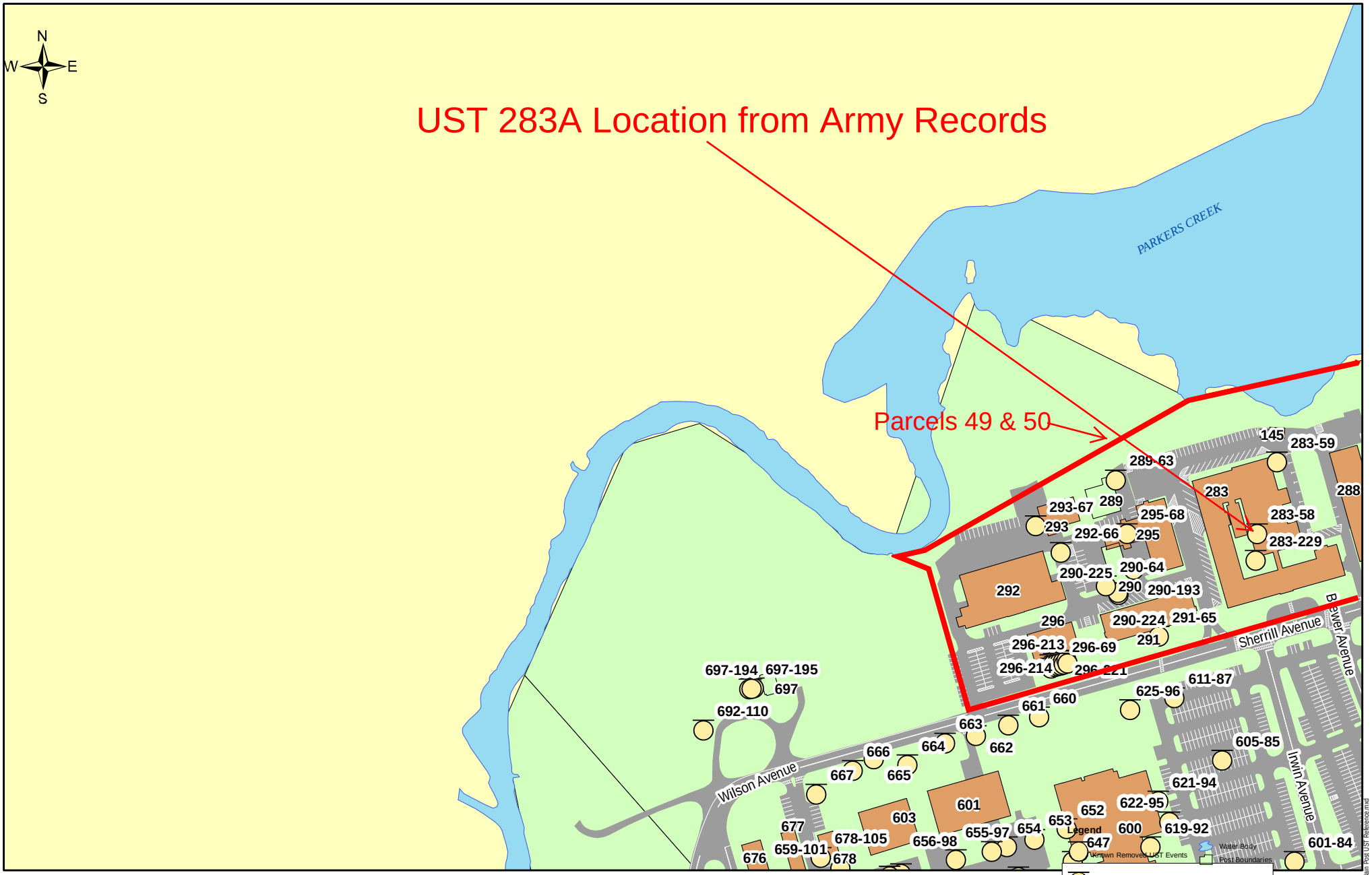
ATTACHMENT B

UST 283A Tank Location Figures

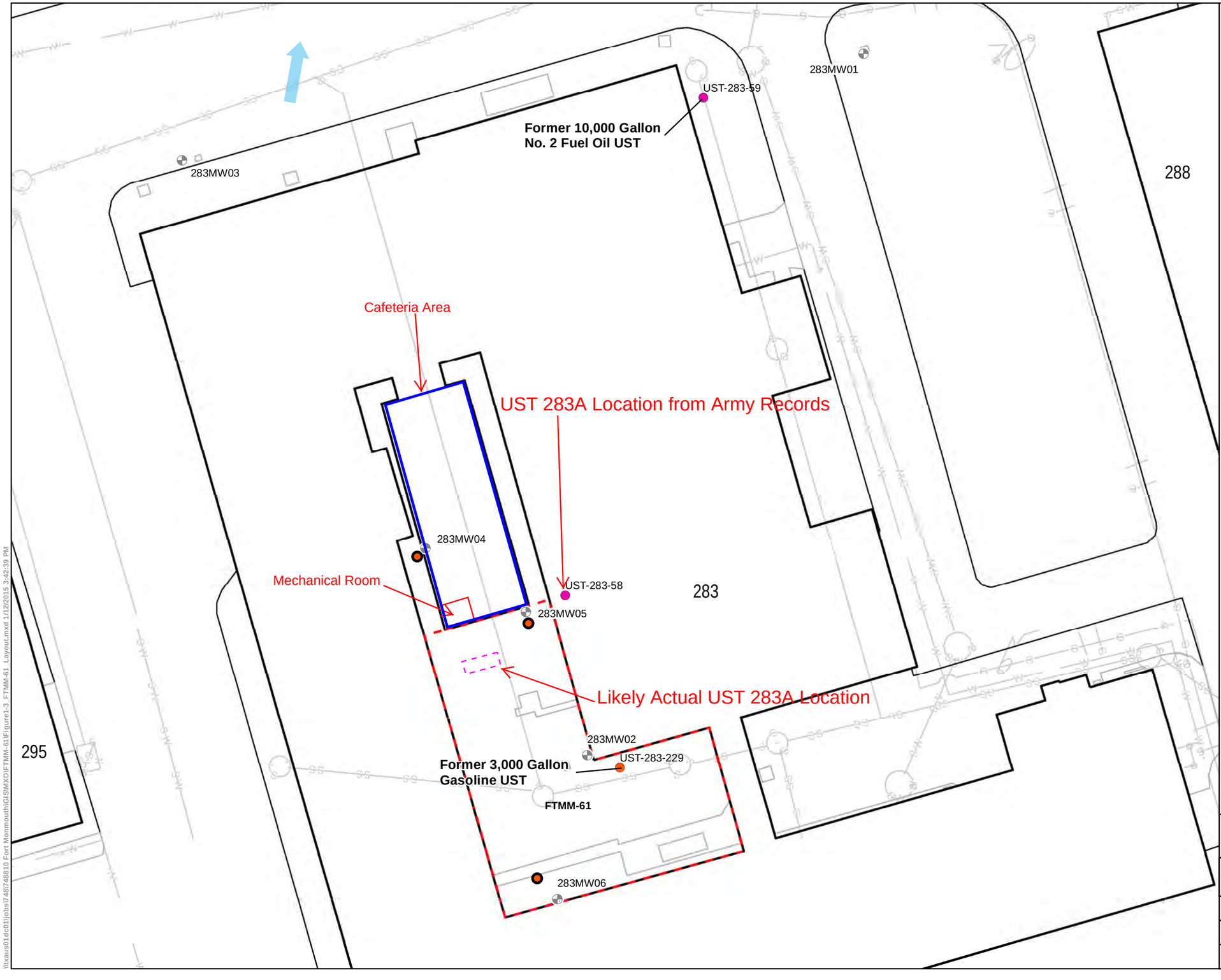


UST Removal Reference Map
Grid B2; Main Post
Fort Monmouth, New Jersey
FOUO

0 150 300 600 Feet

Map Created by:
Fort Monmouth Installation GIO, Environmental Division
Fort Monmouth, New Jersey
Date: August 10, 2011
All drawings must be field verified.
New Jersey State Plane Feet, NAD83

August 10, 2011 H:\GIS\GIS Maps\CHUST Linked\PDF\Main Post UST Reference.mxd



Legend

- Shallow Monitoring
- Shallow Monitoring Well Associated with FTMM-54 / FTMM-55 / FTMM-61
- Abandoned Shallow Monitoring
- Removed Gasoline UST associated with FTMM-61
- Removed Steel UST associated with FTMM-61 (Building 283)
- FTMM-61 and general courtyard area
- FTMM-08, FTMM-54 and FTMM-55 Boundaries
- Municipal
- Installation
- W Water Line
- S Sanitary Sewer
- SW Storm Sewer Line
- G Gas Line
- Generalized Groundwater Flow
- Monitor well location from 4/15/2015 site visit observations (shows potential for map shift)

N

1 inch = 30 feet

0 30 60 Feet

Source: FTMM Supplied CAD, 2013.

PARSONS 401 Diamond Drive NW, Huntsville AL	Fort Monmouth New Jersey

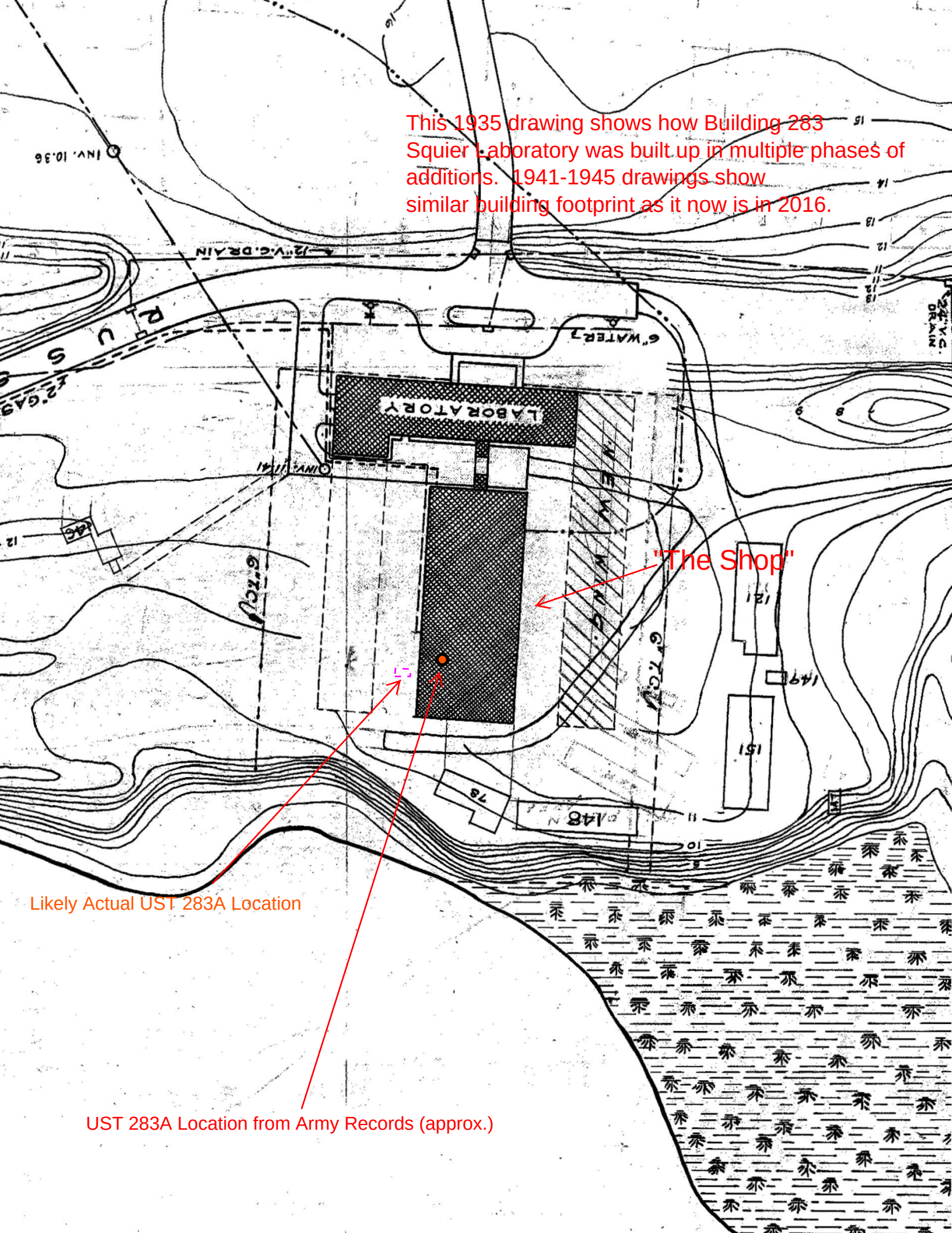
UST 283A Location Evaluation

CREATED BY: TS	REVIEWED BY: AM
DATE: January 2015	FIGURE NUMBER: Figure 1.3
PROJECT NUMBER: 748810.02160	FILE: Figure1-3_FTMM-61_Layout.mxd

\\txaus01dc01\jobs\748\748810 Fort Monmouth\GIS\MXD\FTMM-61\Figure1-3_FTMM-61_Layout.mxd 1/12/2015 3:42:39 PM

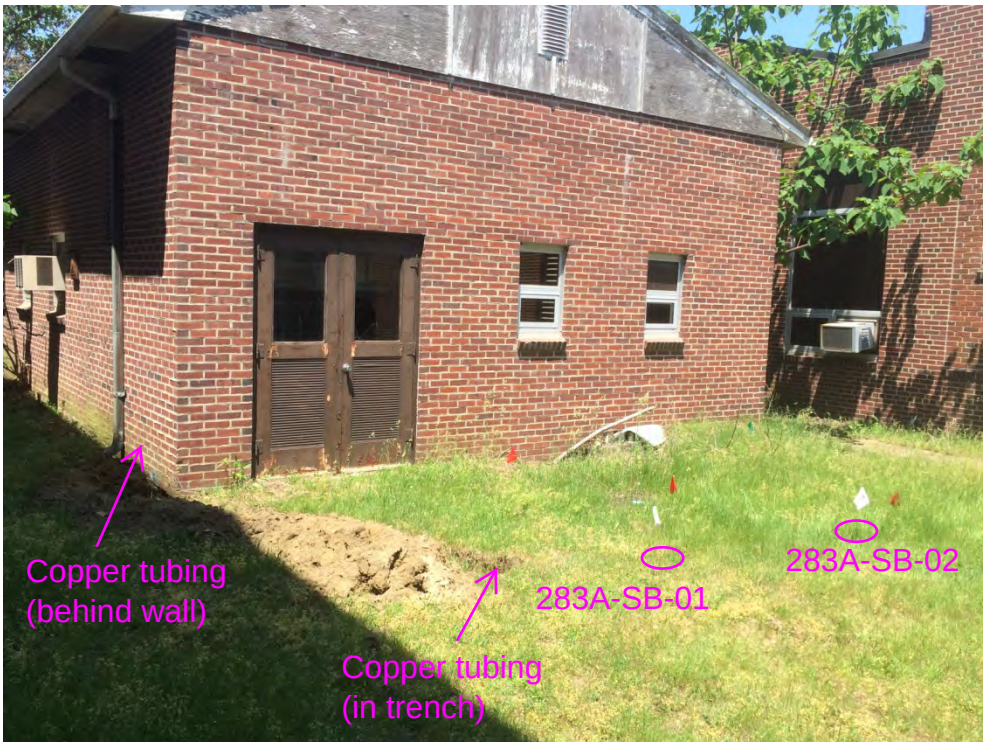
ATTACHMENT C

1935 Drawing of Squier Hall Vicinity

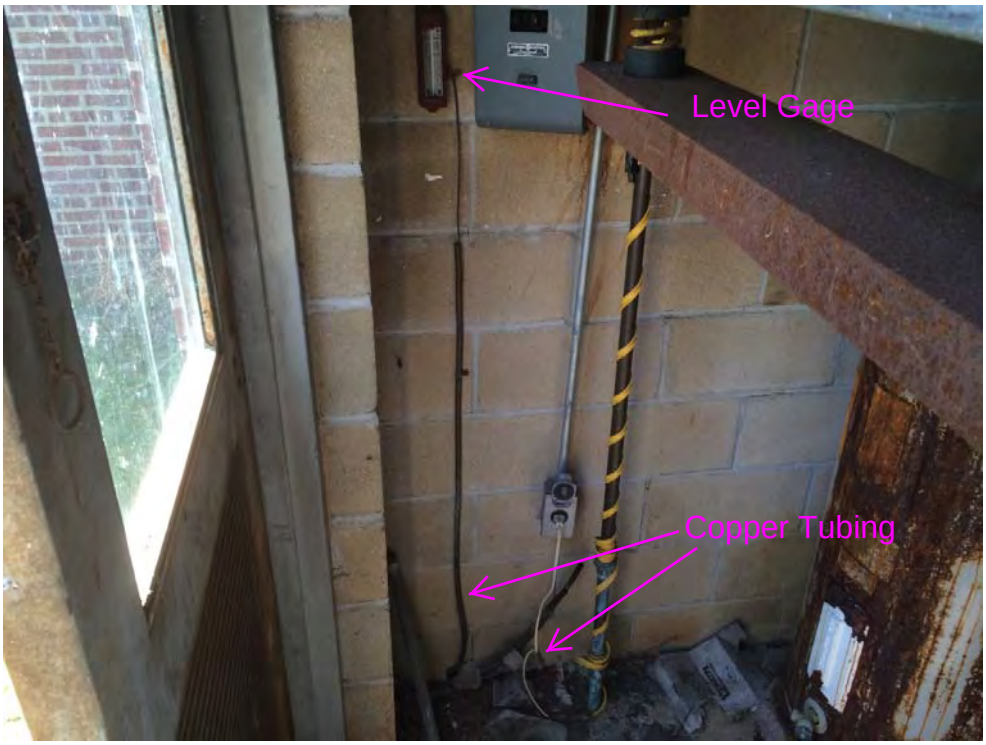

This 1935 drawing shows how Building 283 Squier Laboratory was built up in multiple phases of additions. 1941-1945 drawings show similar building footprint as it now is in 2016.
"The Shop"
Likely Actual UST 283A Location
UST 283A Location from Army Records (approx.)
LABORATORY
6" WATER
12" V.C. DRAIN
INV. 10.36
INV. 11.41
148
149
151
78

ATTACHMENT D

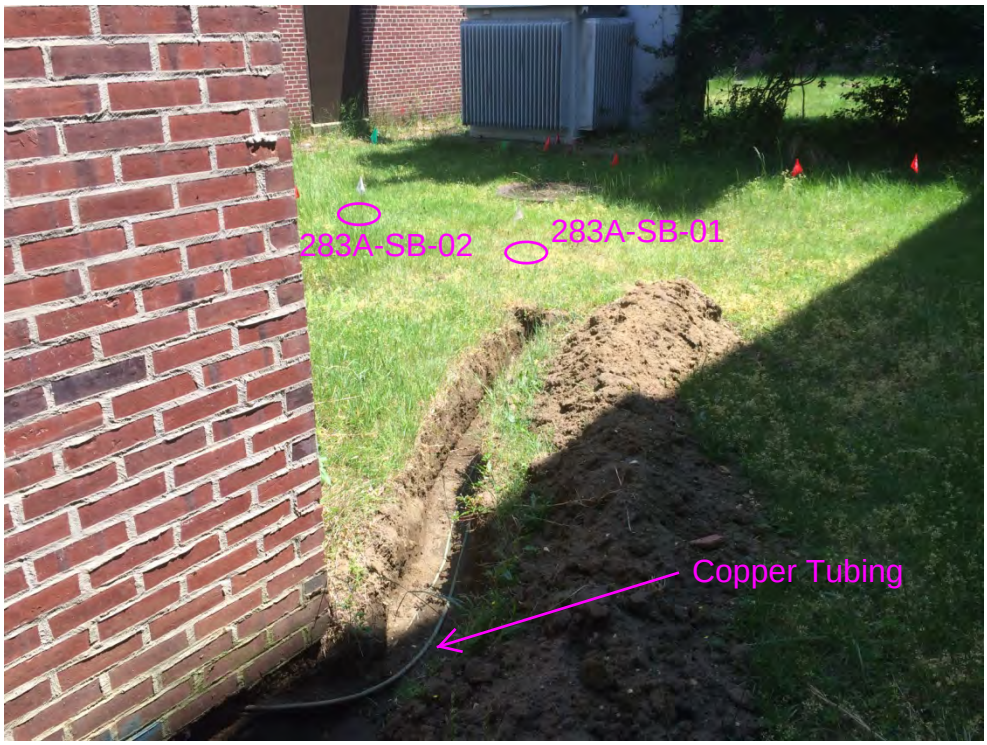
Site Photographs



1. View within Building 283 courtyard, facing north, of the entrance to the mechanical room, near the likely actual location of UST 283A. Proposed borings marked with white flags.



2. View inside mechanical room, facing west, showing copper tubing and level gage, indicating a former fuel oil tank in the vicinity (see Photo 3).



3. View facing south from outside corner of mechanical room, showing trench with uncovered copper tubing.

4. View within Building 283 courtyard, facing west-northwest. Proposed borings marked with white flags, buried electric line with red flags, and well 283MW05 to the right.

ATTACHMENT E

Summary Table and Figure of Proposed UST 283A Sampling

TABLE 1
SAMPLING SUMMARY FOR UST 283A WORK PLAN ADDENDUM
FORT MONMOUTH, NEW JERSEY

Parcel	Location	Field Meter Readings [a/]	SVOCs + TICs by Method 8270D [b/]	Non-Fractionated EPH [c/]
Soil				
68	2 soil borings, 2 samples each (assume 1 sample in each boring requires contingency SVOC analysis) [d/].	2 borings	2	4
QA/QC samples (see SAP for additional details) [e/]				
Field Duplicates (5% Sampling Frequency per media)		NA	1	1
Matrix Spike (5% Sampling Frequency per media)		NA	1	1
Matrix Spike Duplicate (5% Sampling Frequency per media)		NA	1	1
Trip Blank (1 per cooler of VOCs per media)		NA	0	0
QA Split (5% per media)		NA	1	1
Equipment Blank (5% Sampling Frequency per media)		NA	1	1
	TOTAL	**NA**	**7**	**9**

Notes:

NA = not applicable.

[a/] Field meter readings include, in soil samples: photoionization detector (PID) readings along entire soil column.

[b/] SVOCs = semivolatile organic compounds; TICs = tentatively identified compounds.

[c/] EPH = extractable petroleum hydrocarbons.

[d/] If any EPH concentrations in soil exceed 1000 mg/kg in any of the site samples, then minimum 25% of the samples where EPH exceeds 1000 mg/kg will also be analyzed for 2-methylnaphthalene and naphthalene.

[e/] QA/QC = quality assurance/quality control; SAP = Sampling and Analysis Plan. The requirement for QA/QC samples may be fulfilled with samples from other parcels.

283MW01

UST-283-59

Former 10,000 Gallon
No. 2 Fuel Oil UST

283MW03

288

UST 283A Location from Army Records

283MW04

Mechanical Room

UST-283-58

283

283MW05

283A-SB-02

283A-SB-01

Uncovered Copper Tubing

Likely Actual UST 283A Location

Electrical Vault

295

283MW02

UST-283-229

Former 3,000 Gallon
Gasoline UST

FTMM-61

283MW06

Legend

- Shallow Monitoring
- Shallow Monitoring Well Associated with FTMM-54 / FTMM-55 / FTMM-61
- Abandoned Shallow Monitoring
- Removed Gasoline UST associated with FTMM-61
- Removed Steel UST associated with FTMM-61 (Building 283)
- FTMM-61
- FTMM-08, FTMM-54 and FTMM-55 Boundaries
- Municipal
- Installation
- W Water Line
- S Sanitary Sewer
- SW Storm Sewer Line
- G Gas Line
- Generalized Groundwater Flow
- Suggested boring location to evaluate UST 283A

N

1 inch = 30 feet

0 30 60 Feet

Source: FTMM Supplied CAD, 2013.

PARSONS 401 Diamond Drive NW, Huntsville AL	Fort Monmouth New Jersey
Proposed UST 283A Sampling Locations	
CREATED BY: TS	REVIEWED BY: AM
DATE: January 2015	FIGURE NUMBER: Figure 1.3
PROJECT NUMBER: 748810.02160	FILE: Figure1-3_FTMM-61_Layout.mxd

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State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Case Management
401 East State Street
P.O. Box 420/Mail Code 401-05F
Trenton, NJ 08625-0028
Phone #: 609-633-1455
Fax #: 609-633-1439

BOB MARTIN
Commissioner

January 26, 2016

William R. Colvin
BRAC Environmental Coordinator
OACSIM – U.S. Army Fort Monmouth
PO Box 148
Oceanport, NJ 07757

Approval

Re: *Annual (Fourth Quarter) 2014 Groundwater Sampling Report* dated *December 2015*
Fort Monmouth
Oceanport, Monmouth County
PI G000000032

Dear Mr. Colvin:

The New Jersey Department of Environmental Protection (NJDEP) has completed review of the referenced report, received December 7, 2015, prepared by Parsons to support the Remedial Investigation (RI), Feasibility Study (FS), and Decision Documents project at Fort Monmouth. An annual ground water sampling event was conducted at fourteen (14) FTMM sites between September 29, 2014 and December 19, 2014. Sampling methodologies used included low-flow and passive diffusion bag samplers (PDBS). Comments on each FTMM site are as follows:

FTMM-02 Landfill

Historic sampling at this parcel has revealed Ground Water Quality Standard (GWQS) exceedances of VOCs. Results from the annual sampling event confirmed the exceedance of the GWQS for benzene. The report recommends one additional sampling round for wells M2MW11, M2MW21, M2MW22 and M2MW24. The report recommends continued annual VOC monitoring for M2MW03 and M2MW10. The NJDEP finds the recommendations acceptable. As indicated in the submittal, and as previously requested, as this round may be a final sampling round for select monitoring wells at FTMM-02, sampling will be conducted using low-flow purging (LFPS).

FTMM-03 Landfill

Historic sampling at this parcel revealed GWQS exceedances of vinyl chloride. Results from the annual sampling event for well 3MW02 were below GWQS. The GWQS for vinyl chloride was exceeded in well

3MW07. The presence of vinyl chloride is attributed to leaching of PVC piping from well 3MW07 and does not represent ground water conditions at the parcel. The report recommends the abandonment of 3MW07 and discontinuing ground water sampling at FTMM-03. The NJDEP finds the recommendations acceptable.

FTMM-05 Landfill

Historic sampling at this parcel revealed GWQS exceedances of PCE, TCE and vinyl chloride. Results from the annual sampling event exceeded GWQS for PCE and TCE. The report recommends continued annual VOC sampling of wells M5MW11, M5MW16, M5MW20 and M5MW23. The NJDEP finds the recommendations acceptable. At any point where a decision is made to terminate ground water sampling at this parcel, the NJDEP will require confirmatory sampling using low-flow due to PDBS results at this parcel biased low compared to the low-flow results.

FTMM-08 Landfill

Historic sampling at this parcel revealed GWQS exceedances of pesticides, benzene, PCE and lead. Results from the annual sampling event exceeded the GWQS for PCE and pesticides. The report recommends continued annual ground water sampling of well M8MW11 for VOCs and lead, M8MW12 for VOCs and 697MW01 for pesticides and VOCs. The report recommends discontinuing the sampling of M8MW15, M8MW16, M8MW17, M8MW21 and RM8MW24. The NJDEP finds the recommendations acceptable.

FTMM-18 Landfill

Historic sampling at this parcel revealed GWQS exceedances of benzene and 1,2-DCA. Results from the annual sampling event exceeded the GWQS for benzene and 1,2-DCA. The report recommends continued annual ground water sampling of wells M18MW22, M18MW23, 296MW04 and 296MW06 for VOCs using PDBS methodology. The NJDEP finds the recommendations acceptable.

FTMM-22 Former Wastewater Treatment Lime Pit

Historic sampling at this parcel revealed GWQS exceedances of TCE. Results from the annual sampling event exceeded the GWQS for TCE and vinyl chloride. The report recommends continued quarterly VOC sampling of wells CW1MW27, CW1MW28, CW1MW29, CW1MW31, CW1MW37 and CW1MW281. The NJDEP finds the recommendation acceptable. However, due to the increase of VOC concentrations in deep well CW1MW281, the NJDEP requires the quarterly sampling of deep well CW1MW40, which is located hydraulically downgradient of CW1MW281. At any point where a decision is made to terminate ground water sampling at this parcel, the NJDEP will require confirmatory sampling using low-flow methodology due to PDBS results biasing low compared to low-flow results at the Fort Monmouth site.

FTMM-53 Former Gas Station at Building 699

Historic sampling at this parcel revealed GWQS exceedances of benzene, PCE, TCE, TBA, VOC TICs and lead. Results from the annual sampling event exceeded the GWQS for benzene, PCE, 1,2,4-Trimethylbenzene, and VOC TICs. The report recommends continued quarterly VOC sampling of wells 699MW01, 699MW04, 699MW06, 699MW09, 699MW16, 699RW03, 699RW05 and 699RW11

using PDBS. The NJDEP finds the recommendation acceptable. At any point where a decision is made to terminate ground water sampling at this parcel, the NJDEP will require confirmatory sampling using low-flow due to PDBS biasing low compared to low-flow at the Fort Monmouth site.

FTMM-57 Building 108 UST Gasoline Release

Historic sampling at this parcel revealed GWQS exceedances of lead. Results from the annual sampling event were below the GWQS for lead. The report recommends one additional annual sampling of well 108MW04 for lead. The NJDEP finds the recommendation acceptable.

FTMM-58 Building 2567 UST Gasoline

Historic sampling at this parcel revealed GWQS exceedances of TBA. Results from the annual sampling event exceeded the GWQS for TBA. The report recommends continued annual sampling events of wells 2567MW01 and 2567MW03 for TBA. The NJDEP finds the recommendation acceptable.

FTMM-59 Building 1122 Unknown Discharge

Historic sampling at this parcel revealed no GWQS exceedances for VOCs. Results from the annual sampling event were below GWQS for VOCs. The report recommends evaluating the ground water results as part of the approved RI/FS for this parcel. The NJDEP finds the recommendation acceptable.

FTMM-61 Building 283 Gasoline Storage

Historic sampling revealed GWQS exceedances of benzene and VOC TICs. Results from the 2013 and 2014 annual sampling events were below GWQS for VOCs. The report recommends discontinuing the monitoring program at this parcel. The NJDEP finds the recommendation acceptable.

FTMM-64 Building 812 UST Gasoline

Historic sampling at this parcel revealed GWQS exceedances of benzene, vinyl chloride and metals. Results from the 2014 annual sampling event exceeded the GWQS for vinyl chloride. The report recommends continued annual VOC sampling of well 812MW04. The NJDEP finds the recommendation acceptable. If a decision is made to terminate ground water sampling at this parcel, the NJDEP will require confirmatory sampling using low-flow due to PDBS biasing low compared to low-flow at the Fort Monmouth site.

FTMM-66 Building 886 Former AST

Historic sampling revealed GWQS exceedances of benzene, VOC TICs, arsenic and lead. The August 2013 sampling results from wells at this parcel showed exceedances of the GWQS for SVOC TICs. Results from the 2014 annual sampling event did not exceed the GWQS for SVOC TICs. The report recommends one additional sampling round from wells 886RW01, 886RW06 and 886RW08 to confirm that ground water is in compliance with the GWQS. The NJDEP finds the recommendation acceptable.

FTMM-68 Building 700 Former Dry Cleaners

Historic sampling results from August 2013 showed exceedances of the GWQS for PCE, TCE, cis-1,2-DCE and vinyl chloride in wells 565MW01 and 565MW01D. Results from the 2014 annual sampling event confirmed that chlorinated VOCs exceed GWQS in ground water. The report recommends continued quarterly ground water sampling for VOCs. The report also references the RI proposed for implementation in 2015 (the March '15 Revision 1 RIFS WP was approved April 27, 2015), to fully characterize the nature and extent of contamination at this parcel. The NJDEP finds the recommendation of continued quarterly sampling acceptable, and looks forward to receipt of the RI findings.

Miscellaneous

Ground water sample contaminant concentrations (exceedances) should be plotted on future submittal maps as required by the Technical Regulations for Site Remediation and guidance documents.

Finally, please ensure all reports submitted to this office are accompanied by a properly completed certification form, a copy of which is attached.

Please contact this office if you have any questions.

Sincerely,

Linda S. Range

Linda S. Range

C: James Moore, USACE
Cris Grill, Parsons
Joe Pearson, Calibre
Rick Harrison, FMERA
Joe Fallon, FMERA
Frank Barricelli, RAB
Daryl Clark, BGWPA

State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Case Management
401 East State Street
P.O. Box 420/Mail Code 401-05F
Trenton, NJ 08625-0028
Phone #: 609-633-1455
Fax #: 609-633-1439

BOB MARTIN
Commissioner

November 16, 2015

John Occhipinti
BRAC Environmental Coordinator
OACSIM – U.S. Army Fort Monmouth
PO Box 148
Oceanport, NJ 07757

Re: *Underground Storage Tanks within Parcels 49 & 50*
Fort Monmouth
Oceanport, Monmouth County
PI G000000032

Dear Mr. Occhipinti:

The New Jersey Department of Environmental Protection (Department) has completed review of the referenced report, received February 3, 2015, prepared by the Department of the Army's Office of Assistant Chief of Staff for Installation Management to document the status of the various USTs within these parcels.

As indicated on pages 2 and 3 of the submittal, the majority of the USTs formerly present within the parcels have received a designation of no further action (NFA) from the Department. Those which had not, or which warrant additional comment, are discussed below.

UST 283A aka UST 283-58
Although no evidence of a discharge was reportedly noted during the May 1990 removal of the underground storage tank, and the specific location of the tank is currently "not known", unless sampling was/is performed in accordance with applicable regulations and guidance documents, the NJDEP cannot comment as to the absence or presence of a petroleum discharge; the request for designation of no further action cannot be granted.

UST 283C aka UST 283-229
The UST, located within an area addressed under the Installation Restoration Program (IRP) and known specifically as FTMM-61, received a designation of NFA from the Department in January of 2003. As per the submittal, any ground water issues relative to FTMM-55 (Building 290) and FTMM-61 (Building 283) will be addressed through the specific IRP site activities.

UST 290A aka UST 290-64

UST 290-64, although listed in a letter dated August 29, 2000 indicating no further action required for multiple USTs, contained post excavation analytical results of up to 11,900 ppm and 16,200 ppm. UST 290-64 (as well as **UST 290-224** and **UST 290-225**) was located in the area being addressed under the IRP as FTMM-55. Additional soil sampling/characterization efforts are proposed and discussed in the February 2015 *ECP Supplemental Phase II Site Investigation Work Plan Addendum for Parcels 34, 50, 51, 52, 66, 80 and 83* and the DEP's comment letter of June 16, 2015.

UST 290C aka 290-193

Following review of the information submitted in the referenced report, it is agreed no further action is necessary for the former waste oil tank.

UST 296A aka UST 296-69

As indicated in the July 10, 2012 DEP correspondence, although Appendix G of the January 2007 ECP Report indicates a report was submitted in February of 1996, no documentation was found, nor has been submitted since, to allow for comment as to the presence or absence of a discharge at this time.

Please contact this office if you have any questions.

Sincerely,

Linda S. Range

Linda S. Range

C: Joe Pearson, Calibre
Rich Harrison, FMERA
Joe Fallon, FMERA
James Moore, USACE
Frank Barricelli, RAB

DEPARTMENT OF THE ARMY

OFFICE OF ASSISTANT CHIEF OF STAFF FOR INSTALLATION MANAGEMENT
U.S. ARMY FORT MONMOUTH
P.O. 148
OCEANPORT, NEW JERSEY 07757

January 30, 2015

Ms. Linda Range
New Jersey Department of Environmental Protection
Case Manager
Bureau of Southern Field Operations
401 East State Street, 5th Floor
PO Box 407
Trenton, NJ 08625

Re: Underground Storage Tanks within Parcels 49 and 50
Fort Monmouth, NJ

Attachments:

A. Site Figure for Parcels 49 and 50
B. No Further Action Letters from NJDEP
C. UST 283A File Review
D. UST 290C File Review

Previous Correspondence:

1. December 1, 2014 letter from the Army to NJDEP, Re: *Request for No Further Action for Groundwater at FTMM-54, Fort Monmouth, Oceanport, Monmouth County, New Jersey.*
2. NJDEP letter to the Army dated May 30, 2013, re: *Army's January 31, 2013 Correspondence – Miscellaneous USTs.*
3. Army letter to NJDEP dated January 31, 2013, re: *NJDEP's Response to Army Correspondence (Dated March 16, 2012).*
4. NJDEP letter to the Army dated July 10, 2012, re: *March 2012 Army Response to NJDEP Correspondence Letter Dated October 28, 2008*.
5. Army letter to NJDEP dated March 16, 2012, re: *Army's Response to NJDEP Correspondence (Dated October 28, 2008), Draft Site Investigation*.
6. NJDEP letter to the Army dated October 28, 2008, re: *Draft Site Investigation Report*.
7. NJDEP letter to the Army dated August 14, 2007, re: *M-18 Landfill*.

Dear Ms. Range:

The U.S. Army Fort Monmouth (FTMM) has reviewed existing file information for underground storage tank (UST) sites at Fort Monmouth within Environmental Condition of Property (ECP) Parcels 49 and 50. The purpose of this review was to document the location and closure status of the various USTs within these parcels. This letter provides the information for Parcel 49 USTs requested in Correspondence (4), in addition to the USTs subsequently addressed in

Correspondence (3) and (2). This information supports the conclusion that all potential UST soil contamination issues previously identified within Parcels 49 and 50 have been adequately addressed by previous or ongoing environmental programs. NJDEP's comments regarding base neutral (BNs) constituents and polychlorinated biphenyls (PCBs) in soils at Parcel 49, as specified in Correspondence (4), will be addressed in an upcoming ECP Work Plan.

Parcel 49 includes the Squire Laboratory and adjoining structures, as well as multiple UST sites (see Attachment A). All of the USTs identified in Attachment A have been removed. Parcel 50 is encompassed by Parcel 49 and is comprised of Installation Restoration Program (IRP) sites FTMM-54 (Bldg 296), FTMM-55 (Bldg 290) and FTMM-61 (Bldg 283). Groundwater issues will be addressed through the specific IRP site activities.

The following is a summary of the USTs previously located within the outer confines of Parcel 49 (which includes Parcel 50), along with the current Army case status and reference to previous NJDEP approval of No Further Action (NFA; see Attachment B for specific letters) if available.

Site Name	IRP Site	Registration ID	DICAR	Tank Size and Type	Product	Army Case Status	NJDEP NFA Letter
283A	No	81533-58		1000 gal. steel	#2 FUEL OIL	Case Closed	None; NFA requested herein
283B	No	81533-59		10,000 gal. steel	#2 FUEL OIL	Case Closed	2/24/2000; 5/30/2013
283C	FTMM-61	81533-229	97-08-28-1330-33	3000 gal. steel	GASOLINE	Case Open	1/10/2003
288	No	81533-62	97-7-15-1002-56	Like, 500 gallon steel or ??	#2 FUEL OIL	Case Closed	10/23/2000
289	No	81533-63	94-09-02-1455-00	1000 gal. steel	#2 FUEL OIL	Case Closed	10/23/2000
290A	FTMM-55	81533-64	94-9-13-1503-57	2000 gal. fiberglass	#2 Diesel	Case Closed	8/29/2000 but see also 8/14/2007
EC290B	FTMM-55	81533-225	94-9-2-1455-00	2000 gal. steel	GASOLINE	Case Open	1/10/2003; 8/14/2007
290B	FTMM-55	81533-224	93-11-30-1246-27	2000 gal. steel	GASOLINE	Case Open	1/10/2003; 8/14/2007
290C	No	81533-193		550 gal. fiberglass	WASTE OIL	Case Closed	None; NFA requested herein
291	No	81533-65	97-08-15-1459-35	3000 gal. steel	#2 FUEL OIL	Case Closed	2/24/2000
292	No	81533-66	94-09-13-1503-57	10,000 gal. steel	#2 FUEL OIL	Case Closed	10/23/2000
293	No	81533-67		1000 gal. steel	#2 FUEL OIL	Case Closed	5/30/2013
295	No	81533-68	94-09-13-1503-57	3000 gal. steel	#2 FUEL OIL	Case Closed	8/29/2000
296A	No	81533-69		550 gal. steel	#2 Diesel	Case Closed	1/10/2003

296B	FTMM-54	81533-216	93-11-2-1200-13	2000 gal. steel	GASOLINE	Case Open	1/10/2003; 8/14/2007
296B	FTMM-54	81533-223	93-11-2-1200-13	1000 gal. steel	DIESEL	Case Open	1/10/2003; 8/14/2007
296B	FTMM-54	81533-217	93-11-2-1200-13	1000 gal. steel	GASOLINE	Case Open	1/10/2003; 8/14/2007
296B	FTMM-54	81533-218	93-11-2-1200-13	1000 gal. steel	GASOLINE	Case Open	1/10/2003; 8/14/2007
296B	FTMM-54	81533-219	93-11-2-1200-13	1000 gal. steel	GASOLINE	Case Open	1/10/2003; 8/14/2007
296B	FTMM-54	81533-215	93-11-2-1200-13	1000 gal. steel	GASOLINE	Case Open	1/10/2003; 8/14/2007
296B	FTMM-54	81533-221	93-11-2-1200-13	1000 gal. steel	GASOLINE	Case Open	1/10/2003; 8/14/2007
296B	FTMM-54	81533-214	93-11-2-1200-13	2000 gal. steel	GASOLINE	Case Open	1/10/2003; 8/14/2007
296B	FTMM-54	81533-213	93-11-2-1200-13	2000 gal. steel	GASOLINE	Case Open	1/10/2003; 8/14/2007
296B	FTMM-54	81533-222	93-11-2-1200-13	1000 gal. steel	DIESEL	Case Open	1/10/2003; 8/14/2007
296B	FTMM-54	81533-220	93-11-2-1200-13	1000 gal. steel	GASOLINE	Case Open	1/10/2003; 8/14/2007

Within the table above, the term "Case Closed" has been used (consistent with previous FTMM procedures) to indicate that the Army has determined that no further sampling or remedial actions are warranted. “Case Open” indicates that the Army has determined that ongoing monitoring, reporting or possibly even remedial action is warranted. In contrast, "No Further Action" is reserved for NJDEP approval that no further sampling or remedial actions are warranted. There are USTs listed above where the Army has designated “case open” but NJDEP has approved NFA; these were assigned to one of the designated IRP sites within Parcel 50 due to groundwater issues identified following closure.

As shown above and as documented in the Attachment B - NJDEP letters, almost all of the USTs within Parcels 49 and 50 have been approved for NFA by the NJDEP. However, three tank sites represent special cases and are discussed further below:

- 283A – A summary description for this No. 2 fuel oil tank is provided in Attachment C. This tank was removed in 1990, and visible contamination was not encountered. Soil sampling was not performed in accordance with then-current procedures at FTMM for sites without visible evidence of contamination. Further, the former tank location was not encountered in the available files, and therefore is not known. Therefore, we request that NJDEP approve NFA for this site.
- 290A - closure of this UST site was already approved by NJDEP in an 8/29/2000 letter; however, additional data gaps were identified by NJDEP in their 8/14/2007 letter (Attachment B). A comprehensive discussion of the site assessment activities at Parcel 50 (IRP sites FTMM-54, FTMM-55, and FTMM-61) as well as a plan for collection of

additional soil samples for Tank 290A area will be presented in an upcoming ECP Work Plan Addendum. Therefore, our request for NFA for this site is temporarily delayed pending the completion of additional field work.

- 290C – A summary description for this waste oil tank site is provided in Attachment D. This tank was removed in 1991, and soil samples were collected. TPH and priority pollutant results were less than the NJDEP comparison criteria, as described in a 1993 Weston site investigation report (also provided in Attachment D). Therefore, we request that NJDEP approve NFA for this site based on these reported results.

As previously mentioned, groundwater contamination issues were previously identified for the three IRP sites (FTMM-54, FTMM-55, and FTMM-61). The FTMM-18 landfill IRP site is also located immediately downgradient (north) of Parcel 49. Groundwater contamination for each of these IRP sites will be addressed individually through future remedial investigation/feasibility study (RI/FS) submittals.

In summary, we request No Further Action for all previously identified UST sites within Parcels 49 and 50, with the exception of 290A, where additional soil sampling is planned. Groundwater issues will be addressed for each individual IRP site. Should you have any questions or require additional information, please contact me at (732) 380-7064 or by email at wanda.s.green2.civ@mail.mil.

Sincerely,

Wanda Green

Wanda Green
BRAC Environmental Coordinator

cc: Delight Balducci, HQDA ACSIM
Joseph Pearson, Calibre
James Moore, USACE
Cris Grill, Parsons

Attachments omitted for brevity

State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

DEPARTMENT OF ENVIRONMENTAL PROTECTION
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BOB MARTIN
Commissioner

July 22, 2013

Wanda Green
BRAC Environmental Coordinator
OACSIM - U.S. Army Fort Monmouth
PO Box 148
Oceanport, NJ 07757

Re: Final Vapor Intrusion Site Investigation Report
Fort Monmouth - Main Post and Charles Wood Area
Monmouth County
PI #G000000032

Dear Ms. Green:

The New Jersey Department of Environmental Protection (Department) has completed review of the referenced submittal, dated January 2013, which details the vapor intrusion investigation conducted at all buildings for which a ground water trigger for performance of same was documented. The investigation was performed at Buildings 283, 602, 699, 700, 1001 and 2700. All comments and questions raised in the correspondence generated by this office on January 3, of 2013 have been satisfactorily addressed.

Future Use/Redevelopment and VI

Until such time as all VI contaminants of concern within the ground water have met criteria, as indicated in the submittal, plans for redevelopment must be mindful of same. It is agreed "engineering controls should be designed as part of any redevelopment effort to match up the future land use with the potential threat to current and planned buildings...." As indicated in the VIG, this can be accomplished by incorporating the presumptive remedy into the design of the building(s) or conducting a VI investigation at the time of redevelopment.

The data package, submitted on December 7, 2012, remains under review for validation purposes.

Please contact this office if you have any questions.

Sincerely,

Linda S. Range

Linda S. Range
Bureau of Case Management

C: Joe Pearson, Calibre Systems
Rick Harrison, FMERA
Julie Carver, Matrix
Ann Charles

State of New Jersey

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

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BOB MARTIN
Commissioner

January 3, 2013

Wanda Green
BRAC Environmental Coordinator
OACSIM - U.S. Army Fort Monmouth
PO Box 148
Oceanport, NJ 07757

Re: Vapor Intrusion Site Investigation Report
Fort Monmouth - Main Post and Charles Wood Area
Monmouth County
PI #G000000032

Dear Ms. Green:

The New Jersey Department of Environmental Protection (Department) has completed review of the referenced submittal, dated August 2012, which details the vapor intrusion investigation conducted at all buildings for which a trigger for performance of same was documented. The investigation was performed at Buildings 283, 602, 699, 700, 1001 and 2700. Comments and questions are as follows:

As discussed during our conference call in November, although it is understood Building 675 is beyond the 100' radius trigger for performance of a vapor intrusion investigation, additional information regarding this as well as Buildings 676 and 677 is necessary. During the "kickoff meeting", it was determined the building was to be assessed at the time of sampling, and recommendations made at that time with respect to sampling. Sections 3.2 and 3.3 of the submittal specify that Buildings 675, 676 and 677 were inspected and evaluated for inclusion in the vapor intrusion sampling program, and report text in Section 3.3 states the results of the inspection are provided in Section 4.1. Other than a brief mention (with no recommendation) in the field logbook notes, a review of the document, however, did not locate the discussion in the remaining sections of the report. Please submit same.

In Section 5.2, page 5-2, the Army posits the chloromethane detected in the samples are from background and unrelated to Site activities. The chloromethane ambient, indoor air, and sub-slab data as presented in the report were reviewed. Chloromethane is not detected in the sub-slab samples. At buildings where chloromethane is detected in the indoor air, the ambient samples likewise have detections of chloromethane. The detected concentrations in the indoor

air and ambient samples are all 1 ug/m^3. The absence of chloromethane detections in the sub-slab samples confirm the vapor intrusion pathway is incomplete, and coupled with the indoor air and ambient results support the Army's hypothesis.

Buildings 283 & 602

It is agreed the VI pathway is incomplete at existing Buildings 283 and 602; no additional action regarding VI is necessary.

Building 699

Section 6 states that the VI pathway is incomplete at this time, but that "VI at this location should be considered when the remedy for Building 700 is being evaluated, and that additional sampling is recommended after the completion of the Building 700 remedy, if necessary".

Groundwater has been and remains a potential source for the PCE and TCE present in the sub-slab soil gas. While it is agreed the VI pathway is not presently complete as indoor air results did not detect PCE or TCE, the sub-slab results for PCE are elevated, up to approximately ten times the soil gas screening level. Although this degree of exceedence was not identified or discussed in the submittal, it does trigger the Long Term Monitoring (Table 6.3) Mitigation Decision Matrix in the Department's Vapor Intrusion Technical Guidance (Version 2, January 2012), Table 6.3, which indicates semi-annual inspection of the building, with annual sampling of indoor air, is appropriate. It is agreed additional sampling following future remedial activities (relating to Building 700) in this area is appropriate.

Building 700

Section 6 states there will be an RI/FS for the PCE spill, the potential for VI should be considered during the Feasibility Study, and "if necessary, after the Building 700 remedy is implemented, additional VI sampling is recommended". The vapor intrusion assessment detected PCE in the sub-slab soil gas at a concentration below the screening level, PCE was not detected in the indoor air. The pathway is therefore currently incomplete. It is agreed, however, VI should be considered during the FS. As indicated, additional VI sampling may also be necessary following the remedy for Building 700.

Building 1001

It is agreed the VI pathway at existing Building 1001 is incomplete; no additional action regarding VI is necessary.

Building 2700

Although historic ground water analytical data indicates a potential source for VI in the building, sampling indicates the VI pathway for the existing Building 2700 is incomplete. No additional action regarding VI is necessary.

Future Use/Redevelopment and VI
Until such time as all VI contaminants of concern within the ground water have met criteria, as indicated in the submittal, plans for redevelopment must be mindful of same. It is agreed "engineering controls should be designed as part of any redevelopment effort to match up the future land use with the potential threat to current and planned buildings...." As indicated in the VIG, this can be accomplished by incorporating the presumptive remedy into the design of the building(s) or conducting a VI investigation at the time of redevelopment.

Miscellaneous
The summary tables list incorrect DEP screening levels for the compound 1,2-dichloroethane. The correct soil gas screening level for residential and non-residential is 20 ug/m^3, and the correct indoor air screening level for residential and non-residential is 2 ug/m^3.

The data package, submitted on December 7, 2012, is currently undergoing additional review for validation purposes.

Please contact this office if you have any questions.

Sincerely,

Linda S. Range

Linda S. Range
Bureau of Case Management

C: Joe Pearson, Calibre Systems
Rick Harrison, FMERA
Julie Carver, Matrix
Ann Charles
Daryl Clark

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY GARRISON FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07703-5000

FILE COPY

REPLY TO
ATTENTION OF

Directorate of Public Works

September 16, 2010

Larry Quinn, Site Manager
New Jersey Department of Environmental Protection
Bureau of Investigation, Design and Construction
401 East State Street, P.O Box 413
Trenton, New Jersey 08625-0413

Subject: Request for Permit-by-Rule for RegenOx™/ORC Advanced™ Injection
Fort Monmouth – Site 283 (FTMM-61) Main Post Area
Fort Monmouth, NJ 07703

Dear Mr. Quinn:

The U.S. Army Fort Monmouth, Directorate of Public Works (DPW) is requesting authorization via Permit-by-Rule pursuant to the New Jersey Pollutant Discharge Elimination System (NJPDES), N.J.A.C. 7:14A-1 *et seq.* to permit the injection of RegenOx with the option of injecting Oxygen Release Compound (ORC) Advanced to the subsurface in an effort to remediate organic Contaminants of Concern (COCs) identified in groundwater.

Background

On behalf of the DPW, Versar, Inc. (VERSAR), submitted the final *Remedial Investigation Report and Remedial Action Work Plan* (RIR/RAWP) dated October 28, 2005 to the New Jersey Department of Environmental Protection (NJDEP). In Section 8.0 of the RIR/RAWP entitled Remedial Action Workplan, VERSAR requested NJDEP approval for the injection of ORC Advanced into groundwater to remediate three aromatic hydrocarbons COCs reported at concentrations exceeding the Ground Water Quality Standards (GWQS) for Class IIA. On October 24, 2007, Mr. Larry Quinn, NJDEP Case Manager issued an approval letter to the DPW which constitutes a Permit-by-Rule for a discharge to groundwater. The ORC injections were completed in May through July 2009 in accordance with the scope of work outlined in the RIR/RAWP. A total of 3,000 pounds of ORC material was injected into the subsurface.

Since July 2007, benzene was identified as the only organic COC in groundwater at monitoring well 283MW02 at concentrations exceeding the GWQS (N.J.A.C. 7:9C, effective October 4, 2005) of 1 µg/L. The average benzene concentration in the last 10 groundwater sampling events (July 2007 through November 2009) is approximately 29 µg/L. The average concentration of benzene in the three groundwater sampling events (August 2009, November 2009, January 2010) following the ORC injections in May and June 2009 is 2.8 µg/L. Based on an evaluation of groundwater quality conditions on-site, it appears that ORC injections into groundwater were successful in reducing the concentrations of benzene at least by an order of magnitude. Concentrations of benzene reported in groundwater samples collected from 283MW02 since July 2007 are provided in **Attachment 1.** A graph showing benzene concentrations with time is presented as **Figure 1.**

Remedial Action Workplan

In an effort to further reduce the concentrations of benzene in groundwater at monitoring well 283MW02, the DPW proposes to conduct additional injections near this location using RegenOx, a product manufactured by Regenesis. RegenOx is an advanced chemical oxidation technology that chemically destroys contaminants *in situ* through a powerful but controlled chemical reaction. RegenOx product maximizes *in situ* performance while using a solid alkaline oxidant that employs a sodium percarbonate complex with a multi-part catalytic formula. RegenOx directly oxidizes contaminants while its unique catalytic component generates a range of very reactive oxidizing free radicals that rapidly and effectively destroy a range of target contaminants including chlorinated hydrocarbons (aliphatic ethenes and ethanes).

RegenOx is delivered as two parts that are combined prior to injection into the subsurface. Following injection into the subsurface, the RegenOx solution produced an effective oxidation reaction that is more effective than Fenton's reaction in treating chlorinated hydrocarbons without the dangers of forming a highly exothermic reaction. RegenOx injections will generally follow the ORC injection procedure as described in the RIR/RAWP. The RegenOx injections will be limited to the area which encompasses monitoring well 283MW02 (**Figure 2**). DPW proposes to inject RegenOx to a maximum depth of 20 feet below grade surface (bgs) up to approximately 7.0 feet bgs which coincides with the approximate depth to groundwater at 283MW02. The assumed thickness of groundwater requiring treatment is approximately 13 feet. According to Regensis, the calculated rate of solution injection will be approximately 23 gallons/vertical foot.

DPW proposes to use RegenOx as the primary oxidant to treat COCs *in situ*. After injection, the RegenOx solution forms an activator complex containing a highly reactive catalytic surface. The contaminant and the oxidizer complex react with the activator complex via an oxidation pathway. The overall stoichiometric pathway for the reaction of RegenOx (hydrogen peroxide, H_2O_2) and benzene (aromatic hydrocarbon) is:

$$C_6H_6 + 15H_2O_2 \rightarrow 6CO_2 + 18H_2O$$

Complete reaction of benzene yields of non-hazardous end products (carbon dioxide and water). These end products are both formed when RegenOx reacts with other COCs including substituted hydrocarbons (e.g., ethylbenzene, toluene, xylenes). Additional information on RegenOx is available (http://www.clean.com.br/PDFs_Zips_Flashs/RegenOx%20Guide/Regensis_Content.pdf.)

DPW proposes to utilize RegenOx to treat the COCs identified in groundwater. After treatment with RegenOx, if benzene or other volatile organic (VO) COC concentrations exceed the applicable NJDEP GWQS, the DPW may opt to continue injections using RegenOx or ORC Advanced.

RegenOx and ORC Advanced Injection Technology Descriptions

RegenOx is an advanced chemical oxidation technology that destroys contaminants through controlled chemical reactions. RegenOx maximizes *in situ* performance by using a solid alkaline oxidant containing a sodium percarbonate complex with a multi-part catalytic formula. RegenOx directly oxidizes contaminants while its unique catalytic component generates a range of highly oxidizing free radicals that rapidly and effectively destroy a range of target contaminants including petroleum hydrocarbons and chlorinated compounds.

ORC Advanced is a non-toxic, easy-to-handle, magnesium peroxide powder that causes a slow and controlled release of oxygen when it contacts soil moisture or groundwater. The increased aqueous oxygen concentration stimulates the growth of naturally occurring aerobic microorganisms that

digest (degrade) hydrocarbons into harmless by-products such as carbon dioxide and water. Therefore, the application of ORC Advanced is an appropriate remedial technique to accelerate the natural, aerobic degradation of any potential hydrocarbon contaminants in groundwater.

The proposed RegenOx/ORC Advanced treatment program for the remediation of benzene at 283MW2 is within the area shown on Figure 8-2 of VERSAR's RIR/RAWP dated October 28, 2005 (**Attachment 2**). This remains as the only location where dissolved COC (benzene) is currently present at concentrations exceeding the NJDEP GWQS. Injection is similar in process to air sparging, except the RegenOx solution is injected, either with or without atmospheric air (positive pressure) to enhance the radius of influence.

The preparation of RegenOx and ORC Advanced solutions to be injected will be prepared consistent with Regenesis Installation Instructions (**Attachment 3**). Additional information about RegenOx and ORC Advanced is provided as **Attachment 4**. The proposed injection will utilize approximately 25 temporary injection points (direct push rig) within an area encompassing approximately 2,500 square feet. The exact locations of the temporary injection points will be based on access of the Geoprobe-equipped truck, overhead building obstructions, and locations of subsurface and overhead utilities.

In the proposed injection events, the RegenOx and ORC Advanced injection rates will not exceed 23 gallons/vertical foot and 5 pounds/vertical foot, respectively using direct push technology (e.g. Geoprobe Model 5400) beginning at a depth of approximately 15 feet bgs. At each injection point, a high-pressure pump will be used to inject the RegenOx/ORC Advanced solution to facilitate lateral distribution in groundwater. After the RegenOx/ORC Advanced solution is injected, the injection point will be raised one foot for the next injection. This process will be repeated until the target depth of 7.0 feet bgs interval is reached. Injection of RegenOx/ORC Advanced solution at this shallow depth interval will ensure that any dissolved COCs entrained at the vadoze zone-water table interface, capillary fringe, and the unsaturated zone is targeted for this remedial effort.

The following conditions will be met during each RegenOx and/or ORC Advanced injection event:

- Surface run-off will be prevented;
- RegenOx and ORC Advanced applications will not result, directly or indirectly, in a discharge to surface water;
- Application(s) will not affect water supplies (no potable or irrigation wells within 2,500 feet) or cause vapor hazards in subsurface structures (e.g., utility lines) nor will it adversely impact the dissolved COCs, causing contaminant migration;
- All results from the RegenOx and/or ORC Advanced applications will be incorporated in an appropriate deliverable to the NJDEP (e.g., *Remedial Action Progress Report*); and
- Injection(s) will be completed no sooner than two weeks prior to each quarterly groundwater monitoring and sampling event.

Performance Monitoring

In order to monitor the injection activities and subsurface response, groundwater monitoring wells hydraulically downgradient of the injection area (283-MW01, 283-MW03) will be monitored prior to, during, and after injection for the media and parameters indicated below:

- Water Column:
  - Depth from top of inner well casing

- Analyze Immediately Parameters (AIPs): Temperature, pH, Dissolved oxygen, Oxidation-Reduction Potential, Specific conductance

- Headspace:
  - VOs using a Photoionization Detector (PID)
  - Oxygen

Performance Sampling

In order to evaluate the performance of the injection event(s), four groundwater sampling events will be performed after each injection event. DPW proposes to collect groundwater samples from monitoring wells 283MW02, 283MW04 and 283MW05 prior to injection and approximately one, and three weeks following each injection event to evaluate the concentrations of dissolved-phase VO+15 in the treatment area and to determine the effectiveness of the injection. All groundwater samples collected will be analyzed for by DPW's NJDEP certified laboratory (NJDEP Certification Number 13461). A summary of the performance monitoring and sampling is provided as follows:

Table A. Summary of Performance Monitoring and Sampling Parameters and Frequencies*

Elapsed Time After RegenOx or ORC Advanced Injection	Comments
0, 1 week, 3 weeks	Measure AIPs at monitoring wells 283MW02, 283MW04 and 283MW05 and headspaces for VOs and oxygen. Collect groundwater samples from 283MW02, 283MW04 and 283MW05 for VO+15.

* If RegenOx is injected, iron and manganese will also be determined in groundwater samples per the above recommended schedule.

Groundwater Sampling Procedures

The DPW will measure AIPs and depth to water at monitoring wells noted in **Table A.** Groundwater samples will be collected in accordance with the DPW's Standard Operating Procedure (SOP) which is included as **Attachment 5.** Prior to purging each monitoring well, the headspace will be monitored for the presence of total VOCs using a calibrated PID.

All groundwater samples will be stored in an insulated cooler at approximately 4 °C (wet ice) and submitted under chain-of-custody to Fort Monmouth's Environmental Testing Laboratory (NJDEP Certified Laboratory Identification Number 13461) for laboratory analysis. The groundwater samples will be analyzed for Priority Pollutant List VOs plus the qualification and quantification of 15 associated peaks via U.S. Environmental Protection Agency (USEPA) approved test method 8260.

Applicable protocols regarding sampling, handling, storage, preservation, reporting, decontamination of field equipment and other procedures will follow DPW's SOP which complies with the NJDEP *Field Sampling Procedures Manual* dated August 2005.

Public Notification Requirement

In accordance with N.J.A.C. 7:26E-7.2(c)2, the DPW forwarded a draft Public Notice via email to NJDEP for approval (**Attachment 6**) on September 3, 2010. On the same day, DPW received NJDEP approval of said Public Notice from Larry Quinn, NJDEP Case Manager. Prior to publishing the Public Notice, the DPW will provide a copy of:

- the approved Public Notice to the clerk for each municipality in which the contaminated site is located, and to the designated local health official;
- the DGW proposal to the clerk for each municipality in which the contaminated site is located and to the designated local health official, if requested; and
- publish the approved public notice of the DGW in two (2) daily or weekly newspapers of general circulation in the vicinity of the contaminated site, at least 35 days prior to the proposed startup date of the ground water discharge; and
- submit to NJDEP proof of publication for the public notice within 15 days after the notice is published, and provide the names and addresses of everyone that was sent a copy of the public notice and DGW proposal.

DPW respectfully requests the NJDEP issue a NJPDES – Class V Underground Injection Control Permit-by-Rule to authorize the RegenOx and ORC Advanced injection as described herein. DPW also requests that the Permit-by-Rule be issued without an expiration date. This will allow the DPW to conduct additional RegenOx and/or ORC Advanced injections without the requirement to request additional written approvals from the NJDEP, thus avoiding time delays. Please note that DPW will conduct the injections in accordance with requirements set forth in the applicable Permit-by-Rule issued by the NJDEP.

As part of this Permit-by-Rule request, DPW will provide the minimum two-week notification to the NJDEP prior to initiating the RegenOx or ORC Advanced injection event(s).

If you have any questions or require additional information, please contact John H. Montgomery, Senior Hydrogeologist, 732-532-7979 or email: John.H.Montgomery@us.army.mil.

Sincerely,

Joseph M. Fallon

Joseph M. Fallon, CHMM
Chief, Environmental Division

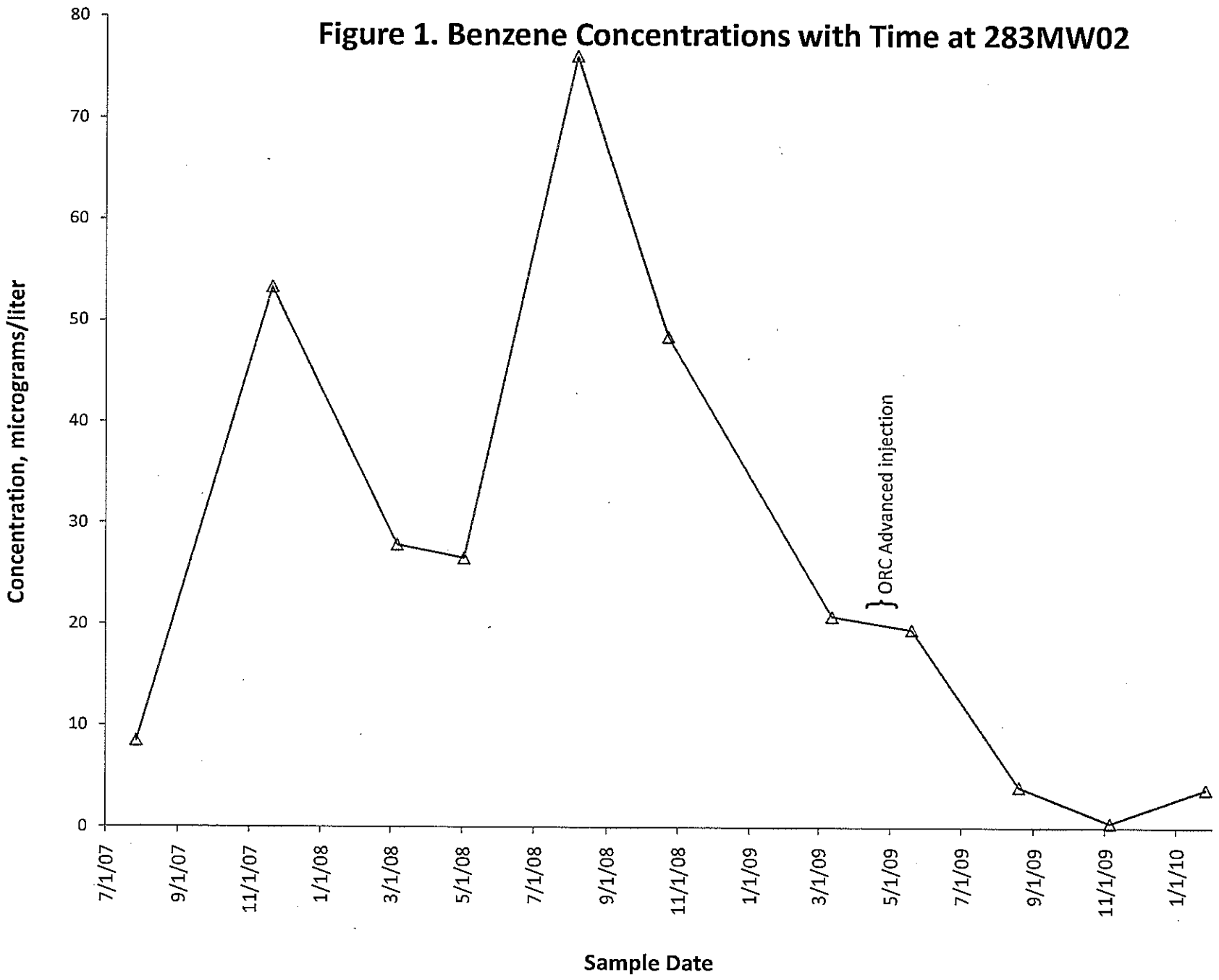
c: file
enclosure

Attachment 1

Groundwater Sampling Results for 283-MW02
(July07-Nov09)

Tables omitted for brevity

Figure 1. Benzene Concentrations with Time at 283MW02



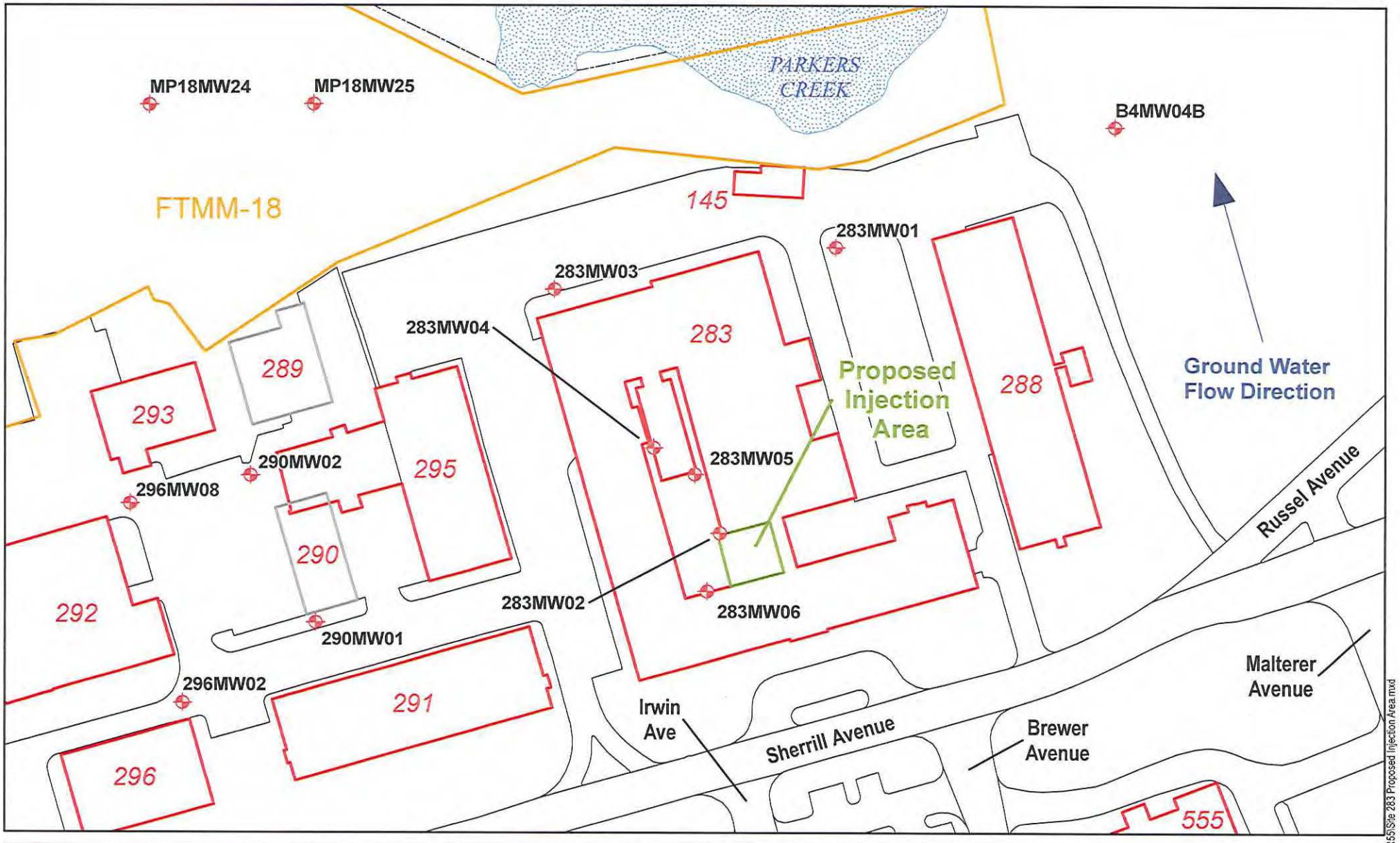


Figure 2. Proposed Injection Area
FTMM-61- Main Post
Fort Monmouth, New Jersey
FOUO

Attachment 2

VERSAR's Figure 8-2 ORC™ Advanced Injection Points Location Map

N

S-145

S-288

283-MW1

283-MW3

283

S-289

293

294

CB.

HYD

283-MW2

PROPOSED ORC ADVANCED® TREATMENT AREA

AVENUE

ROAD (PAVED)		WOODED AREA	
ROAD/TRAIL (UNPAVED)		TREE/BRUSH	
FENCE		LIGHT POLE	
BUILDING		UTILITY POLE	
APPROXIMATE BOUNDARY		BROOK/CREEK	
BASE BOUNDARY		MARSHY AREA	

NOTES:

= MONITORING WELL LOCATION

= INJECTION POINT

NO.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 8-2
ORC ADVANCED® INJECTION POINTS LOCATION MAP
SITE 283 - MAIN POST
FORT MONMOUTH, NEW JERSEY

DRAWN BY: JM	DATE DRAWN: 02 JUL 01
CHECKED BY:	DATE CHECKED: 02 JUL 01
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIGURE 8-2
	FILE No.: 283 FIGURE 8-2
	SCALE: 1" = 60'
	SHEET 1 OF 1 REV.: A

Vet-Soil Inc.
201 GIBRALTAR ROAD, SUITE 100
HORSHAM, PA 19044-2314
(215) 957-0355

Attachment 3

Regenesis RegenOx and ORC Advanced Installation Instructions

Attachments 3 through 6 omitted for brevity

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
SITE REMEDIATION, PUBLICLY FUNDED REMEDIATION ELEMENT
P.O. BOX 413
TRENTON, NEW JERSEY 08625-0413

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

October 28, 2010

Mr. Joseph Fallon, CHMM
Directorate of Public Works
ATTN: IMNE-MON-PWE
167 Riverside Ave.
Fort Monmouth, NJ 07703

RE: **Approval of Discharge to Ground Water (DGW) Permit-by-Rule**
Site 283 - Injection of RegenOx®/ ORC Advanced®
Fort Monmouth, NJ

Dear Mr. Fallon:

The NJDEP Site Remediation Program (SRP) has completed its review of Fort Monmouth's September 16, 2010 request for a permit-by-rule (PBR) for the referenced proposed discharges to ground water (DGW). A permit-by-rule was requested in accordance with N.J.A.C. 7:14A-7.

Fort Monmouth proposes to inject RegenOx® and possibly ORC Advanced® to ground water at Site 283. Fort Monmouth's PBR request included a remedial action workplan (RAW), which was reviewed and approved by NJDEP. Fort Monmouth has complied with the public notice requirements of N.J.A.C. 7:14A-7. NJDEP received no public comments during the designated 30-day public comment period, which ended on October 15, 2010.

A DGW permit-by-rule is hereby granted, with the following conditions:

1. Fort Monmouth will notify the NJDEP site manager prior to performing applications of RegenOx® or ORC Advanced® at Site 283.
2. Fort Monmouth will perform any injections of RegenOx® or ORC Advanced®, and conduct performance monitoring, in accordance with the approved RAW.
3. Remedial action progress reports (RAPRs) shall later be submitted in accordance with New Jersey's Technical Requirements for Site Remediation (N.J.A.C. 7:26C).
4. The DGW permit-by-rule shall have no time limit.

You or your staff may contact me at 609-633-0766 with any questions on this matter, or any other site remediation matters at Fort Monmouth.

Sincerely,

Larry Quinn

Larry Quinn, P.E., Site Manager
Bureau of Investigation, Design and Construction

DEPARTMENT OF THE ARMY
US ARMY INSTALLATION MANAGEMENT COMMAND
HEADQUARTERS, UNITED STATES ARMY GARRISON, FORT MONMOUTH
286 SANGER AVENUE
FORT MONMOUTH, NEW JERSEY 07703-5101

Directorate of Public Works May 22, 2009

State of New Jersey
Department of Environmental Protection
Division of Remediation Management and Response
Bureau of Investigation, Design and Construction
ATTN: Mr. Larry Quinn
P.O. Box 413
Trenton, NJ 08625-0413

Re: U.S. Army Fort Monmouth
Remedial Investigation Report and Remedial Action Workplan,
Site 283
October 28, 2005

NJDEP Correspondence (Dated October 24, 2007)
Remedial Investigation Report and Remedial Action Workplan,
Site 283
Fort Monmouth, NJ

Dear Mr. Quinn:

The Directorate of Public Works (hereafter "The DPW") has reviewed the subject comments as submitted by the NJDEP on 24 October 2007. Referenced below is a line by line response to each comment.

1. General. The NJDEP finds the proposed remedial action of ORC injection at the Site 283 source area to be acceptable. However, the approval is given under the condition that additional remedial investigations shall also be conducted as outlined in the comments below. These investigations can be conducted concurrently with the proposed remedial action.

Response: The DPW will commence ORC injection work at Site 283 starting 29 May 2009 and complete said work by 12 June 2009. ORC injections will be performed as described in the Remedial Investigation Report and Remedial Action Workplan, Site 283, October 28, 2005.

2. Section 2.4.2 (Hydrogeology): The report identifies tidal influence as one of the factors that could be influencing shallow ground water flow. Fort Monmouth shall comment on whether a tidal study was ever performed pursuant to N.J.A.C. 7:26E-3.7(e)3iv(3). If a tidal study has not been conducted, Fort Monmouth shall conduct a tidal study.

Response: The Hydrogeology section of the Remedial Investigation Report and Remedial Action Workplan, paragraph 2.4.2 states "Shallow groundwater **may be** locally influenced within the Main Post Area by the following factor:

• Tidal influence (based on the proximity to the Atlantic Ocean, rivers and tributaries).

As of this date, this statement has not been confirmed or denied. The DPW will prepare a workplan that will investigate whether or not shallow groundwater within zone of impact is tidally influenced. Said workplan will be submitted to the NJDEP for review and approval prior to its implementation.

3. Section 3.2 (Ground Water Sample Collection Activities): The report states that sampling and decontamination procedures were conducted in accordance with the December 1997 Fort Monmouth Standard Sampling Operating Procedure. All future sampling procedures and equipment for decontamination must be conducted pursuant to the most recent version of the NJDEP Field Sampling Procedures Manual per the requirements of N.J.A.C. 7:26E-4.4(d).

Response: The following corrections are made to the Remedial Investigation Report and Remedial Action Workplan, Site 283, October 28, 2005: "Sampling and decontamination procedures were conducted in accordance with Standard Operating Procedure, SOP No. SAM-0205, Monitoring Well Sampling for IRP Site at Fort Monmouth, August 9, 1999 (retired January 28, 2003) and Standard Operating Procedure, SOP No. SAM-0205, Monitoring Well Sampling for IRP Site at Fort Monmouth, January 17, 2003 (retired October 29, 2004). Copies of both SOPs are attached for your review. Both SOPs were consistent with the NJDEP Field Sampling Procedures Manual, May 1992, and the NJDEP Field Analysis Manual, July 1994. It should be noted that groundwater sampling and analysis was conducted from September 1999 through February 2004 at Site 283 as part of the remedial investigation documented in the RIR/RAWP, October 28, 2005."

4. Section 3.2 (Ground water Sample Collection Activities): The report is deficient pursuant to **N.J.A.C. 7:26E-4.8(c)7**. Information regarding the purging and sampling of the monitoring wells was not provided in the report. At a minimum, the purging and sampling information for the last 4 quarters of sampling must be submitted to NJDEP. The information should be submitted for all 21 sampling events if available on compact disc.

Response: Information pertaining to the purging and sampling of monitoring wells, pursuant to N.J.A.C. 7:26E-4.8(c)7, was provided in the Remedial Investigation Report and Remedial Action Workplan, Site 283, October 28, 2005, under Appendix E. Said

information can be found following the Chain of Custody Record for each quarterly groundwater sampling event. An electronic copy of Appendix E is attached for your review. Sampling procedures are also discussed in detail in the pertinent Standard Operating Procedures discussed in response to comment # 3.

5. Section 5.1 (Ground Water Sampling Results): The ground water investigation was deficient pursuant to **N.J.A.C. 7:26E-2.1(c)**. Fort Monmouth failed to analyze ground water samples obtained from the monitoring wells for MTBE and TBA. The tank removed from Site 283 contained gasoline. Therefore, MTBE and TBA analysis is required for future sampling rounds of all Site 283 wells.

Response: MTBE and TBA were included as part of the VOC+15 scan for each groundwater sample collected and analyzed as part of the remedial investigation of Site 283. MTBE and TBA were not detected above their respective method detection limits in any of the three (3) monitoring wells during the specified groundwater monitoring period (3rd Qt 1999 – 1st Qt 2004). All laboratory data, to include MTBE and TBA, can be found under Appendix E.

6. Section 5.1.1 (VOCs): The report states that the NJDEP has no criteria for VOC TICs in ground water. The Ground Water Quality Criteria for VOC TICs are as follows: 100 ppb for individual TICs, and 500 ppb for total TICs.

7. **Response:** The DPW acknowledges the Ground Water Quality Criteria for VOC TICs are 100 ppb for individual TICs and 500 ppb for total TICs. This information will be properly presented in the next Remedial Action Progress Report for Site 283.

8. Vapor Intrusion. Pursuant to **N.J.A.C. 7:26E-4.4(h)3viii.**, Fort Monmouth is deficient in not evaluating Building 283 and adjacent subsurface utilities for vapor hazards associated with contaminated ground water. A vapor intrusion investigation is warranted based on the concentrations of benzene found in well 283-MW2. Fort Monmouth shall refer to the Department's October 2005 Vapor Intrusion Guidance Document for conducting a vapor intrusion investigation. The document is available online at www.state.nj.us/dep/srp/guidance/vaporintrusion/.

Response: A vapor intrusion investigation was conducted at Site 283 and documented as part of the U.S. Army BRAC 2005 Site Investigation Report, Fort Monmouth, NJ, July 21, 2008. The following information was taken directly from said report.

Vapor Intrusion (VI) Sampling Methodology:

Indoor air samples were collected concurrently with ambient air and sub-slab soil gas samples.

A laboratory holding a current certification/accreditation from the NJDEP Office of Quality Assurance (OQA) for the NJDEP – SRWM USEPA TO-15 Method was utilized to provide the canisters and to perform the analyses.

Six-liter stainless SUMMA canisters were utilized for sample collection. Breathing zone height (3 to 5 ft) was targeted for ground floor sample collection, and basement samples were positioned as close as possible to the potential intrusion area(s) (e.g., sumps, major cracks in foundation). One ambient (outdoor) sample was collected per parcel concurrently with the indoor samples to assist in evaluating background chemical levels. This ambient air sample was taken at breathing zone height and located in a reasonably representative area (e.g., not immediately next to auto traffic or other potential sources). Air samples were collected over a 24-hour period, and air filters were utilized for each canister to prevent clogging. The certified laboratory provided stainless steel canisters with pre-set regulators (based on the sample time prescribed by Shaw).

Indoor air results were compared to the NJDEP indoor air screening levels.

A building walkthrough was conducted prior to indoor air and/or sub-slab soil gas sampling to address:

- Detection of potential background sources of VOs.
- Determination of the building construction.
- Recognition of points of VI in a structure.
- Identification of possible sample locations.
- Education of the occupants on VI and sampling procedures.

The building walkthroughs were conducted in November 2007. The *Indoor Air Building Survey and Sampling Form* (Appendix B to the NJDEP VI Guidance) was completed in conjunction with the building walkthroughs and sampling event and is included in **Appendix C.**

A PID was utilized during building walkthroughs and during sampling events to identify items such as individual cans of solvents that could be potential vapor sources in order to remove them from the building in advance of the sampling event. No readings were registered on the PID detector during building walkthroughs.

The general condition of the slab and walls was documented as part of the Building Survey form. The investigators noted the presence of sumps, cleanouts, and floor drains.

Site Investigation Sampling:

Through previous investigations conducted under the IRP, groundwater VO contamination has been identified in close proximity to Bldg. 283. All groundwater is currently being addressed under the IRP. However, Bldg. 283 is a two-story building with a basement and totals approximately 76,500 square feet in size. The footprint of Bldg. 283 covers approximately 50,000 square feet. Per NJDEP guidance and consistent with USEPA policy, the NJDEP recommends investigation of VI where structures are within 100 ft horizontally or vertically of shallow groundwater contamination in excess of GWSLs. In the case of the presence of petroleum hydrocarbon contamination (particularly BTEX), a 30-ft distance criterion is utilized. BTEX contaminants have been detected above the GWSLs within 30 ft of the Bldg. 283. Therefore, VI at Bldg. 283 was

evaluated through the collection of near-slab soil gas samples and indoor air samples. No sub-slab soil gas samples were collected at Bldg. 283 due to the observation of groundwater intrusion within the basement during the 2006 VSI.

Site Investigation Results:

A total of 25 VOs were detected in soil gas samples (**Table 3.11-3**) collected in Parcel 50. Of the 25 VOs detected, two (benzene and PCE) equaled and/or exceeded NJDEP Soil Gas NRSs for soil gas samples. Benzene was detected in two of the five soil gas samples at a concentration equal to the NRS of 26 µg/m3 (samples 50SG-2 and 3). PCE was detected in two of the five soil gas samples at concentrations greater than the NRS of 36 µg/m3; ranging from 97.6 µg/m3 in sample 50SG-1 to 144 µg/m3 in sample 50SG-5. A total of 23 VOs were detected at concentrations below NJDEP Indoor Air NRSs in indoor air samples collected in Bldg. 283 (**Table 3.11-4**).

Summary and Conclusions:

No constituents were identified above applicable NJDEP criteria in indoor air samples collected from Bldg. 283. Two VOs, benzene and PCE, equaled and/or exceeded NJDEP Soil Gas NRSs in soil gas at Parcel 50. Based on NJDEP VI guidance, one additional round of indoor air sampling is recommended to confirm constituents are not present above criteria in indoor air at Bldg. 283.

In a letter dated October 28, 2008, the NJDEP concurred with the Army's recommendation to conduct one additional round of indoor air sampling at Site 283 (Parcel 50). The DPW has yet to implement the second round of indoor air sampling at Site 283 (Building 283). The DPW will provide prior notice to the NJDEP as to when the second round of air sampling will take place. A copy of the write-up for Parcel 50 (Site 283) as presented in the U.S. Army BRAC 2005 Site Investigation Report, Fort Monmouth, NJ, July 21, 2008, is enclosed for your review.

9. Sanitary Sewer. Pursuant to **N.J.A.C. 7:26E-4.4(e)**, Fort Monmouth was deficient in not properly locating all ground water sampling points. A 20-inch diameter sanitary sewer is located near the former UST location and well 283-MW2. The cross section on Figure 4-2 shows the sewer located below the water table. It is likely that the soils surrounding the sewer pipes are more permeable than the silty clays, fine sands and clayey silts identified in the boring logs for well 283-MW2. Ground water could be flowing preferentially along the sewer lines. Therefore, Fort Monmouth must install and sample well points along the sanitary sewer to the east and west of monitoring well 283-MW2. The approximate locations of the well points recommended by NJDEP are shown on the attached figure. Fort Monmouth shall submit a remedial investigation workplan pursuant to the applicable requirements of N.J.A.C. 7:26E-4.2. If the results of the investigation show contaminant migration along the sewer, complete delineation via additional well points and/or monitoring wells will be required.

10. **Response:** The DPW will submit a remedial investigation workplan pursuant to the applicable requirements of N.J.A.C. 7:26E-4.2 in order to evaluate potential soil and groundwater impacts adjacent to the 20-inch sanitary sewer line. If the results of the investigation show contaminant migration along the sanitary sewer line, complete delineation via additional well points and/or monitoring wells will be conducted.

11. Parkers Creek: Because of the proximity of ground water contamination to Parkers Creek, a surface water and sediment investigation and a Baseline Ecological Evaluation must be conducted in accordance with the applicable requirements of **N.J.A.C. 7:26E-4.5** and **4.7**. NJDEP understands that Fort Monmouth is considering an overall investigation/evaluation of Parkers Creek (and possibly Mill Creek and Lafetra Creek) that will address all potentially-contributing AOCs including Site 283 and the M-18 Landfill. NJDEP concurs with that approach.

Response: A Baseline Ecological Evaluation (BEE) Work Plan is currently being prepared for Fort Monmouth pursuant to the applicable requirements of N.J.A.C. 7:26E-4.5 and 4.7. The BEE Work Plan will cover 23 IRP and ECP sites. Site 283 is one of the 23 sites to be evaluated. The BEE Work Plan will be submitted for NJDEP review and approval prior to its implementation.

Questions concerning this submission can be directed to the undersigned at (732) 532-6223 or by email to Joseph.M.Fallon@us.army.mil.

Sincerely,

Joseph M. Fallon

Joseph M. Fallon, CHMM
Chief, Environmental Division
Directorate of Public Works

Retired 1/28/03

STANDARD OPERATING PROCEDURE

SOP No.: SAM-0205
Revision No.: 4 (new)
Date Revised: 8/9/99

CATEGORY: Sample Handling
TITLE: Monitor Well Sampling for IRP Sites at Fort Monmouth

1 PURPOSE:

To document current procedures for monitoring well sampling.

2 RESPONSIBILITY:

Designated field samplers who have been properly trained and instructed in NJDEP field sampling procedures and protocol.

3 REFERENCES:

3.1 Field Sampling Procedures Manual, May 1992 (most current). New Jersey Department of Environmental Protection and Energy.

3.2 Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities developed by NIOSH, OSHA, USCG, EPA. Oct. 1985

3.3 NJDEP Field Analysis Manual, July 1994.

3.4 On the World Wide Web: www.state.nj.us/dep or www.state.nj.us/dep/srp.

3.5 Lab SOP: SAM-0200, SAM-0202, OQC-0302

4 SUMMARY:

The procedures, materials, and equipment describe the recommended methods for sampling monitoring wells. Necessary equipment, calibrations, calculations and appropriate QA/QC procedures are also included. These procedures are to be followed by all personnel involved with the sampling and purging of wells at Fort Monmouth. Persons following this SOP are recommended to also refer to the NJDEP Field Sampling Procedures Manual.

Prepared By [signature] D. Wright Date 8-11-99

Approved By Jackie Herman Date 8/11/99
QA Manager / Laboratory Director

Retired 1/28/03

Refer to NJDEP Field Sampling Procedure Manual Table 2-1 Aqueous Sampling Equipment Decontamination (Lab and Field).

7 CALIBRATION:

All instruments used for field readings are calibrated before each day of use. The use of pH meters must start out with a calibration using buffer solution standards to check or calibrate accuracy. HNU's are calibrated with a known calibration gas. Dissolved oxygen meters are checked against a winkler method test weekly. All calibrations for a given day's use are recorded in the log provided for each instrument. Refer to equipment directions for calibration instruction. Likewise, specific conductivity meters are checked against standards regularly. Cooler thermometers are calibrated against an NIST traceable thermometer annually.

8 PROCEDURE:

The following articles document the procedures for sampling monitor wells. They are to be used as a guide, by trained personnel, in conjunction with the NJDEP Field Sampling Procedures Manual.

8.1.1 Preparation: It should be noted that before going out into the field, certain preparations must be made. This includes the selection of PPE, safety plans, proper bottle acquisition for analytes being tested, site entry, map information, and equipment.

8.1.2 Selection of PPE: For adequate protection and prevention of contaminant exposure to workers at hazardous waste sites in all phases of work, PPE is properly used and supplied. Determination of PPE will be outlined in a Health and Safety Plan, and also by preliminary site investigations. Refer to NJDEP Field Sampling Procedures Manual, and the Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.

8.1.3 Health and Safety Plans: These plans are developed to encompass all the aspects of site operations. Plans are available to personnel associated with site sampling and a copy is kept on file at the site (in this case, the laboratory). At a minimum, the plan includes all portions of Site Remediation Program's (SRP) Site Safety and Health Standard Operating Procedures deemed appropriate for site, detailed site description, emergency phone numbers, a map and directions to nearest hospital identified on the map, and all PPE needed.

8.1.4 Proper bottle selection: Please refer to QA/QC section 10.1.

8.1.13 Total depth of well and depth to water: These readings are taken using a depth meter. Total depth of well, depth to water, and depth to screen are measured from the top of the inner casing or surveyors mark. All data is recorded on well sheet.

8.1.14 Calculations: Calculations are made as stated in section 9.

8.2 Purging: When pre-purge activities are complete, the purging of a well can begin. This includes pre-entry to the well and pump setup.

8.2.1 Pre-entry to well: Before tubing (refer to materials section) is inserted into a well, it is wiped down and rinsed with DI water. The tubing is then inserted into the well to a maximum depth of six feet below the water table. During purge activities, the depth of the tubing may be adjusted to prevent the static water level from dropping below the end of the tubing.

8.2.2 Pump setup: Once the battery powered peristaltic pump is set up, purging can begin. Evacuation rates never exceed that of well development, and total volume purged never exceeds 5 times the amount of standing water. Purge water management practices are described in section 10.1.8.

8.3 After Purge: When purging is complete, the pump is removed and tubing is disposed of properly. Data referenced in section 8.3.2 is then taken and recorded.

8.3.1 Pump removal: Tubing is removed from the bottom end while the pump is still running. Tubing is then disposed of. The pump is shut down and decontaminated for its next application.

8.3.2 The following data is recorded on the well sheet: Start and end time of purge, purge method, purge rate, total volume purged, dissolved oxygen, pH, temperature, and specific conductivity readings.

8.4 Field Blank Sample: At this time the field blank sample is collected. A new bailer is opened from its sealed package and field blank water is run over the bailer or sample equipment and collected into the proper sample containers.

9 CALCULATIONS:

Four calculations are made while in the field. The calculations are as follows: linear feet of water (height of water), the volume to be purged, the volume purged not to be exceeded, and purge rate.

9.1 Linear feet of water: This is calculated by knowing the total depth of a well and subtracting the depth to water as measured by a depth meter. These two numbers are measured to within .01 feet. Through this calculation, the linear feet of water is determined.

Equation: (Total well depth – Depth to water = linear feet of water)

9.2 Volume to be purged and volume not to be exceeded: The second calculation is to determine the minimum volume to be purged from a well before sampling. Utilizing the linear feet of water and then multiplying it by the volume per foot for the proper diameter casing (see Figure 1 below) equals the amount of water in casing. Multiplying the amount of water within a casing by 3 equals the minimum volume to be purged. It should be noted that the amount purged should not exceed 5x the amount of standing water in a well.

Equation:
linear feet of water x volume per ft for well diameter = amount of water in casing)
then,
(amount of water in casing x 3 = minimum volume to be purged)

Equation:
(amount of water in casing x 5 = total volume not to be exceeded)

Figure 1: Capacity of Common Casing Diameters
(Pp. 170 in NJDEP FSPM)

Casing Diameter (ft.)	Gallons/linear foot
2 inch (0.1667)	0.1632
4 inch (0.3333)	0.6528
6 inch (0.5000)	1.4688
8 inch (0.6667)	2.6112
10 inch (0.8333)	4.0800
12 inch (1.0000)	5.8752

10.1.3 Color of container. Whenever possible, amber glass is used to prevent photodegradation. If not available, samples are protected from light. One exception is the use of 40 ml clear glass vials which are used for VOA/aqueous analysis.

10.1.4 Container closures. All containers utilized have a leak-proof seal and are constructed out of inert material with respect to sampled materials. The closure may also be separated by a closure liner that is inert to sample material.

10.1.5 Decontamination of containers and chain of custody. Sample containers are laboratory cleaned or purchased as lab cleaned. Bottles being shipped are accompanied by a chain of custody in a cooler with a custody seal. Custody always accompanies containers to the field, during collection, back to lab, and during analysis. This helps to assure no tampering or contamination from outside sources occurs.

10.1.6 Storage and transport. Care is taken to avoid contamination. Clean transport and storage environments are observed. Sample or bottle storage is never near solvents, gasoline, or other equipment that is a potential source of contamination. Samples and chain of custody are secured in coolers or transport, with said chain of custody in with bottles or in the possession of authorized personnel. Also, a temperature blank is included in each cooler to measure temperature of samples on ice (ideally a constant 4 degrees Celsius).

10.1.7 Tubing decontamination: ASTM drinking water grade polyethylene tubing is used and discarded after each use. Care is taken to prevent the pump and tubing from coming into contact with the ground surface. Prior to well purging, all tubing is rinsed/wiped with distilled and deionized water to remove any possible residual materials which may be present.

10.1.8 Disposal of development, purge, pump test, and decon waters: To determine whether waste waters are contaminated, field instrument readings and previous analytical data is used to characterize it. Water not considered contaminated is re-applied directly to ground surface and permitted to percolate back to the water table. Care is taken to avoid nuisance situations where a discharge may cause undue concern. When water is considered contaminated, the water generated is reapplied only if the following conditions are met: ground water is not permitted to migrate offsite, no potential exists for contaminating a previously uncontaminated aquifer, discharge will not cause an increase to ground surface soil contamination. If these conditions are met, the water is re-applied to the ground surface. If these conditions aren't met, than water

10.3 Sample preservation: Sample bottles are preserved by lab staff based upon analytical requirements. Please refer to SAM-0200 Sample Containers, Preservation, and Holding Times SOP and also NJDEP Field Sampling Procedures Manual Appendix 2-1 Analytical Methodology reference Charts, Pp. 24-74.

Retired 10/29/04

STANDARD OPERATING PROCEDURE

SOP No.: SAM-0205
Revision No.: 1
Date Revised: 01/17/03

CATEGORY: Sample Handling
TITLE: Monitor Well Sampling for IRP sites at Fort Monmouth

1 PURPOSE:
1.1 To document current procedures for monitoring well sampling.

2 RESPONSIBILITY:
2.1 Designated field samplers who have been properly trained and instructed in NJDEP field sampling procedures and protocol.

3 SAMPLE COLLECTION, PRESERVATION AND HANDLING:
3.1 For sample collection, preservation and handling, please refer to SOP No. SAM-200.

4 REFERENCES:
4.1 Field Sampling Procedures Manual, May 1992 (most current). New Jersey Department of Environmental Protection and Energy.
4.2 NJDEP Field Analysis Manual, July 1994.
4.3 On the World Wide Web: www.state.nj.us/dep or www.state.nj.us/dep/srp.
4.4 Lab SOP: SAM-0200, SAM-0202, OQC-0302.

5 SUMMARY:
5.1 The procedures, materials, and equipment describe the recommended methods for sampling monitoring wells. Necessary equipment, calibrations, calculations and appropriate QA/QC procedures are also included. These procedures are to be followed by all personnel involved with the sampling and purging of wells at Fort Monmouth. Persons following this SOP are recommended to also refer to the NJDEP Field Sampling Procedures Manual.

6 SAFETY:
6.1 For safety, please refer to CTSC Fort Monmouth, NJ Health and Safety Plan (HASP).

7 EQUIPMENT AND MATERIALS:
7.I Equipment:
7.1.1 Dissolved oxygen meter

Prepared By: Corey McConnell Date: 1/30/03
Laboratory Director: Date: 2-3-03
QA/QC Manager: Arthur Hamer Date 1/30/03

9 QUALITY CONTROL:

9.1 The following QA/QC requirements are established in order to maintain sample integrity. The prime objective is to prevent sample contamination from other sources and ensure potential contaminant concentrations remain stable form sample collection to complete analysis. Refer to the NJDEP Field Sampling Procedures Manual Appendix 2-1 Analytical Methodology Reference Charts, Pp. 24-74. Also refer to SAM-0200 Sample Containers, Preservation and Holding Times.

9.2 Sample Containers: Before sample collection can begin consideration must be given as to what type of container will be used to transport and store samples. The lab provides containers based upon requested methodologies. Selection is based on the matrix, potential contaminants, analytical methods, and lab's internal QA/QC requirements. They should be selected upon review of the following:

9.2.1 Reactivity of container material with sample. Glass is recommended for hazardous material samples since it is chemically inert to most substances. Plastics may be used when analytes of interest or sample characteristics dictate use instead of glass.

9.2.2 Volume of the container. The volume of sample needed is dictated by the analytical method and the matrix of the sample. The lab will supply bottles that allow for sufficient volumes of sample matrix to be collected.

9.2.3 Color of container. Whenever possible, amber glass is used to prevent photo degradation. If not available, samples should be kept protected from light. One exception is the 40 ml clear glass VOA vials used for VOA/aqueous analysis.

9.2.4 Container closures. All containers utilized have a leak-proof seal and are constructed out of material inert with respect to sampled materials. The closure may also be separated by a closure liner that is inert to sample material.

9.2.5 Decontamination of containers and chain of custody. Sample containers are laboratory cleaned or purchased as lab cleaned. Bottles being shipped are accompanied by a chain of custody in a cooler with a custody seal. Custody must accompany containers to field, during collection, back to lab, and during analysis. This helps to assure no tampering or contamination from outside sources occurs.

9.3 Storage and transport. Care is taken to avoid contamination. Clean transport and storage environments are observed. Sample or bottle storage is never near solvents, gasoline, or other equipment that is a potential source of contamination. Samples and chain of custody are secured in coolers for transport, with said chain of custody in with bottles or in the hands of authorized personnel. Also, a temperature blank is included in each cooler to measure temperature of samples on ice in coolers (ideally a constant 4 degrees Celsius).

alternately filling sample bottles from the same source/device for each parameter. VOA samples are same bailer and first set filled.

9.5.2.2 Matrix spike/Matrix spike duplicate analyses or MS/MSDS sample: The lab is supplied with triple volume in order to perform matrix spike and matrix spike dupes. This does not include trips or field blanks. They should occur every case of field samples, every 20-field samples or each 14-day calendar period in which a site is being worked at and samples collected.

9.6 Sample preservation: Sample bottles are preserved by lab staff based upon analytical requirements. Please refer to SAM-0200 Sample Containers, Preservation, and Holding Times SOP and also NJDEP Field Sampling Procedures Manual Appendix 2-1 Analytical Methodology reference Charts, Pp. 24-74.

10 CALIBRATION:

10.1 All instruments used for field readings are calibrated before each day of use. The use of pH meters must start out with a calibration using buffer solution standards to check or calibrate accuracy. HNU's are calibrated with a known calibration gas. Dissolved oxygen meters are checked against a Winkler method test weekly. All calibrations for a given days use are recorded in the log provided for each instrument. Refer to equipment directions for calibration instruction. Like wise, specific conductivity meters are checked against standards regularly. Cooler thermometers are calibrated against a NIST traceable thermometer annually.

11 PROCEDURE:

11.1 The following articles document the procedures for sampling monitor wells. They are to be used as a guide by trained personnel in conjunction with the NJDEP Field Sampling Procedures Manual.

11.1.1 Proper bottle selection: Please refer to QA/QC section 10.1.

11.1.2 Equipment: Please refer to Equipment section 5.

11.1.3 Before purge activities: Certain instruments and meters are calibrated before use. Also, certain measurements and calculations are obtained before any purge activity can occur. The following is a list of information/data/steps required before purging and pertinent information recorded in log books or on well sheets: Date, time and weather conditions: Date and time are needed for holding time, and general record keeping. Weather conditions may affect ambient conditions at a particular site, so are therefore recorded. Tidal influences may also be included here, if wells are in a tidal area.

11.8 Pump setup: The peristaltic pump is then setup with its connection to battery and purging begun. Evacuation rate should not exceed that of well development, and total volume purged should not exceed 5 times the amount of standing water. Discharge water must be in compliance with those stated in section 13. Please refer to the NJDEP Field Sampling Procedures Manual as well.

11.9 After Purge: When purging is complete, pump is removed and tubing is disposed of properly. Data in section 11.2 is then taken and recorded.

11.10 Pump removal: Using peristaltic pumps, the tubing is removed from well at end of purge while pump still running. Tubing is then disposed of. Pump can than be shut down and decontaminated for next use as needed.

11.11 The following data must be recorded on well sheet: Start and end time of purge, purge method and purge rate. Total volume purged, dissolved oxygen, pH, temperature, and specific conductivity readings.

11.12 Ground water sampling: Following well evacuation procedures, groundwater sampling can begin. This is immediately after purge, not lapsing more than 2 hours afterwards. When multiple wells are being sampled, the least contaminated should be done first in order of ascending contamination, Sampling is done by using a bottom filling Teflon bailer, dedicated to that particular sampling event. Bailer is lowered slowly into water until submerged, and then slowly retrieved. Sample is then carefully transferred to sample containers. The first full bailer of water is used for sampling, it may not be discarded.

Sample order: Samples are collected in the following order:

volatile organics (VOA)
purgeable organic carbons (POC)
purgeable organic halogens (POX)
total organic halogens (TOX)
total organic carbon (TOC)
base neutrals/acid extractables
TPHC/oil and grease
PCB's/pesticides
total metals
dissolved metals
phenols, cyanide
sulfate and chloride
turbidity
nitrate and ammonia,
preserved inorganics
radionuclides

(amount of water in casing x 5 = total volume **not** to be exceeded)

Figure 1: Capacity of Common Casing Diameters
(Pp. 170 in NJDEP FSPM)

Casing Diameter (ft.)	Gallons/linear foot
2 inch (0.1667)	0.1632
4 inch (0.3333)	0.6528
6 inch (0.5000)	1.4688
8 inch (0.6667)	2.6112
10 inch (0.8333)	4.0800
12 inch (1.0000)	5.8752

12.1.3 Purge rate: The purge rate is determined by calculating the length of time it takes for pump to fill a 1-gallon bucket with water. The time is multiplied by the minimum volume to be purged. The gallons being purged is then divided by this number (which also happens to be the length of time the purge will take in minutes) which equals the gallons per minute or purge rate.

Equation:

(time x minimum volume to be purged = length of purge in minutes)

then,

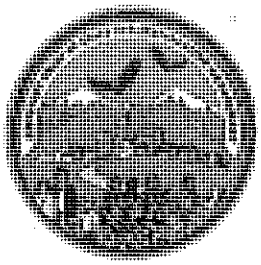
(minimum volume to be purged / length of purge in minutes = gallons per minute or the purge rate)

13 POLLUTION PREVENTION:

13.1 For pollution prevention, please refer to SOP No. SAM-0222.

14 WASTE MANAGEMENT:

14.1 For sample disposal, please refer to SOP No. SAM-0220.



U.S. Army BRAC 2005
Site Investigation Report
Fort Monmouth

Final 21-July-2008

3.11 Parcel 50 – IRP Sites FTMM-54, FTMM-55, and FTMM-61

3.11.1 Site Description

Site FTMM-54 is a former fuel distribution facility on the MP which was abandoned. The tanks and distribution piping were rediscovered during a renovation project at Bldg 296. The facility dates back to the 1940s and is located on Sherrill Avenue. The UST system was comprised of ten 1,000-gallon tanks which stored various types of fuel products. These products were distributed from remote pumping islands located over 450 ft from the UST field and within 50 ft of Parkers Creek (a sensitive estuarine marsh area).

FTMM-55 is the site of a former UST system which was located at Bldg 290. The site formerly served as a motor pool for a military unit that has since left FTMM.

Site FTMM-61 is located off of Sherrill Avenue in the northern section of the MP. On August 28, 1997, a 3,000-gallon steel UST (No. 0081533- 229) was removed. The tank was used to store gasoline. The UST was located within the courtyard of Bldg 283. Additional information pertaining to this parcel can be found in Section 5.2.1.1, Table 5-10, Section 5.13.2, and Appendix G of the Phase I ECP (1).

3.11.2 Previous Investigations

The Bldg 296 site, the Bldg 290 site, and the M-18 Landfill are located in close proximity to one another (44). Due to the close proximity, the RI results for all three sites were reported in one RI Report. This report, submitted to the NJDEP in October 2003, presents a groundwater flow and transport model to evaluate the migration of benzene and metals in groundwater.

FTMM-54: Bldg 296. Between November and December 1993, the previously unknown fuel distribution system was removed and the source of contamination was eliminated. Benzene and lead were detected in site monitoring wells above NJDEP GWQC. An NFA determination was requested for this site. Currently, as part of the monitoring program, seven groundwater monitoring wells are sampled on a quarterly basis. The cleanup strategy is to continue compliance monitoring of seven groundwater monitoring wells.

FTMM-55: Bldg 290. The UST tanks at this location were used to store gasoline and they were both removed on September 2, 1994. On July 2, 1996, a construction activity identified gasoline-contaminated soil within 50 ft of the former UST site. Soils were removed and disposed of in accordance with NJDEP requirements. Additional soil and groundwater samples were collected in March 1998 to further delineate the area of contamination. No additional contaminated soils were identified within the AOC. Arsenic and lead were detected in site monitoring wells above NJDEP GWQC. An NFA determination was requested for this site. The cleanup strategy is to continue compliance monitoring of two groundwater monitoring wells.

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
50IA-1 through 50IA-10 (10 samples – includes 1 duplicate sample)	Indoor air	Nine indoor air samples were collected from within Bldg 283. One additional ambient air sample was collected from outside the building. Sample locations were biased towards potential source areas and potential migration pathways.	NJDEP – SRWM USEPA TO-15 Method

3.11.4 Site Investigation Results

A total of 25 VOs were detected in soil gas samples (**Table 3.11-3**) collected in Parcel 50. Of the 25 VOs detected, two (benzene and PCE) equaled and/or exceeded NJDEP Soil Gas NRSs for soil gas samples. Benzene was detected in two of the five soil gas samples at a concentration equal to the NRS of 26 $\mu g/m^3$ (samples 50SG-2 and 3). PCE was detected in two of the five soil gas samples at concentrations greater than the NRS of 36 $\mu g/m^3$; ranging from 97.6 $\mu g/m^3$ in sample 50SG-1 to 144 $\mu g/m^3$ in sample 50SG-5.

A total of 23 VOs were detected at concentrations below NJDEP Indoor Air NRSs in indoor air samples collected in Bldg 283 (**Table 3.11-4**).

3.11.5 Summary and Conclusions

No constituents were identified above applicable NJDEP criteria in indoor air samples collected from Bldg 283. Two VOs, benzene and PCE, equaled and/or exceeded NJDEP Soil Gas NRSs in soil gas at Parcel 50. Based on NJDEP VI guidance (12), one additional round of indoor air sampling is recommended to confirm constituents are not present above criteria in indoor air at Bldg 283.

Table 3.11-3
Fort Monmouth ECP Site Investigation, Parcel 50
Summary of Analytical Parameters Detected in Indoor Air (µg/m³)

Chemical	RAL[3]	IA Non-residential[2]	Sample ID: / Lab ID: / Date Sampled:	Analytical Results				
				50IA-7 J78674-7 12/09/07	50IA-8 J78674-8 12/09/07	50IA-8 DUP J78674-9 12/09/07	50IA-9 J78674-10 12/09/07	50IA-AMBIENT J78674-20 12/09/07
				Result	Result	Result	Result	Result
Volatiles								
Acetone	6,600	4,600		8.3	6.9	4.0	7.8	4.5
Benzene	14	2		1.2	1.2	1.2	1.1	1.2
Chloromethane	NLE	130		1.0	1.1	1.1	1.2	1.1
Dichlorodifluoromethane	NLE	260		2.3	2.3	2.6	2.7	2.7
Dichloromethane	400	9		0.52 J	0.52 J	0.49 J	0.56 J	0.76
Ethanol	NLE	NLE		18	6.2	3.2	19.2	5.7
Ethyl Acetate	NLE	NLE		2.6	2.5	4.7	<0.3	1.4
Ethylbenzene	2,200	1,500		0.78 J	<0.083	<0.083	0.42 J	<0.083
n-Heptane	NLE	NLE		0.49 J	<0.13	0.40 J	0.49 J	<0.13
Isopropyl Alcohol	NLE	NLE		2.1	1.7	<0.15	2.7	0.76
Methyl ethyl ketone	NLE	7,200		2.2	0.77	0.56 J	0.97	0.68
Propylene	NLE	NLE		<0.12	<0.12	2.2	<0.12	2.2
Tetrahydrofuran	NLE	NLE		0.83	<0.2	<0.2	<0.2	<0.2
Toluene	10,000	7,200		3.4	2.0	1.9	2.1	2.0
1,1,1-Trichloroethane	NLE	1,400		<0.27	<0.27	<0.27	<0.27	<0.27
1,1,2-Trichloro-1,2,2-trifluoroethane	NLE	44,000		<0.25	<0.25	<0.25	<0.25	<0.25
Trichloroethylene	20	3		<0.16	<0.16	<0.16	<0.16	0.64 J
Trichlorofluoromethane	NLE	1,000		2.4	1.3	1.4	2.6	1.4
1,2,4-Trimethylbenzene	NLE	NLE		2.1	<0.1	<0.1	1.2	<0.1
1,3,5-Trimethylbenzene	NLE	NLE		0.48 J	<0.088	<0.088	<0.088	<0.088
o-Xylene	NLE	NLE		1.1	0.40 J	0.40 J	0.43 J	0.40 J
Xylenes (m&p)	NLE	NLE		2.7	1.0	1.1	1.3	1.1
Xylenes (total)	220	150		3.9	1.4	1.5	1.7	1.5

[1] NJDEP Generic Vapor Intrusion Screening Levels, Indoor Air Screening Levels, Residential, March 2007.

[2] NJDEP Generic Vapor Intrusion Screening Levels, Indoor Air Screening Levels, Nonresidential, March 2007. Results were compared to these levels.

[3] NJDEP Rapid Action Levels for Indoor Air, March 2007.

J = Indicates an estimated value.

DUP = Duplicate Sample

NLE = No Limit Established

Bold = Analyte detected

Shaded = Concentration exceeds of IA Nonresidential.

Table 3.11-4
Fort Monmouth ECP Site Investigation, Parcel 50
Summary of Analytical Parameters Detected Soil Gas (ug/m^3)

		Analytical Results				
Sample ID:		50SG-1	50SG-2	50SG-3	50SG-4	50SG-5
Lab ID:		J79249-6	J79249-7	J79249-8	J79249-9	J79249-5
Date Sampled:		12/12/07	12/12/07	12/12/07	12/12/07	12/12/07
Depth (ft. bgs):		5'	5'	5'	5'	5'
Chemical	SG Non-residential[2]	Result	Result	Result	Result	Result
Volatiles						
Acetone	230,000	102	40.6	60.6	14	24.5
Benzene	26	22	25	26	<0.7	<0.7
Carbon disulfide	51,000	6.2	4.7 J	4.4 J	3.4 J	6.5
Cyclohexane	430,000	6.2	11	6.9	<1.2	<1.2
Ethanol	NLE	50.3	<2.3	26.6	34.3	25.4
Ethylbenzene	74,000	8.3	6.1 J	4.8 J	<0.65	3.6 J
4-Ethyltoluene	NLE	6.4 J	<0.69	<0.69	<0.69	<0.69
n-Heptane	NLE	20	32	32	<0.98	<0.98
n-Hexane	51,000	40.9	79.3	56.0	<0.99	<0.99
2-Hexanone	NLE	4.9 J	<1.6	<1.6	<1.6	<1.6
Isopropyl Alcohol	NLE	5.7	<1.2	<1.2	<1.2	9.8
4-Methyl-2-pentanone (MIBK)	220,000	8.2	<0.82	<0.82	<0.82	<0.82
Methyl ethyl ketone	360,000	4.7	<0.91	<0.91	<0.91	<0.91
Methyl tertiary butyl ether (MTBE)	180	6.1	<1.3	<1.3	<1.3	<1.3
Propylene	NLE	15	20.4	14	5.7 J	12
Tertiary Butyl Alcohol	4,600	<1.1	<1.1	<1.1	3.0 J	<1.1
Tetrachloroethylene	36	97.6	9.5 J	14	<1.3	344
Toluene	360,000	55.8	62.6	56.9	8.7	8.7
Trichloroethylene	27	<1.3	9.7	<1.3	<1.3	26
1,2,4-Trimethylbenzene	NLE	35	7.4 J	<0.84	6.4 J	17
1,3,5-Trimethylbenzene	NLE	7.9	<0.69	<0.69	<0.69	<0.69
2,2,4-Trimethylpentane	NLE	22	38	34	8.4	<0.75
Xylenes (m&p)	NLE	36	24	20	7.8	18
o-Xylene	NLE	13	8.3	6.9	<0.74	7.4
Xylenes (total)	7,700	49.5	32	27	7.8	25

[1] NJDEP Generic Vapor Intrusion Screening Levels, Soil Gas Screening Levels, Residential, March 2007.

[2] NJDEP Generic Vapor Intrusion Screening Levels, Soil Gas Screening Levels, Nonresidential, March 2007. Results were compared to these levels.

(a) = Sum of cis-1,2-Dichloroethylene and trans-1,2-Dichloroethylene.

J = Indicates an estimated value.

DUP = Duplicate Sample

NLE = No Limit Established

Bold = Analyte detected.

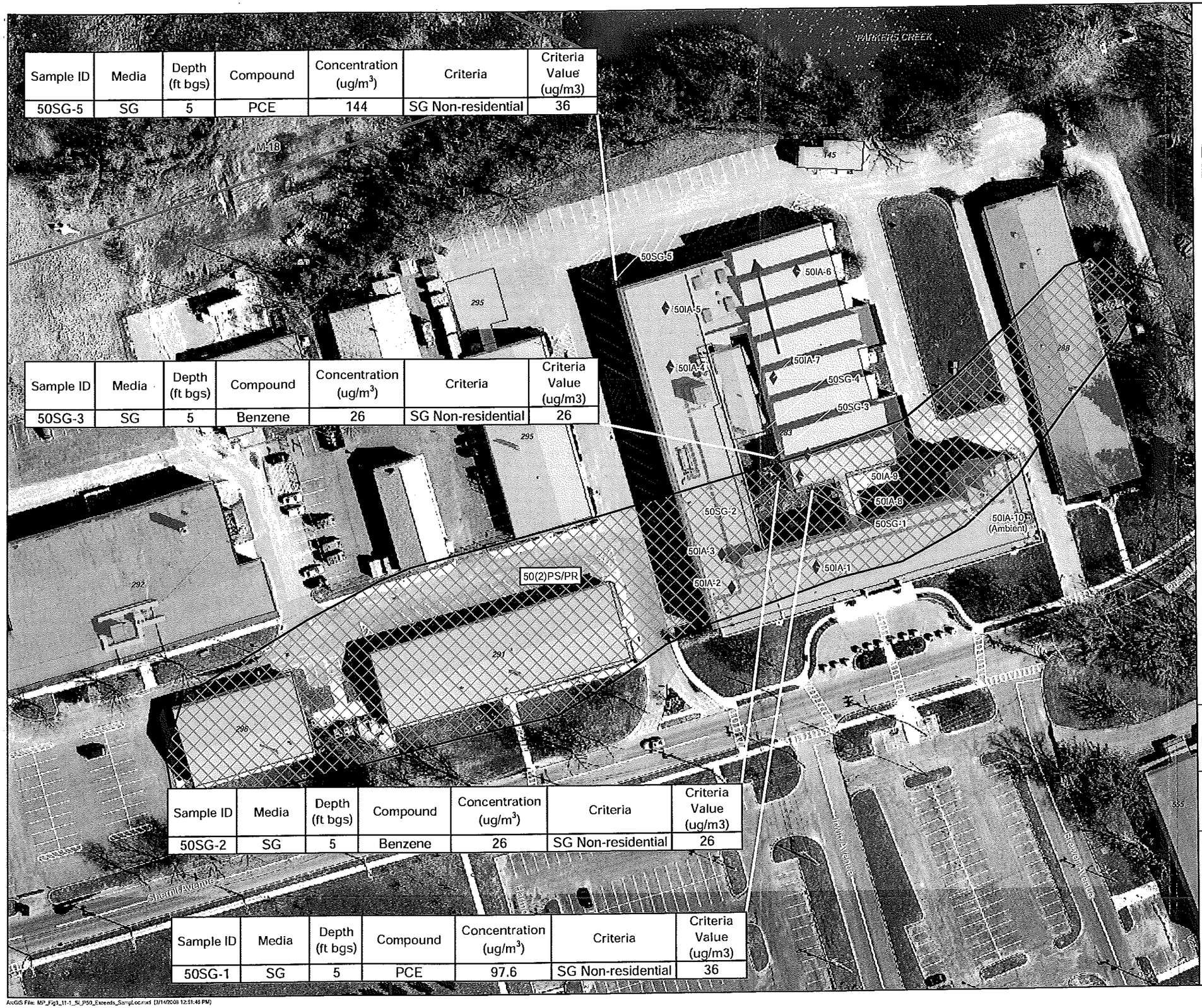
Shaded = Concentration exceeds SG Nonresidential.

Sample ID	Media	Depth (ft bgs)	Compound	Concentration (ug/m^3)	Criteria	Criteria Value (ug/m3)
50SG-5	SG	5	PCE	144	SG Non-residential	36

Sample ID	Media	Depth (ft bgs)	Compound	Concentration (ug/m^3)	Criteria	Criteria Value (ug/m3)
50SG-3	SG	5	Benzene	26	SG Non-residential	26

Sample ID	Media	Depth (ft bgs)	Compound	Concentration (ug/m^3)	Criteria	Criteria Value (ug/m3)
50SG-2	SG	5	Benzene	26	SG Non-residential	26

Sample ID	Media	Depth (ft bgs)	Compound	Concentration (ug/m^3)	Criteria	Criteria Value (ug/m3)
50SG-1	SG	5	PCE	97.6	SG Non-residential	36



LEGEND

- Soil-Gas Sample Location
- Indoor Air Sample Location
- Generalized Groundwater Flow Direction. Direction of Generalized Groundwater Flow derived from qualitative evaluation of surface topography, surface water features, and pre-existing IRP site groundwater potentiometric maps where available.
- Building
- IRP Site Boundary

ECP PARCEL CATEGORY DEFINITIONS

2 Areas where only release or disposal of petroleum products has occurred.

BRAC PARCEL LABEL DEFINITIONS

8(2)PS
- CONTAMINATION DESCRIPTION
  - HS - Hazardous Substance Storage
  - HR - Hazardous Substance Release
  - PS - Petroleum Storage
  - PR - Petroleum Release
  - (P) - Possible Release or Disposal
- CATEGORY NUMBER
- PARCEL NUMBER

N

SCALE:

0 37.5 75 150 Feet

Base Realignment and Closure 2005

U.S. Army Corps of Engineers

Shaw® Shaw Environmental, Inc.

FIGURE 3.11-1

FORT MONMOUTH ECP
SITE INVESTIGATION

PARCEL 50 SAMPLE LOCATIONS AND CONSTITUENTS OF CONCERN

MAIN POST
FORT MONMOUTH
NEW JERSEY

ArcGIS File: MP_Fig3_11-1_SI_P50_Exceeds_Sampl.mxd (7/14/2008 12:51:48 PM)

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Remediation Management & Response
P.O. Box 413
Trenton, New Jersey 08625-0413

JON S. CORZINE
Governor

LISA P. JACKSON
Commissioner

October 24, 2007

Mr. Joseph Fallon, CHMM
Directorate of Public Works
ATTN: IMNE-MON-PWE
167 Riverside Ave.
Fort Monmouth, NJ 07703

RE: Remedial Investigation Report and Remedial Action Workplan
Site 283
Fort Monmouth, NJ

Dear Mr. Fallon:

The NJDEP Division of Remediation Management & Response (DRMR) has completed its review of the report titled "Remedial Investigation Report and Remedial Action Workplan, Site 283", dated October 28, 2005, by Versar Inc. Our comments are attached.

NJDEP approves the proposed injections of oxygen release compound (ORC) to accelerate the degradation of volatile organic contamination in ground water at Site 283, based upon our review of the RIR and RAW. However, we have several requirements regarding additional investigation of the site, as outlined in the attached comments.

This approval letter shall constitute a permit-by-rule for discharges to ground water in accordance with N.J.A.C. 7:14A-7. This permit-by-rule will be in effect for 180 days, commencing at the start of the proposed injections of ORC at Site 283.

You or your staff may contact me at 609-633-0766 with any questions on the enclosed comments, or any other site remediation matters at Fort Monmouth.

Sincerely,

Larry Quinn

Larry Quinn, P.E., CHMM, Case Manager
Bureau of Design and Construction

Attachment

NJDEP COMMENTS ON
RI REPORT and RA WORKPLAN for SITE 283
FORT MONMOUTH, NJ

1. General. The NJDEP finds the proposed remedial action of ORC injection at the Site 283 source area to be acceptable. However, the approval is given under the condition that additional remedial investigations shall also be conducted as outlined in the comments below. These investigations can be conducted concurrently with the proposed remedial action.

2. Section 2.4.2 (Hydrogeology): The report identifies tidal influence as one of the factors that could be influencing shallow ground water flow. Fort Monmouth shall comment on whether a tidal study was ever performed pursuant to N.J.A.C. 7:26E-3.7(e)3iv(3). If a tidal study has not been conducted, Fort Monmouth shall conduct a tidal study.

3. Section 3.2 (Ground Water Sample Collection Activities): The report states that sampling and decontamination procedures were conducted in accordance with the December 1997 Fort Monmouth Standard Sampling Operating Procedure. All future sampling procedures and equipment decontamination must be conducted pursuant to the most recent version of the NJDEP Field Sampling Procedures Manual per the requirements of N.J.A.C. 7:26E-4.4(d).

4. Section 3.2 (Ground water Sample Collection Activities): The report is deficient pursuant to **N.J.A.C. 7:26E-4.8(c)7.** Information regarding the purging and sampling of the monitoring wells was not provided in the report. At a minimum, the purging and sampling information for the last 4 quarters of sampling must be submitted to NJDEP. The information should be submitted for all 21 sampling events if available on compact disc.

5. Section 5.1 (Ground Water Sampling Results): The ground water investigation was deficient pursuant to **N.J.A.C. 7:26E-2.1(c).** Fort Monmouth failed to analyze ground water samples obtained from the monitoring wells for MTBE and TBA. The tank removed from Site 283 contained gasoline. Therefore, MTBE and TBA analysis is required for future sampling rounds of all Site 283 wells.

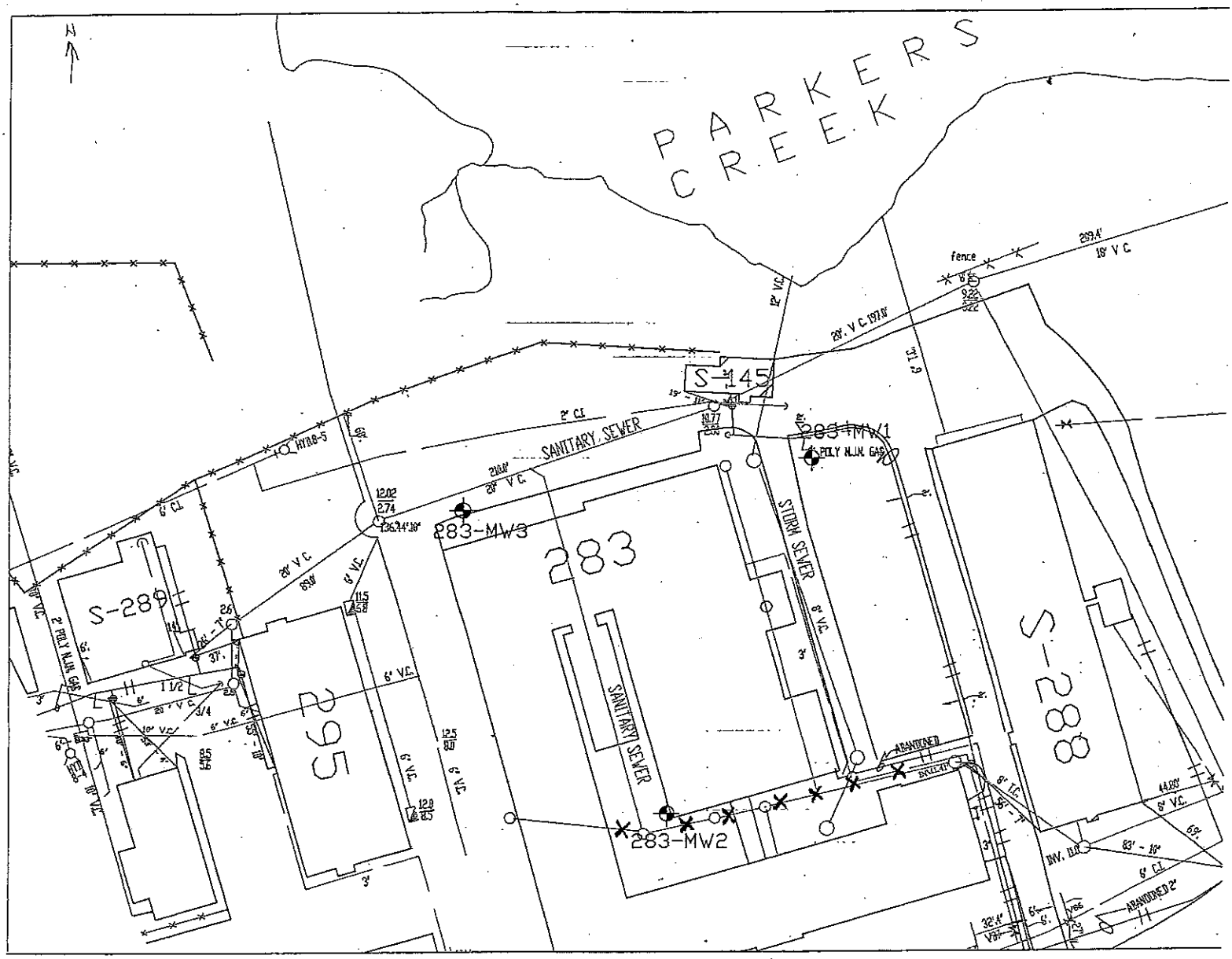
6. Section 5.1.1 (VOCs): The report states that the NJDEP has no criteria for VOC TICs in ground water. The Ground Water Quality Criteria for VOC TICs are as follows: 100 ppb for individual TICs, and 500 ppb for total TICs.

NJDEP COMMENTS ON
RI REPORT and RA WORKPLAN for SITE 283
FORT MONMOUTH, NJ (continued)

7. Vapor Intrusion. Pursuant to **N.J.A.C. 7:26E-4.4(h)3viii.**, Fort Monmouth is deficient in not evaluating Building 283 and adjacent subsurface utilities for vapor hazards associated with contaminated ground water. A vapor intrusion investigation is warranted based on the concentrations of benzene found in well 283-MW2. Fort Monmouth shall refer to the Department's October 2005 Vapor Intrusion Guidance Document for conducting a vapor intrusion investigation. The document is available online at www.state.nj.us/dep/srp/guidance/vaporintrusion/.

8. Sanitary Sewer. Pursuant to **N.J.A.C. 7:26E-4.4(e)**, Fort Monmouth was deficient in not properly locating all ground water sampling points. A 20-inch diameter sanitary sewer is located near the former UST location and well 283-MW2. The cross section on Figure 4-2 shows the sewer located below the water table. It is likely that the soils surrounding the sewer pipes are more permeable than the silty clays, fine sands and clayey silts identified in the boring logs for well 283-MW2. Ground water could be flowing preferentially along the sewer lines. Therefore, Fort Monmouth must install and sample well points along the sanitary sewer to the east and west of monitoring well 283-MW2. The approximate locations of the well points recommended by NJDEP are shown on the attached figure. Fort Monmouth shall submit a remedial investigation workplan pursuant to the applicable requirements of N.J.A.C. 7:26E-4.2. If the results of the investigation show contaminant migration along the sewer, complete delineation via additional well points and/or monitoring wells will be required.

9. Parkers Creek: Because of the proximity of ground water contamination to Parkers Creek, a surface water and sediment investigation and a Baseline Ecological Evaluation must be conducted in accordance with the applicable requirements of **N.J.A.C. 7:26E-4.5** and 4.7. NJDEP understands that Fort Monmouth is considering an overall investigation/evaluation of Parkers Creek (and possibly Mill Creek and Lafetra Creek) that will address all potentially-contributing AOCs including Site 283 and the M-18 Landfill. NJDEP concurs with that approach.



X Location of well points recommended by BGWPA for sanitary sewer investigation

State of New Jersey

James E. McGreevey
Governor

Department of Environmental Protection

Bradley M. Campbell
Commissioner

Mr. Dinkerrai Desai
DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY COMMUNICATIONS-ELECTRONIC COMMAND
FORT MONMOUTH, NJ 07703-5000

JAN 10 2003

Re: UST Closure Approval/NFA
Fort Monmouth Main Post
Monmouth County

Dear Mr. Desai:

The NJDEP is in receipt of sixty-eight (68) underground storage tank (UST) closure reports dated between July 17, 2001 and May 15, 2002. The Army has requested to receive No Further Action (NFA) approval letters for each of these reports. This letter approves the NFA requests for the following 68 UST that are located on the Main Post of the Fort Monmouth site:

Submittal Date	Building No.	NJDEP Reg. #	Residential	
07/17/2001	104	90010-75	NO	
07/17/2001	699A	81533-112	NO	
07/17/2001	800A	81533-127	NO	
07/17/2001	875	81533-234	NO	
07/17/2001	949	81533-203	NO	
07/17/2001	1220A	81533-184	NO	
07/17/2001	2000B	192486-38	NO	
01/02/2002	257	81533-200	NO	
01/02/2002	283C	81533-229	NO	FTMM-61
01/02/2002	290B	81533-224	NO	
01/02/2002	290B	81533-225	NO	
01/02/2002	491	90010-71	NO	
01/02/2002	605	81533-85	NO	
01/02/2002	678	81533-105	NO	
01/02/2002	699	81533-236	NO	
01/02/2002	699	81533-238	NO	
01/02/2002	699	81533-237	NO	
01/02/2002	699	81533-235	NO	
01/02/2002	801B	81533-129	NO	
01/02/2002	804A	81533-130	NO	
01/02/2002	2337	81515-65	NO	
01/02/2002	2562A	81515-41	NO	
01/02/2002	2707	81515-50	NO	
01/02/2002	2707	81515-49	NO	
01/02/2002	2707	81515-51	NO	
01/02/2002	2707	81515-47	NO	
01/02/2002	2707	81515-48	NO	

Submittal Date	Building No.	NJDEP Reg. #	Residential
02/13/2002	2044	192486-24	NO
02/13/2002	2044	192486-32	NO
02/13/2002	2044	192486-33	NO
02/26/2002	208B	81533-210	YES
03/05/2002	246	N/A	YES
03/05/2002	261B	N/A	YES
05/15/2002	106	90010-74	NO
05/15/2002	164	90010-15	NO
05/15/2002	173	90010-19	NO
05/15/2002	200	81533-2	NO
05/15/2002	208A	81533-6	YES
05/15/2002	233	81533-21	YES
05/15/2002	237	81533-25	YES
05/15/2002	271	81533-55	YES
05/15/2002	277	90010-24	NO
05/15/2002	296B	81533-217	NO
05/15/2002	296B	81533-223	NO
05/15/2002	296B	81533-221	NO
05/15/2002	296B	81533-220	NO
05/15/2002	296B	81533-222	NO
05/15/2002	296B	81533-218	NO
05/15/2002	296B	81533-216	NO
05/15/2002	296B	81533-215	NO
05/15/2002	296B	81533-214	NO
05/15/2002	296B	81533-213	NO
05/15/2002	296B	81533-219	NO
05/15/2002	426	90010-40	NO
05/15/2002	482	90010-54	NO
05/15/2002	600 A	81533-83	NO
05/15/2002	600 B	81533-212	NO
05/15/2002	611	81533-87	NO
05/15/2002	615	81533-89	NO
05/15/2002	618	81533-91	NO
05/15/2002	619	81533-92	NO
05/15/2002	621	81533-94	NO
05/15/2002	634	N/A	NO
05/15/2002	638	N/A	NO
05/15/2002	639-2	N/A	NO
05/15/2002	640	N/A	NO
05/15/2002	641	N/A	NO
05/15/2002	644	N/A	NO
05/15/2002	664	N/A	NO
05/15/2002	666	N/A	NO
05/15/2002	686	81533-107	NO
05/15/2002	697	81533-194	NO
05/15/2002	697	81533-195	NO

Submittal Date	Building No.	NJDEP Reg. #	Residential
05/15/2002	697	81533-196	NO
05/15/2002	876B	81533-139	NO
05/15/2002	886	81533-140	NO
05/15/2002	905	81533-145	NO
05/15/2002	1102	81533-162	NO
05/15/2002	1104	81533-164	NO
05/15/2002	2067	192486-37	NO
05/15/2002	2534	81515-24	NO
05/15/2002	2603	81515-60	NO
05/15/2002	2700 2,6	81515-61	NO

The NJDEP has determined that the Army has performed the remedial actions in a manner consistent with the regulatory requirements, specifically the Technical Requirements For Site Remediation (N.J.A.C. 7:26E et seq.). Soils with contamination in excess of the NJDEP residential cleanup criteria have been excavated and the Army has taken great care to provide documentation that assures us that all sources of contamination have been remediated.

If you should have any questions or comments, please do not hesitate to contact me at (609) 633-7232 or via E-mail.

Sincerely,

Ian R. Curtis, Case Manager
Bureau of Case Management
ICURTIS@DEP.STATE.NJ.US

FTMMTH116IRC.DOC

State of New Jersey

Department of Environmental Protection

Christine Todd Whitman
Governor

Robert C. Shinn, Jr.
Commissioner

Mr. James Ott
C/O: Dinker Desai
Director – Public Works
U.S. Army, Fort Monmouth
Fort Monmouth, NJ 07703

FEB 24 2000

Re: UST Closure Reports - Closure Approvals
Fort Monmouth Army Base
Fort Monmouth, Monmouth County

Dear Mr. Ott:

The NJDEP has reviewed the UST Closure and Site Investigation Reports for the Fort Monmouth underground storage tank sites noted below. Based on the NJDEP review of these documents, your request that the NJDEP approve the closure reports for those tanks listed below.

The following tanks were removed, sampled and analyzed in accordance with State and Federal requirements. Additionally, the reports consistently state the Fort Monmouth Public Works Department policy of removing all soils which are determined to have total petroleum hydrocarbon contamination (TPHC) greater than 1000 ppm. NJDEP criteria requires similar removal for TPHC contamination greater than 10,000 ppm. These activities are conservative and therefore further assure the NJDEP that no further action is necessary at these sites.

NJDEP Reg. #	Bldg. #	NJDEP Reg. #	Bldg. #
0081533-59	283B	*0081533-135	828
0090010-46	430C	0081533-136	864A
0081533-111	695	0081533-137	866
0081533-117	739	*0081533-231	907
0081533-118	744	0081533-154	916
0081533-121	747	0081533-156	918
0081533-124	787	0081533-170	1110
0081533-125	788	0081533-172	1123
0081533-128	801A	0081533-207	1150
0081533-133	812		

* No product lines were found during the excavation of the UST due to the fact the buildings were removed prior to the USTs. Based on a review of available maps and drawings, the product lines were less than 15 feet in length at each of the locations. Thus, no additional sampling was required.

If you should have any questions or comments, please do not hesitate to contact me at (609) 633-7232 or via E-mail.

Sincerely,

Ian R. Curtis, Case Manager
Bureau of Case Management
ICURTIS@DEP.STATE.NJ.US

FTMMTH062IRC.DOC

ATTACHMENT B

Previous Reports

1. SMC, 1998. *Underground Storage Tank Closure and Site Investigation Report, Building 283B, Main Post – West Area, NJDEP UST Registration No. 0081533-59.* September.
2. Versar, 2000. *Underground Storage Tank Closure and Site Investigation Report, Building 283C, Main Post – West Area.* October.
3. Versar, 2005. *Remedial Investigation Report and Remedial Action Workplan, Site 283, U.S Army Garrison Fort Monmouth, Fort Monmouth, NJ.* October 28.
4. Excerpt from Shaw, 2008. *U.S. Army BRAC 2005 Site Investigation Report, Fort Monmouth.*
5. VeeTech, 2010. *Site 283 (FTMM-61) Remedial Action Progress Report (2nd Quarter 2004 through 4th Quarter 2008), NJDEP Case Number # 97-08-28-1330-33, U.S. Army Garrison Fort Monmouth, Main Post, Fort Monmouth, New Jersey*. July.
6. Excerpt from Bureau Veritas, 2013. *Vapor Intrusion Site Investigation Report, Main Post and Charles Wood Area, OACSIM – U.S. Army Fort Monmouth, Oceanport, New Jersey.* January.
7. Appendix K of Parsons, 2015. *Annual (Fourth Quarter) 2014 Groundwater Sampling Report, Fort Monmouth, Oceanport, Monmouth County, New Jersey.* December.

United States Army
Fort Monmouth, New Jersey

Underground Storage Tank Closure and Site Investigation Report

Building 283B
Main Post-West Area

NJDEP UST Registration No. 0081533-59

SEPTEMBER 1998

UNDERGROUND STORAGE TANK
CLOSURE AND SITE INVESTIGATION REPORT

BUILDING 283B

MAIN POST-WEST AREA
NJDEP UST REGISTRATION NO. 0081533-59

SEPTEMBER 1998

PREPARED FOR:

UNITED STATES ARMY, FORT MONMOUTH, NEW JERSEY
DIRECTORATE OF PUBLIC WORKS
BUILDING 167
FORT MONMOUTH, NJ 07703

PREPARED BY:

SMC ENVIRONMENTAL SERVICES GROUP
501 ALLENDALE ROAD
KING OF PRUSSIA, PA 19406

PROJECT NO. 2491-308

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Figure 4 Soil Sampling Location Map

APPENDICES

Appendix A NJDEP Standard Reporting Form
Appendix B Site Assessment Summary
Appendix C Waste Manifest
Appendix D UST Disposal Certificate
Appendix E Soil Analytical Data Package
Appendix F Photographs

EXECUTIVE SUMMARY

UST Closure

On August 11, 1997, a tar-coated steel underground storage tank (UST) was closed by removal in accordance with the New Jersey Department of Environmental Protection (NJDEP) underground storage tank procedures at the Main Post-West area of the U.S. Army Fort Monmouth, Fort Monmouth, New Jersey. The UST, NJDEP Registration No. 0081533-59 (Fort Monmouth ID No. 283B), was located north of Building 283B. UST No. 0081533-59 was a 10,000-gallon No. 2 fuel oil UST.

Site Assessment

The site assessment was performed by U.S. Army personnel in accordance with the NJDEP *Technical Requirements for Site Remediation* (N.J.A.C. 7:26E) and the NJDEP *Field Sampling Procedures Manual.* The sampling and laboratory analysis conducted during the site assessment were performed in accordance with Section 7:26E-2.1 of the *Technical Requirements for Site Remediation.* Soils surrounding the tank were screened visually and with air monitoring equipment for evidence of contamination. Following removal, the UST was inspected for corrosion holes or punctures. No holes or punctures were noted in the UST. Groundwater was not encountered. No evidence of potentially contaminated soil or groundwater was observed surrounding the tank. Soil samples contained TPHC concentrations ranging from non-detect to 232.54 mg/kg.

Site Restoration

Following receipt of all post-excavation soil sampling results, the excavation was backfilled with crushed stone, sand, and native backfill to grade and restored to its original condition.

Conclusions and Recommendations

Based on the post-excavation soil sampling results, soils with TPHC concentrations exceeding the NJDEP soil cleanup criteria for total organic contaminants of 10,000 mg/kg, do not exist in the former location of the UST or associated piping.

No further action is proposed in regard to the closure and site assessment of UST No. 0081533-59 at Building 283B.

1.0 UNDERGROUND STORAGE TANK DECOMMISSIONING ACTIVITIES

1.1 OVERVIEW

One underground storage tank (UST), New Jersey Department of Environmental Protection (NJDEP) Registration No. 0081533-59, was closed at Building 283B at the Main Post-West area of U.S. Army Fort Monmouth, Fort Monmouth, New Jersey on August 11, 1997. Refer to site location map on Figure 1. This report presents the results of the Department of Public Works= (DPW) implementation of the UST Decommissioning/Closure Plan approved by the NJDEP. The UST was a tar-coated steel 10,000-gallon tank containing No. 2 fuel oil.

Decommissioning activities for UST No. 0081533-59 complied with all applicable Federal, State and Local laws and ordinances in effect at the date of decommissioning. These laws included but were not limited to N.J.A.C. 7:14B-1 et seq., N.J.A.C. 5:23-1 et seq., and Occupational Safety and Health Administration (OSHA) 1910.146 & 1910.120. All permits including but not limited to the NJDEP-approved Decommissioning/Closure Plan were posted onsite for inspection. The decommissioning activities were conducted by DPW personnel who are registered and certified by the NJDEP for performing UST closure activities. Closure of UST No. 0081533-59 proceeded under the approval of the NJDEP Bureau of Underground Storage Tanks (NJDEP-BUST). The Standard Reporting Form and signed Site Assessment Summary form for UST No. 0081533-59 are included in Appendices A and B, respectively.

Based on inspecting the UST, field screening of subsurface soils and groundwater, and reviewing analytical results of collected soil samples, the DPW has concluded that no significant historical discharges are associated with the UST or associated piping.

This UST Closure and Site Investigation Report has been prepared by SMC Environmental Services Group, to assist the United States Army Directorate of Public Works (DPW) in complying with the NJDEP-BUST regulations. The applicable NJDEP-BUST regulations at the date of closure were the *Interim Closure Requirements for Underground Storage Tank Systems* (N.J.A.C. 7:14B-1 et seq. October 1990 and revisions dated November 1, 1991).

This report was prepared using information collected at the time of closure. Section 1 of this UST Closure and Site Investigation Report provides a summary of the UST decommissioning activities. Section 2 of this report describes the site investigation activities. Conclusions and recommendations, including the results of the soil sampling investigation, are presented in the final section of this report.

1.2 SITE DESCRIPTION

Building 283B is located in the Main Post-West area of the Fort Monmouth Army Base. UST No. 0081533-59 was located north of Building 283B and appurtenant copper piping ran approximately seven (7) feet southwest from the excavation to Building 283B. A site map is provided on Figure 2.

1.2.1 Geological/Hydrogeological Setting

The following is a description of the geological/hydrogeological setting of the area surrounding Building 283B. Included is a description of the regional geology of the area surrounding Fort Monmouth as well as descriptions of the local geology and hydrogeology of the Main Post area.

Regional Geology

Monmouth County lies within the New Jersey Section of the Atlantic Coastal Plain physiographic province. The Main Post, Charles Wood, and the Evans areas are located in what may be referred to as the Outer Coastal Plain subprovince, or the Outer Lowlands.

In general, New Jersey Coastal Plain formations consist of a seaward-dipping wedge of unconsolidated deposits of clay, silt, and gravel. These formations typically strike northeast-southwest with a dip ranging from 10 to 60 feet per mile and were deposited on Precambrian and lower Paleozoic rocks (Zapecza, 1989). These sediments, predominantly derived from deltaic, shallow marine, and continental shelf environments, date from Cretaceous through the Quaternary Periods. The mineralogy ranges from quartz to glauconite.

The formations record several major transgressive/regressive cycles and contain units which are generally thicker to the southeast and reflect a deeper water environment. Over 20 regional geologic units are present within the sediments of the Coastal Plain. Regressive, upward coarsening deposits are usually aquifers (e.g., Englishtown and Kirkwood Formations, and the Cohansey Sand) while the transgressive deposits act as confining units (e.g., the Merchantville, Marshalltown, and Navesink Formations). The individual thicknesses for these units vary greatly (i.e., from several feet to several hundred feet). The Coastal Plain deposits thicken to the southeast from the Fall Line to greater than 6,500 feet in Cape May County (Brown and Zapecza, 1990).

Local Geology

Based on the regional geologic map (Jablonski, 1968), the Cretaceous age Red Bank and Tinton Sands outcrop at the Main Post area. The Red Bank sand conformably overlies the Navesink Formation and dips to the southeast at 35 feet per mile. The upper member (Shrewsbury) of the Red Bank sand is a yellowish-gray to reddish brown clayey, medium-to-coarse-grained sand that contains abundant rock fragments, minor mica and glauconite (Jablonski). The lower member (Sandy Hook) is a dark gray to black, medium-to-fine grained sand with abundant clay, mica, and glauconite.

The Tinton sand conformably overlies the Red Bank Sand and ranges from a clayey medium to very coarse grained feldspathic quartz and glauconite sand to a glauconitic coarse sand. The color varies from dark yellowish orange or light brown to moderate brown and from light olive to grayish olive. Glauconite may constitute 60 to 80 percent of the sand fraction in the upper part of the unit (Minard, 1969). The upper part of the Tinton is often highly oxidized and iron oxide encrusted (Minard).

Hydrogeology

The water table aquifer in the Main Post area is identified as part of the "composite confining units", or minor aquifers. The minor aquifers include the Navesink formation, Red Bank Sand, Tinton Sand, Hornerstown Sand, Vincentown Formation, Manasquan Formation, Shark River Formation, Piney Point Formation, and the basal clay of the Kirkwood Formation.

Based on records of wells drilled in the Main Post area, water is typically encountered at depths of 2 to 9 feet below ground surface (bgs). According to Jablonski, wells drilled in the Red Bank and Tinton Sands may produce 2 to 25 gallons per minute (gpm). Some well owners have reported acidic water that requires treatment to remove iron.

Due to the proximity of the Atlantic Ocean to Fort Monmouth, shallow groundwater may be tidally influenced and may flow toward creeks and brooks as the tide goes out, and away from creeks and brooks as the tide comes in. However, an abundance of clay lenses and sand deposits were noted in borings installed throughout Fort Monmouth. Therefore, the direction of shallow groundwater should be determined on a case-by-case basis.

Shallow groundwater is locally influenced within the Main Post area by the following factors:

X tidal influence (based on proximity to the Atlantic Ocean, rivers, and tributaries)
X topography
X nature of the fill material within the Main Post area
X presence of clay and silt lenses in the natural overburden deposits
X local groundwater recharge areas (i.e., streams, lakes)

Due to the fluvial nature of the overburden deposits (i.e., sand and clay lenses), shallow groundwater flow direction is best determined on a case-by-case basis. This is consistent with lithologies observed in borings installed within the Main Post area, which primarily consisted of fine-to-medium grained sands, with occasional lenses or laminations of gravel silt and/or clay.

Building 283B located approximately 200 feet south of Parkers Creek, the nearest water body. Based on the Main Post topography, the groundwater flow in the area of Building 283B is anticipated to be to the north.

1.3 HEALTH AND SAFETY

Before, during, and after all decommissioning activities, hazards at the work site which may have posed a threat to the Health and Safety of all personnel who were involved with, or were affected by, the decommissioning of the UST system were minimized. All areas, which posed, or may have been suspected to pose a vapor hazard were monitored by a qualified individual utilizing an organic vapor analyzer (OVA). The individual ascertained if the area was properly vented to render the area safe, as defined by OSHA.

1.4 REMOVAL OF UNDERGROUND STORAGE TANK

1.4.1 General Procedures

- X All underground obstructions (utilities, etc.) were identified by the contractor performing the closure prior to excavation activities.
- X All activities were carried out with the greatest regard to safety and health and the safeguarding of the environment.
- X All excavated soils were visually examined and screened with an OVA for evidence of contamination. Potentially contaminated soils were identified and logged during closure activities.
- X Surface materials (i.e., asphalt, concrete, etc.) were excavated and staged separately from all soil and recycled in accordance with all applicable regulations and laws.
- X A Sub-Surface Evaluator from the DPW was present during all site assessment activities.

1.4.2 Underground Storage Tank Excavation and Cleaning

Prior to UST decommissioning activities, surficial soil was removed to expose the UST and associated piping. All free product present in the piping was drained into the UST, and the UST was purged to remove vapors prior to cutting and removal of the piping. After removal of the associated piping, a manway was made in the UST to allow for proper cleaning. The UST was completely emptied of all liquids prior to removal from the ground. Approximately 962 gallons of liquid from the UST and its associated piping were transported by Lionetti Oil Recovery Co. Inc to the Lionetti Oil Recovery Co. Inc. facility, a NJDEP-approved petroleum recycling and disposal company located in Old Bridge, New Jersey. Refer to Appendix C for the waste manifest.

The UST was cleaned prior to removal from the excavation in accordance with the NJDEP-BUST regulations. After the UST was removed from the excavation, it was staged on polyethylene sheeting and examined for holes. No holes or punctures were observed during the inspection by the Sub-Surface Evaluator. Soils surrounding the UST were screened visually and with an OVA for evidence of contamination. No evidence of contamination was observed. Soil screening was also performed along the piping run associated with the UST closure. No contamination was noted anywhere along the piping length. Groundwater was not encountered. See Figure 3 for a cross-sectional view of the excavated area.

1.5 UNDERGROUND STORAGE TANK TRANSPORTATION AND DISPOSAL

The tank was transported to Mazza and Sons, Inc., Metal Recyclers. See Appendix D for a copy of the UST disposal certificate and Appendix F for photographs of the UST. The transportation of the UST was in compliance with all applicable regulations and laws.

The UST was labeled prior to transport with the following information:

- X Site of origin
- X Contact person
- X NJDEP UST Facility ID number
- X Former contents

1.6 MANAGEMENT OF EXCAVATED SOILS

Based on OVA air monitoring and TPHC analysis results from the post-excavation soil samples, no soils exhibited signs of contamination. Therefore, the excavated soils were used as backfill following removal of the UST.

2.0 SITE INVESTIGATION ACTIVITIES

2.1 OVERVIEW

The Site Investigation was managed and carried out by U.S. Army DPW personnel. All analyses were performed and reported by U.S. Army Fort Monmouth Environmental Laboratory, a NJDEP-certified testing laboratory. All sampling was performed under the direct supervision of a NJDEP Certified Sub-Surface Evaluator according to the methods described in the NJDEP *Field Sampling Procedures Manual* (1992). Sampling frequency and parameters analyzed complied with the NJDEP-BUST document *Interim Closure Requirements for Underground Storage Tank Systems* (October 1990 and revisions dated November 1, 1991) which was the applicable regulation at the date of the closure. All records of the Site Investigation activities are maintained by the Fort Monmouth DPW Environmental Office.

The following Parties participated in Closure and Site Investigation Activities:

- X Subsurface Evaluator: Dinker De Sai
  Employer: U.S. Army, Fort Monmouth
  Phone Number: (908) 532-0989
  NJDEP Certification No.: 0010173

- X Analytical Laboratory: U.S. Army Fort Monmouth Environmental Laboratory
  Contact Person: Daniel K. Wright
  Phone Number: (908) 532-4359
  NJDEP Company Certification No.: 13461

- X Hazardous Waste Hauler: Lionetti Oil Recovery Co. Inc
  Contact Person: Charles Clayton
  Phone Number: (908) 721-0900
  NJDEP Hazardous Waste Hauler No.: S6247

2.2 FIELD SCREENING/MONITORING

Field screening was performed by a NJDEP Certified Sub-Surface Evaluator using an OVA and visual observations to identify potentially contaminated material. Soil excavated from around the tank and appurtenant piping, as well as the UST excavation sidewalls and bottom, did not exhibit any evidence of potential contamination. Groundwater was not encountered.

2.3 SOIL SAMPLING

On August 11, 1997, following the removal of the UST, post-excavation soil samples A, B, C, D, E, F, and DUP B were collected from a total of six (6) locations of the UST excavation. All samples were collected along the excavation floor at a depth of 11.0 feet bgs. On August 12, sample G was collected along the excavation floor at a depth of 8.0 feet bgs. All samples were analyzed for total petroleum hydrocarbons (TPHC) and total solids.

U.S. Army personnel in accordance with the NJDEP Technical Requirements and the NJDEP Field Sampling Procedures Manual performed the site assessment. A summary of sampling activities including parameters analyzed is provided in Table 1. The post-excavation soil samples were collected using NJDEP *Field Sampling Procedures Manual* (1992) standard sampling procedures. Following soil sampling activities, the samples were chilled and delivered to U.S. Army Fort Monmouth Environmental Laboratory located in Fort Monmouth, New Jersey, for analysis.

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 SOIL SAMPLING RESULTS

To evaluate soil conditions following removal of the UST, post-excavation soil samples were collected on August 11 and 12, 1997, from a total of seven (7) locations. All samples were analyzed for TPHC and total solids. The post-excavation sampling results were compared to the NJDEP residential direct contact total organic contaminants soil cleanup criteria of 10,000 mg/kg (N.J.A.C. 7:26D and revisions dated February 3, 1994). A summary of the analytical results and comparison to the NJDEP soil cleanup criteria is provided in Table 2 and the soil sampling locations are shown on Figure 4. The analytical data package is provided in Appendix E.

All post-excavation soil samples collected on August 11 and 12, 1997, from the UST excavation and from below piping associated with the UST contained concentrations of TPHC below the NJDEP soil cleanup criteria. Samples contained levels of TPHC ranging in concentration from non-detect to 232.54 mg/kg.

3.2 CONCLUSIONS AND RECOMMENDATIONS

The analytical results for all post-excavation soil samples collected from the UST closure excavation at Building 283B were below the NJDEP soil cleanup criteria for total organic contaminants.

Based on the post-excavation sampling results, soils with TPHC concentrations exceeding the NJDEP soil cleanup criteria for total organic contaminants of 10,000 mg/kg, do not exist in the former location of the UST or associated piping.

No further action is proposed in regard to the closure and site assessment of UST No. 0081533-59 at Building 283B.

TABLES

TABLE 1

SUMMARY OF POST-EXCAVATION SAMPLING ACTIVITIES
BUILDING 283B, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID	Date of Collection	Date Analysis Started	Matrix	Sample Type	Analytical Parameters*	Analysis Method
A	8/11/97	8/13/97	Soil	Post-Excavation	TPHC	OQA-QAM-025
B	8/11/97	8/13/97	Soil	Post-Excavation	TPHC	OQA-QAM-025
C	8/11/97	8/13/97	Soil	Post-Excavation	TPHC	OQA-QAM-025
D	8/11/97	8/13/97	Soil	Post-Excavation	TPHC	OQA-QAM-025
E	8/11/97	8/13/97	Soil	Post-Excavation	TPHC	OQA-QAM-025
F	8/11/97	8/13/97	Soil	Post-Excavation	TPHC	OQA-QAM-025
DUP B	8/11/97	8/13/97	Soil	Post-Excavation	TPHC	OQA-QAM-025
G	8/12/97	8/13/97	Soil	Post-Excavation	TPHC	OQA-QAM-025

Note:
* TPHC Total Petroleum Hydrocarbons

TABLE 2

POST-EXCAVATION SOIL SAMPLING RESULTS
BUILDING 283B, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID/ Depth	Sample Laboratory ID	Sample Date	Analysis Date	Analytical Method Used	Method Detection Limit (mg/kg)	Compound of Concern	Result (mg/kg) *	NJDEP Soil Cleanup Criteria ** (mg/kg)	Exceeds Cleanup Criteria
A/11.0=	2893.01	8/11/97	8/13/97	Total Solid	--	--	73.40	--	--
				TPHC	205	yes	ND	10,000	No
B/11.0=	2893.02	8/11/97	8/13/97	Total Solid	--	--	72.52	--	--
				TPHC	217	yes	ND	10,000	No
C/11.0=	2893.03	8/11/97	8/13/97	Total Solid	--	--	71.55	--	--
				TPHC	219	yes	232.54	10,000	No
D/11.0=	2893.04	8/11/97	8/13/97	Total Solid	--	--	71.37	--	--
				TPHC	211	yes	ND	10,000	No
E/11.0=	2893.05	8/11/97	8/13/97	Total Solid	--	--	74.92	--	--
				TPHC	207	yes	ND	10,000	No
F/11.0=	2893.06	8/11/97	8/13/97	Total Solid	--	--	74.19	--	--
				TPHC	201	yes	ND	10,000	No
DUP B/11.0=	2893.07	8/11/97	8/13/97	Total Solid	--	--	73.38	--	--
				TPHC	205	yes	ND	10,000	No
G/8.0=	2895.01	8/12/97	8/13/97	Total Solid	--	--	79.00	--	--
				TPHC	185	yes	223.45	10,000	No

Note:
* Total Solid results are expressed as a percentage.
** NJDEP Residential Direct Contact soil cleanup criteria for total organics
-- Not detected above stated sample quantitation limit
TPHC Total Petroleum Hydrocarbons

FIGURES

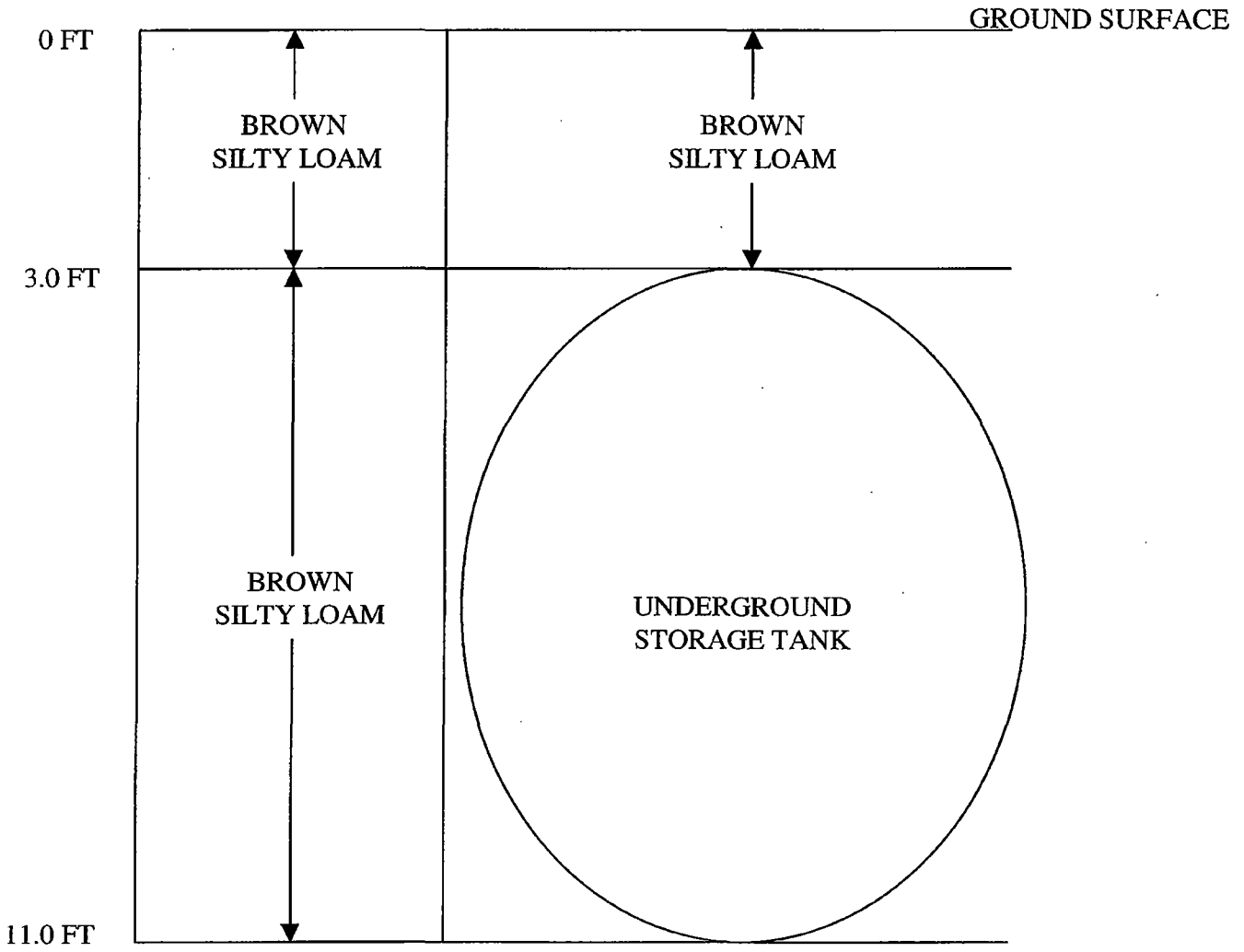

FIGURE 3
CROSS SECTIONAL VIEW
BUILDING 283B
FORT MONMOUTH ARMY BASE
MONMOUTH COUNTY, NJ

SMC ENVIRONMENTAL SERVICES GROUP
Engineers, Managers, Scientists & Planners
VALLEY FORGE, PA.

SCALE: NTS | DATE: AUGUST 1998

Date Rec'd.	
Auth	
Routing	
UST NO.	

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF WATER RESOURCES
CN 029
TRENTON, NEW JERSEY 08625
ATTN: BUST Program
(609) 984-3156

STANDARD REPORTING FORM
for the:
Installation/Abandon/Remove/Sale-Transfer/Substantial Modification
Circle Only One — Use One Form Per Activity

(More than one tank can be listed per tank activity)

Answer questions 1 through 5 and others as applicable:

1. Company name and address: (as it appears on registration questionnaire)

U.S. Army
DEH Bldg. #167
Attn: SELFM-EH
Fort Monmouth, NJ 07703

2. Facility name and location: (if different from above)

U.S. Army Fort Monmouth
Main Post West

3. Contact person for this activity:

Mr. Joseph M. Fallon

Telephone Number: (908) 532-6223

4. The identification number of the affected tank as it appears in Question Number 12 on the Registration Questionnaire: Tank No. 58, 88, 95, 104, 110, 113, 146, 148, 158, & 163
Bldgs. 283A, 614, 622, 676, 692, 701A, 906, 910, 1004, 1103

5. Registration Number (if known): UST - # 0081533

(OVER)

United States Army
Fort Monmouth, New Jersey

Underground Storage Tank Closure and Site Investigation Report

Building 283C
Main Post-West Area

NJDEP UST Registration No. 81533-229
DICAR No. 97-08-28-1330-33

October 2000

UNDERGROUND STORAGE TANK
CLOSURE AND SITE INVESTIGATION REPORT

BUILDING 283C

MAIN POST-WEST AREA
NJDEP UST REGISTRATION NO. 81533-229

OCTOBER 2000

PREPARED FOR:

UNITED STATES ARMY, FORT MONMOUTH, NEW JERSEY
DIRECTORATE OF PUBLIC WORKS
BUILDING 167
FORT MONMOUTH, NJ 07703

PREPARED BY:

Versar INC.
1900 FROST ROAD
SUITE 110
BRISTOL, PA 19007

PROJECT NO. 4435-043

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EXECUTIVE SUMMARY

UST Closure

On August 28, 1997, a steel underground storage tank (UST) was closed by removal in accordance with New Jersey Department of Environmental Protection (NJDEP) closure procedures at the Main Post-West Area of the U.S. Army Fort Monmouth, Fort Monmouth, New Jersey. The UST, NJDEP Registration No. 0081533-229 (Fort Monmouth ID No. 283C), was located south of Building 283C. UST No. 0081533-229 was a 3,000-gallon tank containing gasoline.

Site Assessment-Soil

The site assessment was performed by U.S. Army personnel in accordance with the NJDEP *Technical Requirements for Site Remediation* (N.J.A.C. 7:26E) and the NJDEP *Field Sampling Procedures Manual*. The sampling and laboratory analyses conducted during the site assessment were performed in accordance with Section 7:26E-2.1 of the *Technical Requirements for Site Remediation*. Soils surrounding the tank were screened visually and with air monitoring equipment for evidence of contamination. Following removal, the UST was inspected for corrosion holes. Numerous holes were noted in the UST. Soils at the location of the holes were dark in color and appeared to be contaminated. Based on the inspection of the UST, Directorate of Public Works (DPW) concluded that a discharge of petroleum products was associated with this UST. The NJDEP hotline was notified and the case was assigned DICAR No. 97-08-28-1330-33. Groundwater was encountered at 8.0 feet below ground surface and sheen was observed on groundwater.

On September 3, 1997, following the removal of the UST and associated piping, post-excavation soil samples A, B, C, D, E, F, G, H, I, J, K, L, and DUP D were collected from twelve (12) locations within the UST excavation area. Excavation floor samples A, B, C, D, and DUP D were collected at a depth of 10.0 feet bgs. Sidewall samples E, F, G, H, I, J, K, and L were collected at a depth of 6.5 feet bgs. All samples were analyzed for total petroleum hydrocarbons (TPHC), total solids, lead, and Volatile Organic Compounds (VOCs).

On September 9,1997, following the removal of 84 cubic yards of potentially petroleum contaminated soil from the excavated area, post-excavation soil samples A, B, C, D, E, F, G, H, I, J, K, and DUP D were collected from eleven (11) locations within the UST excavation. Excavation floor samples A, C, D, H, I, J, K, and DUP D were collected at a depth of 13.0 feet bgs. Sidewall samples B, E, F, and G were collected at a depth of 6.5 feet bgs. All samples were analyzed for TPHC, total solids, lead, and VOCs.

On September 15,1997, following the removal of 60 cubic yards of potentially petroleum contaminated soil from the excavated area, post-excavation soil samples A, B, C, D, and DUP B were collected from four (4) locations within the UST excavation. Excavation floor samples A, B, and DUP B were collected at a depth of 13.0 feet bgs. Sidewall samples

C and D were collected at a depth of 6.5 feet bgs. All samples were analyzed for TPHC, total solids, lead, and VOCs.

On September 22,1997, following the removal of 54 cubic yards of potentially petroleum contaminated soil from the excavated area, post-excavation soil samples A, B, C, D, E, F, G, and DUP A were collected from seven (7) locations within the UST excavation area. Excavation floor samples A, B, E, and DUP A were collected at a depth of 13.0 feet bgs. Sidewall samples C, D, F, and G were collected at a depth of 6.5 feet bgs. All samples were analyzed for TPHC, total solids, lead, and VOCs.

On September 26,1997, following the removal of 56 cubic yards of potentially petroleum contaminated soil from the excavated area, post-excavation soil samples A, B, and DUP A were collected along the excavation floor at a depth of 14.0 feet bgs. All samples were analyzed for TPHC, total solids, lead, and VOCs.

On October 3,1997, post-excavation soil samples A, B, C, and DUP A were collected along the former piping length of the excavation. The piping samples were collected at a depth of 1.0 feet bgs. All samples were analyzed for TPHC, total solids, lead, and VOCs.

On July 1,1998, Geoprobe soil sample B1 was collected at a depth of 7.5 feet bgs. The sample was analyzed for TPHC, total solids, lead, and VOCs.

Site Assessment-Findings

Analytical results of post-excavation soil samples collected between September 3, 1997, and October 3, 1997, contained either non-detectable concentrations of contaminants or concentrations of contaminants below the NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC).

Site Assessment-Groundwater

In response to the observation of potentially contaminated soil near the shallow water table, one (1) groundwater sample was collected at Building 283C. On July 1, 1998, Building 283C was analyzed for VOCs calibrated for xylene plus 15 tentatively identified compounds (TICs), methyl tertiary butyl ether (MTBE), tertiary butyl alcohol (TBA), and lead. Sampling and analyses were performed in accordance with the NJDEP *Field Sampling Procedures Manual* and the *Technical Requirements for Site Remediation.*

All groundwater analytical results were either below the method detection limit or in compliance with the New Jersey Ground Water Quality Criteria (GWQC) with the exception of benzene and toluene. Benzene was detected at a concentration of 2,238.10 ug/L, above the GWQC of 1.0 ug/L. Toluene was detected at a concentration of 1,084.57 ug/L, above the GWQC of 1,000 ug/L.

Based on the analytical results of the groundwater sample collected on July 1, 1998, one shallow overburden monitoring well (MW-2) was installed at the Building 283C area on July 28, 1999. The well was installed approximately 5 feet south of the southwestern corner of Building 283C in the vicinity of the former excavation. It was screened in the 5.0 to 20.0 foot depth interval, across the water table, which is approximately 8 to 9 feet below ground

surface.

A second shallow overburden monitoring well (MW-1) was installed at the Building 283C area on March 28, 2000. It was installed approximately 35 feet east of the northeastern corner of Building 283C in the vicinity of the former excavation. It was screened in the 5.0 to 25.0 foot depth interval, across the water table, which is approximately 8 to 9 feet below ground surface.

A third shallow overburden monitoring well (MW-3) was installed at the Building 283C area on March 28, 2000. It was installed approximately 50 feet east of the northwestern corner of Building 283C in the vicinity of the former excavation. It was screened in the 5.0 to 20.0 foot depth interval, across the water table, which is approximately 8 to 9 feet below grade surface.

Monitoring well MW-2 was sampled on September 20, 1999, December 27, 1999, March 23, 1999, June 28, 2000, and August 10, 2000. Monitoring well MW-2 was analyzed for VOCs calibrated for xylene plus 15 TICs, semivolatile organic compounds (SVOCs) plus 15 TICs, pesticide/PCB, and Target Analyte List (TAL) metals.

Monitoring well MW-1 was sampled on June 28, 2000, and August 10, 2000, and analyzed for VOCs calibrated for xylene plus 15 TICs, SVOCs plus 15 TICs, pesticide/PCB, and TAL metals.

Monitoring well MW-3 was sampled on June 28, 2000, and August 10, 2000, and analyzed for VOCs calibrated for xylene plus 15 TICs, SVOCs plus 15 TICs, pesticide/PCB, and TAL metals.

All sampling and analyses were performed in accordance with the NJDEP *Field Sampling Procedures Manual*, and the *Technical Requirements for Site Remediation*, N.J.A.C. 7:26E (*Technical Requirements*).

Findings-Groundwater

A review of the historical groundwater analytical results indicates that concentrations of benzene, ethyl benzene, xylenes, aluminum, iron, and lead have been detected during these sampling events at concentrations that exceed the respective NJDEP GWQS. The highest concentrations historically have been detected in samples collected from MW-2. The groundwater analytical data is summarized in Table 5.

Conclusion and Recommendations

Based on the analytical results of the post-excavation soil samples collected between September 3, 1997, and October 3, 1997, soil quality at the Building 283C UST closure site does not exceed the NJDEP NRDCSCC. Therefore, no further action is warranted.

Based on the analytical results of the groundwater samples collected from MW-1, MW-2, and MW-3, groundwater quality at the Building 283C UST closure site exceeds the New Jersey Groundwater Quality Standard for benzene, ethyl benzene, xylenes, aluminum, iron, and lead. Continued collection of groundwater samples on a quarterly basis from MW-1, MW-2, and MW-3 is recommended. The data will determine if the previously detected contaminant concentrations are declining or if further delineation and remediation activities are necessary. The need for additional actions to address groundwater contamination should be evaluated following receipt of the additional groundwater monitoring data. This may include the performance of additional remedial investigations and/or the preparation of a Remedial Action Work Plan for the site.

1.0 UNDERGROUND STORAGE TANK DECOMMISSIONING ACTIVITIES

1.1 OVERVIEW

One underground storage tank (UST), New Jersey Department of Environmental Protection (NJDEP) Registration No. 81533-229, was closed at Building 283C at the Main Post-West area of U.S. Army Fort Monmouth, Fort Monmouth, New Jersey on August 28, 1997. Refer to the Site Location Map, Figure 1. This report presents the results of the Department of Public Works' (DPW) implementation of the UST Decommissioning/Closure Plan approved by the NJDEP. The UST was a steel 3,000-gallon tank containing gasoline.

Decommissioning activities for UST No. 81533-229 complied with all applicable Federal, State, and Local laws and ordinances in effect at the date of decommissioning. These laws included but were not limited to N.J.A.C. 7:14B-1 et seq., N.J.A.C. 5:23-1 et seq., and Occupational Safety and Health Administration (OSHA) 1910.146 and 1910.120. All permits including but not limited to the NJDEP-approved Decommissioning/Closure Plan were posted onsite for inspection. The decommissioning activities were conducted by DPW personnel who are registered and certified by the NJDEP for performing UST closure activities. Closure of UST No. 81533-229 proceeded under the approval of the NJDEP Bureau of Federal Case Management (NJDEP-BFCM). The Standard Reporting Form and signed Site Assessment Summary form for UST No. 81533-229 are included in Appendices A and B, respectively.

This UST Closure and Site Investigation Report has been prepared by Versar, to assist the U.S. Army DPW in complying with the NJDEP regulations. The applicable NJDEP regulations at the date of closure were the *Interim Closure Requirements for Underground Storage Tank Systems* (N.J.A.C. 7:14B-1 et seq. October 1990 and revisions dated November 1, 1991).

This report was prepared using information collected at the time of closure. Section 1 of this UST Closure and Site Investigation Report provides a summary of the UST decommissioning activities. Section 2 of this report describes the site investigation activities. Conclusions and recommendations, including the results of the soil sampling and groundwater investigation, are presented in the final section of this report.

1.2 SITE DESCRIPTION

Building 283C is located in the Main Post-West area of the Fort Monmouth Army Base. UST No. 0081533-229 was located southwest of Building 283C and appurtenant steel piping ran approximately forty-three (43) feet north from the excavation to Building 283C. A Site Map is provided as Figure 2.

1.2.1 Geological/Hydrogeological Setting

The following is a description of the geological/hydrogeological setting of the area surrounding Building 283C. Included is a description of the regional geology of the area surrounding Fort Monmouth as well as descriptions of the local geology and hydrogeology of the Main Post area.

Regional Geology

Monmouth County lies within the New Jersey Section of the Atlantic Coastal Plain physiographic province. The Main Post, Charles Wood, and the Evans areas are located in what may be referred to as the Outer Coastal Plain subprovince, or the Outer Lowlands.

In general, New Jersey Coastal Plain formations consist of a seaward-dipping wedge of unconsolidated deposits of clay, silt, and gravel. These formations typically strike northeast-southwest with a dip ranging from 10 to 60 feet per mile and were deposited on Precambrian and lower Paleozoic rocks (Zapecza, 1989). These sediments, predominantly derived from deltaic, shallow marine, and continental shelf environments, date from Cretaceous through the Quaternary Periods. The mineralogy ranges from quartz to glauconite.

The formations record several major transgressive/regressive cycles and contain units which are generally thicker to the southeast and reflect a deeper water environment. More than 20 regional geologic units are present within the sediments of the Coastal Plain. Regressive, upward coarsening deposits are usually aquifers (e.g., Englishtown and Kirkwood Formations, and the Cohansey Sand) while the transgressive deposits act as confining units (e.g., the Merchantville, Marshalltown, and Navesink Formations). The individual thicknesses for these units vary greatly (i.e., from several feet to several hundred feet). The Coastal Plain deposits thicken to the southeast from the Fall Line to greater than 6,500 feet in Cape May County (Brown and Zapecza, 1990).

Local Geology

Based on the regional geologic map (Jablonski, 1968), the Cretaceous age Red Bank and Tinton Sands outcrop at the Main Post area. The Red Bank sand conformably overlies the Navesink Formation and dips to the southeast at 35 feet per mile. The upper member (Shrewsbury) of the Red Bank sand is a yellowish-gray to reddish brown clayey, medium-to-coarse-grained sand that contains abundant rock fragments, minor mica and glauconite (Jablonski). The lower member (Sandy Hook) is a dark gray to black, medium-to-fine grained sand with abundant clay, mica, and glauconite.

The Tinton sand conformably overlies the Red Bank Sand and ranges from a clayey medium to very coarse-grained feldspathic quartz and glauconite sand to glauconitic coarse sand. The color varies from dark yellowish orange or light brown to moderate brown and from light olive to grayish olive. Glauconite may constitute 60 to 80 percent of the sand fraction in the upper part of the unit (Minard, 1969). The upper part of the Tinton is often highly oxidized and iron oxide encrusted (Minard).

Hydrogeology

The water table aquifer in the Main Post area is identified as part of the "composite confining units," or minor aquifers. The minor aquifers include the Navesink formation, Red Bank Sand, Tinton Sand, Hornerstown Sand, Vincentown Formation, Manasquan Formation, Shark River Formation, Piney Point Formation, and the basal clay of the Kirkwood Formation.

Based on records of wells drilled in the Main Post area, water is typically encountered at depths of 2 to 9 feet below ground surface (bgs). According to Jablonski, wells drilled in the Red Bank and Tinton Sands may produce 2 to 25 gallons per minute (gpm). Some well owners have reported acidic water that requires treatment to remove iron.

Due to the proximity of the Atlantic Ocean to Fort Monmouth, shallow groundwater may be tidally influenced and may flow toward creeks and brooks as the tide goes out, and away from creeks and brooks as the tide comes in. However, an abundance of clay lenses and sand deposits were noted in borings installed throughout Fort Monmouth. Therefore, the direction of shallow groundwater should be determined on a case-by-case basis.

Shallow groundwater is locally influenced within the Main Post area by the following factors:

- tidal influence (based on proximity to the Atlantic Ocean, rivers, and tributaries)
- topography
- nature of the fill material within the Main Post area
- presence of clay and silt lenses in the natural overburden deposits
- local groundwater recharge areas (i.e., streams, lakes)

Due to the fluvial nature of the overburden deposits (i.e., sand and clay lenses), shallow groundwater flow direction is best determined on a case-by-case basis. This is consistent with lithologies observed in borings installed within the Main Post area, which primarily consisted of fine-to-medium grained sands, with occasional lenses or laminations of gravel silt and/or clay.

Building 283C is located approximately 200 feet south of Parkers Creek, the nearest water body. Based on the Main Post topography, the groundwater flow in the area of Building 283C is anticipated to be to the north.

1.3 HEALTH AND SAFETY

Before, during, and after all decommissioning activities, hazards at the work site which may have posed a threat to the Health and Safety of all personnel who were involved with, or were affected by, the decommissioning of the UST system were minimized. All areas which posed or may have been suspected to pose a vapor hazard were monitored by a qualified individual utilizing an organic vapor analyzer (OVA). The individual ascertained if the area was properly vented to render the area safe, as defined by OSHA.

1.4 REMOVAL OF UNDERGROUND STORAGE TANK

1.4.1 General Procedures

- The contractor performing the closure prior to excavation activities identified all underground obstructions (utilities, etc.).
- All activities were carried out with the greatest regard to safety and health and the safeguarding of the environment.
- All excavated soils were visually examined and screened with an Organic Vapor Analyzer (OVA) for evidence of contamination. Potentially contaminated soils were identified and logged during closure activities.
- Surface materials (i.e., asphalt, concrete, etc.) were excavated and staged separately from all soil and recycled in accordance with all applicable regulations and laws.
- A Subsurface Evaluator from the DPW was present during all site assessment activities.

1.4.2 Underground Storage Tank Excavation and Cleaning

Prior to UST decommissioning activities, surficial soil was removed to expose the UST and associated piping. All free product present in the piping was drained into the UST and the UST was purged to remove vapors prior to cutting and removal of the piping. After removal of the associated piping, a manway was cut in the UST to allow for proper cleaning. The UST was completely emptied of all liquids prior to removal from the ground. Approximately 3,000 gallons of liquid from the UST and associated piping were transported by Lionetti Oil Recovery Co., Inc to the Lionetti Oil Recovery Co., Inc. facility, a NJDEP-approved petroleum recycling and disposal company located in Old Bridge, New Jersey. Refer to Appendix C for the waste manifest.

The UST was cleaned prior to removal from the excavation in accordance with the NJDEP regulations. After the UST was removed from the excavation, it was staged on polyethylene sheeting and examined for holes. Numerous holes were observed during the inspection by the Subsurface Evaluator. Soils surrounding the UST were screened visually and with an OVA for evidence of contamination. Soils were stained and appeared to be contaminated. Approximately 398 cubic yards of potentially contaminated soils were removed from the excavated area and stored at the Fort Monmouth petroleum contaminated soil staging area. Soil screening was also performed along the piping associated with the UST. No contamination was noted anywhere along the piping length. Groundwater was encountered at 8.0 feet below ground surface and sheen was observed on groundwater. See Figure 3 for a cross-sectional view of the excavation area.

1.5 UNDERGROUND STORAGE TANK TRANSPORTATION AND DISPOSAL

The tank was transported in compliance with all applicable regulations and laws to Mazza & Sons, Inc. Please refer to Appendix D for the UST Disposal Certificate.

The UST was labeled prior to transport with the following information:

- Site of origin
- Contact person
- NJDEP UST Facility ID number
- Former contents
- Destination site
- Date

1.6 MANAGEMENT OF EXCAVATED SOILS

Based on OVA air monitoring and TPHC analysis results from the post-excavation soil samples, approximately 398 cubic yards of potentially contaminated soil were removed from the UST excavation. All potentially contaminated soils were stockpiled separately from other excavated material and were placed on and covered with polyethylene sheets. Potentially contaminated soils were transported to the soil staging area. Soils that did not exhibit signs of contamination were used as backfill following the removal of the UST. Groundwater was encountered at 8.0 feet below ground surface and sheen was observed on groundwater.

2.0 SITE INVESTIGATION ACTIVITIES

2.1 OVERVIEW

The Site Investigation was managed and carried out by U.S. Army DPW personnel. All analyses were performed and reported by U.S. Army Fort Monmouth Environmental Laboratory, a NJDEP-certified testing laboratory. All sampling was performed under the direct supervision of a NJDEP Certified Subsurface Evaluator according to the methods described in the NJDEP *Field Sampling Procedures Manual* (1992). Sampling frequency and parameters analyzed complied with the NJDEP document, *Interim Closure Requirements for Underground Storage Tank Systems* (October 1990 and revisions dated November 1, 1991), which was the applicable regulation at the date of the closure. The Fort Monmouth DPW Environmental Office maintains all records of the Site Investigation activities.

The following Parties participated in Closure and Site Investigation Activities:

- Subsurface Evaluator: Gene Lesinski
  Employer: U.S. Army, Fort Monmouth
  Phone Number: (908) 532-0989
  NJDEP Certification No.: 0014537

- Analytical Laboratory:U.S. Army Fort Monmouth Environmental laboratory
  Contact Person: Daniel K. Wright
  Phone Number: (908) 532-4359
  NJDEP Company Certification No.: 13461

- Hazardous Waste Hauler: Lorco Petroleum Services
  Contact Person: Chuck Clayton
  Phone Number: (732) 721-0900

2.2 FIELD SCREENING/MONITORING

Field screening was performed by a NJDEP Certified Subsurface Evaluator using an OVA and visual observations to identify potentially contaminated material. Approximately 398 cubic yards of potentially petroleum-contaminated soils were removed from the excavation area and transported to the Fort Monmouth petroleum contaminated soil holding area. Soils were removed from the excavation until no evidence of contamination remained. Groundwater was encountered at 8.0 feet below ground surface and sheen was observed on groundwater.

2.3 SOIL SAMPLING

On September 3, 1997, following the removal of the UST and associated piping, post-excavation soil samples A, B, C, D, E, F, G, H, I, J, K, L, and DUP D were collected from twelve (12) locations within the UST excavation. Excavation floor samples A, B, C, D, and DUP D were collected at a depth of 10.0 feet bgs. Sidewall samples E, F, G, H, I, J, K, and L were collected at a depth of 6.5 feet bgs. All samples were analyzed for TPHC, total solids, lead, and VOCs.

On September 9,1997, following the removal of 84 cubic yards of potentially petroleum contaminated soil from the excavated area, post-excavation soil samples A, B, C, D, E, F, G, H, I, J, K, and DUP D were collected from a total of eleven (11) locations within the UST excavation. Excavation floor samples A, C, D, H, I, J, K, and DUP D were collected at a depth of 13.0 feet bgs. Sidewall samples B, E, F, and G were collected at a depth of 6.5 feet bgs. All samples were analyzed for TPHC, total solids, lead, and VOCs.

On September 15,1997, following the removal of 60 cubic yards of potentially petroleum contaminated soil from the excavated area, post-excavation soil samples A, B, C, D, and DUP B were collected from a total of four (4) locations within the UST excavation. Excavation floor samples A, B, and DUP B were collected at a depth of 13.0 feet bgs. Sidewall samples C and D were collected at a depth of 6.5 feet bgs. All samples were analyzed for TPHC, total solids, lead, and VOCs.

On September 22,1997, following the removal of 54 cubic yards of potentially petroleum contaminated soil from the excavated area, post-excavation soil samples A, B, C, D, E, F, G, and DUP A were collected from a total of seven (7) locations within the UST excavation. Excavation floor samples A, B, E, and DUP A were collected at a depth of 13.0 feet bgs. Sidewall samples C, D, F, and G were collected at a depth of 6.5 feet bgs. All samples were analyzed for TPHC, total solids, lead, and VOCs.

On September 26,1997, following the removal of 56 cubic yards of potentially petroleum contaminated soil from the excavated area, post-excavation soil samples A, B, and DUP A were collected along the excavation floor at a depth of 14.0 feet bgs. All samples were analyzed for TPHC, total solids, lead, and VOCs.

On October 3,1997, post-excavation soil samples A, B, C, and DUP A were collected along the former piping length of the excavation. The piping samples were collected at a depth of 1.0 feet bgs. All samples were analyzed for TPHC, total solids, lead, and VOCs.

On July 1,1998, geoprobe soil sample B1 was collected at a depth of 7.5 feet bgs. The sample was analyzed for TPHC, total solids, lead, and VOCs.

U.S. Army personnel performed the site assessment in accordance with the NJDEP Technical Requirements and the NJDEP Field Sampling Procedures Manual. A summary of sampling activities including parameters analyzed is provided in Table 1. The post-excavation soil samples were collected using NJDEP *Field Sampling Procedures Manual* (1992) standard sampling procedures. Following soil sampling activities, the samples were chilled and delivered to U.S. Army Fort Monmouth Environmental Laboratory located in

Fort Monmouth, New Jersey, for analysis.

2.4 GROUNDWATER SAMPLING

2.4.1 Monitoring Well Installation

One shallow overburden monitoring well (MW-2) was installed at the Building 283C area on July 28, 1999. The well was installed approximately 5 feet south of the southwestern corner of Building 283C in the vicinity of the former excavation. It was screened in the 5.0 to 20.0 foot depth interval, across the water table, which is approximately 8 to 9 feet below ground surface.

A second shallow overburden monitoring well (MW-1) was installed at the Building 283C area on March 28, 2000. The well was installed approximately 35 feet east of the northeastern corner of Building 283C in the vicinity of the former excavation. It was screened in the 5.0 to 25.0 foot depth interval, across the water table, which is approximately 8 to 9 feet below ground surface.

A third shallow overburden monitoring well (MW-3) was installed at the Building 283C area on March 28, 2000. The well was installed approximately 50 feet east of the northwestern corner of Building 283C in the vicinity of the former excavation. It was screened in the 5.0 to 20.0 foot depth interval, across the water table, which is approximately 8 to 9 feet below ground surface.

The three wells were constructed in accordance with NJDEP's well construction protocols outlined in its May 1992 *Field Sampling Procedures Manual.* The NJDEP well permits and well construction logs are presented in Appendix G.

2.4.2 Monitoring Well Sampling

Monitoring well MW-2 was sampled on September 20, 1999, December 27, 1999, March 23, 1999, June 28, 2000, and August 10, 2000. Monitoring well MW-2 was analyzed for VOCs calibrated for xylene plus 15 TICs, SVOCs plus 15 TICs, pesticide/PCB, and TAL metals.

Monitoring well MW-1 was sampled on June 28, 2000, and August 10, 2000, and analyzed for VOCs calibrated for xylene plus 15 TICs, SVOCs plus 15 TICs, pesticide/PCB, and TAL metals.

Monitoring well MW-3 was sampled on June 28, 2000, and August 10, 2000, and analyzed for VOCs calibrated for xylene plus 15 TICs, SVOCs plus 15 TICs, pesticide/PCB, and TAL metals.

All sampling and analyses were performed in accordance with the NJDEP *Field Sampling Procedures Manual*, and the *Technical Requirements for Site Remediation*, N.J.A.C. 7:26E (*Technical Requirements*).

3.0 CONCLUSIONS AND RECOMMENDATIONS

3.1 SOIL SAMPLING RESULTS

To evaluate soil conditions following removal of the UST and associated soils, forty (40) post-excavation sample results were compared to NJDEP Non-Residential Direct Contact Soil Cleanup Criteria (NRDCSCC) (N.J.A.C. 7:26D and revisions dated May 12, 1999). Summaries of analytical results for soils are presented in Tables 1 to 4 and the associated soil sampling locations are shown on Figure 4. The analytical data package is provided in Appendix E.

Excavation of potentially contaminated soil from the area surrounding the UST was performed between August 28, 1997, and October 3, 1997. Approximately 398 cubic yards of potentially contaminated soil were removed from the excavated area and stored at the Fort Monmouth petroleum contaminated soil staging area.

Analytical results of post-excavation soil samples collected between September 3, 1997, and October 3, 1997, contained either non-detectable concentrations of contaminants or concentrations of contaminants below the NJDEP NRDCSCC.

3.2 GROUNDWATER SAMPLING RESULTS

A review of the historical groundwater analytical results indicates that concentrations of benzene, ethyl benzene, xylenes, aluminum, iron, and lead have been detected during these sampling events above the NJDEP GWQS. The highest concentrations have historically been detected in samples collected from MW-2. The groundwater analytical data is summarized in Table 5 and the groundwater sampling locations are shown on Figure 5. Refer to Appendix F for the groundwater analytical data package.

3.3 CONCLUSIONS AND RECOMMENDATIONS

Based on the analytical results of the post-excavation soil samples collected between September 3, 1997, and October 3, 1997, soil quality at the Building 283C UST closure site does not exceed the NJDEP NRDCSCC. Therefore, no further action is warranted.

Based on the analytical results of the groundwater samples collected from MW-1, MW-2, and MW-3, groundwater quality at the Building 283C UST closure site exceeds the New Jersey GWQS for benzene, ethyl benzene, xylenes, aluminum, iron, and lead. Continued collection of groundwater samples on a quarterly basis from MW-1, MW-2, and MW-3 is recommended. The analysis will determine if the previously detected contaminant concentrations are declining. The need for additional actions to address groundwater quality should be evaluated following receipt of the additional groundwater monitoring data. This may include the performance of further remedial investigations and/or the preparation of a Remedial Action Work Plan for the site.

TABLES

TABLE 1

SUMMARY OF POST-EXCAVATION SAMPLING ACTIVITIES
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID	Date of Collection	Date Analysis Started	Matrix	Sample Type	Analytical Parameters*	Sample Method
**A	9/3/97	9/4/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
**B	9/3/97	9/4/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
**C	9/3/97	9/4/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
D	9/3/97	9/4/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
E	9/3/97	9/4/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
F	9/3/97	9/4/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
G	9/3/97	9/4/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
H	9/3/97	9/4/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
**I	9/3/97	9/4/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
**J	9/3/97	9/4/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
**K	9/3/97	9/4/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
L	9/3/97	9/4/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
DUP D	9/3/97	9/4/97	Soil	Post-excavation	TPHC,VO+15,Lead	Scoop

Note:
* TPHC Total Petroleum Hydrocarbons
** Sample location further remediated and resampled

TABLE 1

SUMMARY OF POST-EXCAVATION SAMPLING ACTIVITIES
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID	Date of Collection	Date Analysis Started	Matrix	Sample Type	Analytical Parameters*	Sample Method
A	9/9/97	9/11/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
B	9/9/97	9/11/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
C	9/9/97	9/11/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
D	9/9/97	9/11/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
E	9/9/97	9/11/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
F	9/9/97	9/11/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
G	9/9/97	9/11/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
H	9/9/97	9/11/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
I	9/10/97	9/11/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
J	9/10/97	9/11/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
K	9/10/97	9/11/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
DUP D	9/10/97	9/11/97	Soil	Post-excavation	TPHC,VO+15,Lead	Scoop

Note:
* TPHC Total Petroleum Hydrocarbons

TABLE 1

SUMMARY OF POST-EXCAVATION SAMPLING ACTIVITIES
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID	Date of Collection	Date Analysis Started	Matrix	Sample Type	Analytical Parameters*	Sample Method
A	9/15/97	9/17/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
B	9/15/97	9/17/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
C	9/15/97	9/17/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
D	9/15/97	9/17/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
DUP B	9/15/97	9/17/97	Soil	Post-excavation	TPHC,VO+15,Lead	Scoop

Note:
* TPHC Total Petroleum Hydrocarbons

TABLE 1

SUMMARY OF POST-EXCAVATION SAMPLING ACTIVITIES
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID	Date of Collection	Date Analysis Started	Matrix	Sample Type	Analytical Parameters*	Sample Method
A	9/15/97	9/17/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
B	9/15/97	9/17/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
C	9/15/97	9/17/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
D	9/15/97	9/17/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
E	9/15/97	9/17/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
F	9/15/97	9/17/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
G	9/15/97	9/17/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
DUP A	9/15/97	9/17/97	Soil	Post-excavation	TPHC,VO+15,Lead	Scoop

Note:
* TPHC Total Petroleum Hydrocarbons

TABLE 1

SUMMARY OF POST-EXCAVATION SAMPLING ACTIVITIES
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID	Date of Collection	Date Analysis Started	Matrix	Sample Type	Analytical Parameters*	Sample Method
A	9/26/97	9/29/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
B	9/26/97	9/29/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
DUP A	9/26/97	9/29/97	Soil	Post-excavation	TPHC,VO+15,Lead	Scoop

Note:
* TPHC Total Petroleum Hydrocarbons

TABLE 1

SUMMARY OF POST-EXCAVATION SAMPLING ACTIVITIES
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID	Date of Collection	Date Analysis Started	Matrix	Sample Type	Analytical Parameters*	Sample Method
A	10/3/97	10/6/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
B	10/3/97	10/6/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
C	10/3/97	10/6/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
D	10/3/97	10/6/97	Soil	Post-Excavation	TPHC,VO+15,Lead	Scoop
DUP A	10/3/97	10/6/97	Soil	Post-excavation	TPHC,VO+15,Lead	Scoop

Note:
* TPHC Total Petroleum Hydrocarbons

TABLE 1

SUMMARY OF POST-EXCAVATION SAMPLING ACTIVITIES
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID	Date of Collection	Date Analysis Started	Matrix	Sample Type	Analytical Parameters*	Sample Method
B1	7/1/98	7/7/98	Soil	Post-Excavation	VO+15,Lead	Geoprobe

Note:
* TPHC Total Petroleum Hydrocarbons

TABLE 2
POST-EXCAVATION SOIL SAMPLING RESULTS
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID/ Depth	Sample Laboratory ID	Sample Date	Analysis Date	Analytical Parameters	Method Detection Limit (mg/kg)	Compound of Concern	Results (mg/kg) *	NJDEP Soil Cleanup Criteria ** (mg/kg)	Exceeds Cleanup Criteria
***A/10.0'=	2957.01	9/3/97	9/4/97	Total Solid	--	--	74.56 %	--	--
				TPHC	202	Yes	717.16	10,000	No
***B/10.0'=	2957.02	9/3/97	9/4/97	Total Solid	--	--	67.94 %	--	--
				TPHC	220	Yes	325.83	10,000	No
***C/10.0'=	2957.03	9/3/97	9/4/97	Total Solid	--	--	70.81 %	--	--
				TPHC	214	Yes	363.79	10,000	No
D/10.0'=	2957.04	9/3/97	9/4/97	Total Solid	--	--	71.47 %	--	--
				TPHC	214	Yes	314.25	10,000	No
E/6.5'=	2957.05	9/3/97	9/4/97	Total Solid	--	--	72.45 %	--	--
				TPHC	210	Yes	ND	10,000	No
F/6.5'=	2957.06	9/3/97	9/4/97	Total Solid	--	--	73.25 %	--	--
				TPHC	206	Yes	377.63	10,000	No
G/6.5'=	2957.07	9/3/97	9/4/97	Total Solid	--	--	73.19 %	--	--
				TPHC	213	Yes	ND	10,000	No
H/6.5'=	2957.08	9/3/97	9/4/97	Total Solid	--	--	75.98 %	--	--
				TPHC	200	Yes	272.56	10,000	No
***I/6.5'=	2957.09	9/3/97	9/4/97	Total Solid	--	--	75.28 %	--	--
				TPHC	191	Yes	1175.59	10,000	No
***J/6.5'=	2957.10	9/3/97	9/4/97	Total Solid	--	--	76.08 %	--	--
				TPHC	197	Yes	822.61	10,000	No

Note:

*	Total Solid results are expressed as a percentage.
**	NJDEP Residential Direct Contact soil cleanup criteria for total organics
***	Sample location further remediated and resampled
ND	Not detected above stated method detection limit
TPHC	Total Petroleum Hydrocarbons

TABLE 2

POST-EXCAVATION SOIL SAMPLING RESULTS
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID/ Depth	Sample Laboratory ID	Sample Date	Analysis Date	Analytical Parameters	Method Detection Limit (mg/kg)	Compound of Concern	Results (mg/kg) *	NJDEP Soil Cleanup Criteria ** (mg/kg)	Exceeds Cleanup Criteria
***K/8.5'=	2957.11	9/3/97	9/4/97	Total Solid	--	--	73.05 %	--	--
				TPHC	211	Yes	4351.68	10,000	No
L/6.5'=	2957.12	9/3/97	9/4/97	Total Solid	--	--	77.42 %	--	--
				TPHC	189	Yes	293.95	10,000	No
DUPD/6.5'=	2957.13	9/3/97	9/4/97	Total Solid	--	--	73.11 %	--	--
				TPHC	206	Yes	263.38	10,000	No

Note:

*	Total Solid results are expressed as a percentage.
**	NJDEP Residential Direct Contact soil cleanup criteria for total organics
***	Sample location further remediated and resampled
ND	Not detected above stated method detection limit
TPHC	Total Petroleum Hydrocarbons

TABLE 2

POST-EXCAVATION SOIL SAMPLING RESULTS
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID/ Depth	Sample Laboratory ID	Sample Date	Analysis Date	Analytical Parameters	Method Detection Limit (mg/kg)	Compound of Concern	Results (mg/kg) *	NJDEP Soil Cleanup Criteria ** (mg/kg)	Exceeds Cleanup Criteria
A/12.0'=	2980.01	9/9/97	9/11/97	Total Solid	--	--	73.63 %	--	--
				TPHC	203	Yes	206.50	10.000	No
B/6.5'=	2980.02	9/9/97	9/11/97	Total Solid	--	--	75.07 %	--	--
				TPHC	203	Yes	756.60	10.000	No
C/13.0'=	2980.03	9/9/97	9/11/97	Total Solid	--	--	76.53 %	--	--
				TPHC	194	Yes	ND	10.000	No
D/13.0'=	2980.04	9/9/97	9/11/97	Total Solid	--	--	72.38 %	--	--
				TPHC	205	Yes	ND	10.000	No
E/6.5'=	2980.05	9/9/97	9/11/97	Total Solid	--	--	73.18 %	--	--
				TPHC	209	Yes	1919.13	10.000	No
F/6.5'=	2980.06	9/9/97	9/11/97	Total Solid	--	--	74.68 %	--	--
				TPHC	195	Yes	1939.40	10.000	No
G/6.5'=	2980.07	9/9/97	9/11/97	Total Solid	--	--	75.38 %	--	--
				TPHC	200	Yes	ND	10.000	No
H/13.0'=	2980.08	9/9/97	9/11/97	Total Solid	--	--	76.13 %	--	--
				TPHC	191	Yes	ND	10.000	No
I/13.0'=	2980.09	9/10/97	9/11/97	Total Solid	--	--	75.79 %	--	--
				TPHC	203	Yes	ND	10.000	No
J/13.0'=	2980.10	9/10/97	9/11/97	Total Solid	--	--	74.93 %	--	--
				TPHC	197	Yes	ND	10.000	No

Note:
* Total Solid results are expressed as a percentage.
** NJDEP Residential Direct Contact soil cleanup criteria for total organics
ND Not detected above stated method detection limit
TPHC Total Petroleum Hydrocarbons

TABLE 2

POST-EXCAVATION SOIL SAMPLING RESULTS
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID/ Depth	Sample Laboratory ID	Sample Date	Analysis Date	Analytical Parameters	Method Detection Limit (mg/kg)	Compound of Concern	Results (mg/kg) *	NJDEP Soil Cleanup Criteria ** (mg/kg)	Exceeds Cleanup Criteria
K/13.0'=	2980.11	9/10/97	9/11/97	Total Solid	--	--	75.66 %	--	--
				TPHC	206	Yes	ND	10.000	No
DUPD/13.0'=	2980.12	9/10/97	9/11/97	Total Solid	--	--	76.12 %	--	--
				TPHC	201	Yes	ND	10.000	No

Note:

*	Total Solid results are expressed as a percentage.
**	NJDEP Residential Direct Contact soil cleanup criteria for total organics
ND	Not detected above stated method detection limit
TPHC	Total Petroleum Hydrocarbons

TABLE 2

POST-EXCAVATION SOIL SAMPLING RESULTS
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID/ Depth	Sample Laboratory ID	Sample Date	Analysis Date	Analytical Parameters	Method Detection Limit (mg/kg)	Compound of Concern	Results (mg/kg) *	NJDEP Soil Cleanup Criteria ** (mg/kg)	Exceeds Cleanup Criteria
A/13.0'=	2992.01	9/15/97	9/17/97	Total Solid	--	--	76.19 %	--	--
				TPHC	206	Yes	ND	10.000	No
B/13.0'=	2992.02	9/15/97	9/17/97	Total Solid	--	--	75.05 %	--	--
				TPHC	201	Yes	ND	10.000	No
C/6.5'=	2992.03	9/15/97	9/17/97	Total Solid	--	--	71.45 %	--	--
				TPHC	206	Yes	ND	10.000	No
D/6.5'=	2992.04	9/15/97	9/17/97	Total Solid	--	--	73.97 %	--	--
				TPHC	201	Yes	226.76	10.000	No
DUPB/13.0'=	2992.05	9/15/97	9/17/97	Total Solid	--	--	76.64 %	--	--
				TPHC	201	Yes	226.20	10.000	No

Note:
* Total Solid results are expressed as a percentage.
** NJDEP Residential Direct Contact soil cleanup criteria for total organics
ND Not detected above stated method detection limit
TPHC Total Petroleum Hydrocarbons

TABLE 2

POST-EXCAVATION SOIL SAMPLING RESULTS
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID/ Depth	Sample Laboratory ID	Sample Date	Analysis Date	Analytical Parameters	Method Detection Limit (mg/kg)	Compound of Concern	Results (mg/kg) *	NJDEP Soil Cleanup Criteria ** (mg/kg)	Exceeds Cleanup Criteria
A/13.0'=	3008.01	9/22/97	9/24/97	Total Solid	--	--	74.50 %	--	--
				TPHC	201	Yes	ND	10,000	No
B/13.0'=	3008.02	9/22/97	9/24/97	Total Solid	--	--	73.98 %	--	--
				TPHC	204	Yes	ND	10,000	No
C/6.5'=	3008.03	9/22/97	9/24/97	Total Solid	--	--	72.11 %	--	--
				TPHC	203	Yes	ND	10,000	No
D/6.5'=	3008.04	9/22/97	9/24/97	Total Solid	--	--	71.13 %	--	--
				TPHC	220	Yes	221.18	10,000	No
E/13.0'=	3008.05	9/23/97	9/24/97	Total Solid	--	--	72.72 %	--	--
				TPHC	208	Yes	ND	10,000	No
F/6.5'=	3008.06	9/23/97	9/24/97	Total Solid	--	--	73.43 %	--	--
				TPHC	212	Yes	247.98	10,000	No
G/6.5'=	3008.07	9/23/97	9/24/97	Total Solid	--	--	73.37 %	--	--
				TPHC	199	Yes	ND	10,000	No
DUPA/13.0'=	3008.08	9/23/97	9/24/97	Total Solid	--	--	75.34 %	--	--
				TPHC	204	Yes	ND	10,000	No

Note:

* Total Solid results are expressed as a percentage.

** NJDEP Residential Direct Contact soil cleanup criteria for total organics

ND Not detected above stated method detection limit

TPHC Total Petroleum Hydrocarbons

TABLE 2

POST-EXCAVATION SOIL SAMPLING RESULTS
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID/ Depth	Sample Laboratory ID	Sample Date	Analysis Date	Analytical Parameters	Method Detection Limit (mg/kg)	Compound of Concern	Results (mg/kg) *	NJDEP Soil Cleanup Criteria ** (mg/kg)	Exceeds Cleanup Criteria
A/14.0'=	3014.01	9/26/97	9/29/97	Total Solid	--	--	75.35 %	--	--
				TPHC	197	Yes	ND	10,000	No
B/14.0'=	3014.02	9/26/97	9/29/97	Total Solid	--	--	74.34 %	--	--
				TPHC	200	Yes	ND	10,000	No
DUPA/14.0'=	3014.03	9/26/97	9/29/97	Total Solid	--	--	75.39 %	--	--
				TPHC	198	Yes	ND	10,000	No

Note:
* Total Solid results are expressed as a percentage.
** NJDEP Residential Direct Contact soil cleanup criteria for total organics
ND Not detected above stated method detection limit
TPHC Total Petroleum Hydrocarbons

TABLE 2

POST-EXCAVATION SOIL SAMPLING RESULTS
BUILDING 283C, MAIN POST-WEST AREA
FORT MONMOUTH, NEW JERSEY

Sample ID/ Depth	Sample Laboratory ID	Sample Date	Analysis Date	Analytical Parameters	Method Detection Limit (mg/kg)	Compound of Concern	Results (mg/kg) *	NJDEP Soil Cleanup Criteria ** (mg/kg)	Exceeds Cleanup Criteria
A/1.0'=	3032.01	10/3/97	10/6/97	Total Solid	--	--	82.99 %	--	--
				TPHC	180	Yes	ND	10,000	No
B/1.0'=	3032.02	10/3/97	10/6/97	Total Solid	--	--	84.85 %	--	--
				TPHC	185	Yes	ND	10,000	No
C/1.0'=	3032.03	10/3/97	10/6/97	Total Solid	--	--	84.66 %	--	--
				TPHC	185	Yes	ND	10,000	No
D/1.0'=	3032.04	10/3/97	10/6/97	Total Solid	--	--	86.26 %	--	--
				TPHC	176	Yes	ND	10,000	No
DUPA/1.0'=	3032.05	10/3/97	10/6/97	Total Solid	--	--	82.50 %	--	--
				TPHC	184	Yes	ND	10,000	No

Note:

* Total Solid results are expressed as a percentage.

** NJDEP Residential Direct Contact soil cleanup criteria for total organics

ND Not detected above stated method detection limit

TPHC Total Petroleum Hydrocarbons

TABLE 3

SUMMARY OF ANALYTICAL RESULTS FOR SOIL
BUILDING NO. 283C
FORT MONMOUTH, NEW JERSEY

Sample I.D.	Laboratory I.D.	Sample Date	Acetone	Methylene Chloride	Benzene	Toulene	Ethylbenzene	Xylenes(Total)
UNITS:			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
NJDEP CRITERIA:	Residential		1000	49	3	1000	1000	410
	Non-Residential		1000	210	13	1000	1000	1000
*A	2957.01	09/03/97	U	U	21	56	41	147
*B	2957.02	09/03/97	U	U	8.7	6.7	1.6	7.7
*C	2957.03	09/03/97	56	U	10	16	3.2	19
D	2957.04	09/03/97	U	U	U	U	U	U
E	2957.05	09/03/97	U	U	0.61	U	.32 J	1.48 J
F	2957.06	09/03/97	58	U	2.3	2.5	.37 J	2.19
G	2957.07	09/03/97	U	U	U	U	U	U
H	2957.08	09/03/97	U	1.6	U	U	U	U
*I	2957.09	09/03/97	U	U	5.5	6.5	35	72.2
*J	2957.10	09/03/97	U	5.9	5.8	15	24	58.5
*K	2957.11	09/03/97	U	U	5	4.7	6.1	15
L	2957.12	09/03/97	U	U	0.65	0.5	3.1	6.8
DUP D	2957.13	09/03/97	U	U	U	U	.25 J	.84 J

Abbreviations:

mg/kg: Milligrams per Kilogram.

U: Compound searched for but not detected.

J: Compound identified below detection limit.

Notes:

Gray shading indicates exceedance of New Jersey Non-Residential Direct Contact Soil Cleanup Criteria

* Sample location further remediated and resampled.

TABLE 3

SUMMARY OF ANALYTICAL RESULTS FOR SOIL
BUILDING NO. 283C
FORT MONMOUTH, NEW JERSEY

Sample I.D.	Laboratory I.D.	Sample Date	Acetone	Methylene Chloride	Benzene	Toulene	Ethylbenzene	Xylenes(Total)
UNITS:			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
NJDEP CRITERIA:	Residential		1000	49	3	1000	1000	3,410
	Non-Residential		1000	210	13	1000	1000	1000
A	2980.01	09/09/97	U	U	4.2	10	3	15.3
B	2980.02	09/09/97	U	U	1.3	8.1	23	87
C	2980.03	09/09/97	U	U	1.4	4.1	0.78	2.19
D	2980.04	09/09/97	U	U	1.5	2.4	0.99	4.4
E	2980.05	09/09/97	U	U	5.4	10	44 E	153 E
F	2980.06	09/09/97	U	U	2.7	15	25	128 E
G	2980.07	09/09/97	U	U	U	U	U	U
H	2980.08	09/09/97	U	U	0.29	U	U	0.68
I	2980.09	09/10/97	U	U	7.1	15	0.67 J	1.86 J
J	2980.10	09/10/97	U	U	2.3	3	U	U
K	2980.11	09/10/97	U	U	1.5	1.1	U	U
DUP D	2980.12	09/09/97	U	U	1.6	2.6	1	4.4

Abbreviations:

mg/kg: Milligrams per Kilogram.

U: Compound searched for but not detected.

J: Compound identified below detection limit.

E: Estimated value above the calibration curve.

TABLE 3

SUMMARY OF ANALYTICAL RESULTS FOR SOIL
BUILDING NO. 283C
FORT MONMOUTH, NEW JERSEY

Sample I.D.	Laboratory I.D.	Sample Date	Acetone	Methylene Chloride	Benzene	Toulene	Ethylbenzene	Xylenes(Total)
UNITS			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
NJDEP CRITERIA	Residential		1000	49	3	1000	1000	410
	Non-Residential		1000	210	13	1000	1000	1000
A	2992.01	09/15/00	U	U	U	U	U	U
B	2992.02	09/15/00	U	U	U	U	U	U
C	2992.03	09/15/00	U	U	U	U	U	U
D	2992.04	09/15/00	U	U	U	U	U	U
DUP B	2992.05	09/15/00	U	U	U	U	U	U

Abbreviations:

mg/kg: Milligrams per Kilogram.

U: Compound searched for but not detected.

TABLE 3

SUMMARY OF ANALYTICAL RESULTS FOR SOIL
BUILDING NO. 283C
FORT MONMOUTH, NEW JERSEY

Sample I.D.	Laboratory I.D.	Sample Date	Acetone	Methylene Chloride	Benzene	Toulene	Ethylbenzene	Xylenes(Total)
UNITS			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
NJDEP CRITERIA	Residential		1000	49	3	1000	1000	410
	Non-Residential		1000	210	13	1000	1000	1000
A	3008.01	09/22/00	U	U	0.64	U	U	U
B	3008.02	09/22/00	U	U	1.1	U	U	U
C	3008.03	09/22/00	U	U	0.52	U	0.51 J	2.95
D	3008.04	09/22/00	U	U	0.42	U	0.37 J	2.54
E	3008.05	09/23/00	U	U	1.2	U	U	U
F	3008.06	09/23/00	U	U	U	U	0.19 J	0.82 J
G	3008.07	09/23/00	U	U	U	U	U	U
DUP A	3008.08	09/22/00	U	U	1.2	U	U	U

Abbreviations:

mg/kg: Milligrams per Kilogram.
U: Compound searched for but not detected.
J: Compound identified below detection limit.

TABLE 3

SUMMARY OF ANALYTICAL RESULTS FOR SOIL
BUILDING NO. 283C
FORT MONMOUTH, NEW JERSEY

Sample I.D.	Laboratory I.D.	Sample Date	Acetone	Methylene Chloride	Benzene	Toulene	Ethylbenzene	Xylenes(Total)
UNITS			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
NJDEP CRITERIA	Residential		1000	49	3	1000	1000	410
	Non-Residential		1000	210	13	1000	1000	1000
A	3014.01	09/26/97	U	U	U	U	U	U
B	3014.02	09/26/97	U	U	U	U	U	U
DUP A	3014.03	09/26/97	U	U	U	U	U	U

Abbreviations:

mg/kg: Milligrams per Kilogram.

U: Compound searched for but not detected.

TABLE 3

SUMMARY OF ANALYTICAL RESULTS FOR SOIL
BUILDING NO. 283C
FORT MONMOUTH, NEW JERSEY

Sample I.D.	Laboratory I.D.	Sample Date	Acetone	Methylene Chloride	Benzene	Toulene	Ethylbenzene	Xylenes(Total)
UNITS:			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
NJDEP CRITERIA:	Residential		1000	49	3	1000	1000	410
	Non-Residential		1000	210	13	1000	1000	1000
A	3032.01	10/03/97	U	U	U	U	U	U
B	3032.02	10/03/97	U	U	U	U	U	U
C	3032.03	10/03/97	U	U	U	U	U	U
D	3032.04	10/03/97	U	U	U	U	U	U
DUP A	3032.05	10/03/97	U	U	U	U	U	U
B-1	3693.04	07/01/98	U	U	0.38	2.70	7.70	39

Abbreviations:

mg/kg: Milligrams per Kilogram.
U: Compound searched for but not detected.

TABLE 4

SUMMARY OF ANALYTICAL RESULTS FOR LEAD
BUILDING 283C
FORT MONMOUTH, NEW JERSEY

Site: B283-C
Lab ID #: 2957.01-.13
Matrix: Soils

Sample Received: 9/3/97
Analysis Start: 9/10/97
Analysis Completed: 9/11/97

LABORATORY I.D. #	SAMPLE LOCATION	RESULT (mg/Kg)	NRDCSCC (mg/Kg)
2957.01	*283C-A	59.83	600
2957.02	*283C-B	ND	600
2957.03	*283C-C	ND	600
2957.04	283C-D	ND	600
2957.05	283C-E	ND	600
2957.06	283C-F	ND	600
2957.07	283C-G	ND	600
2957.08	283C-H	ND	600
2957.09	*283C-I	8.51	600
2957.10	*283C-J	3.34	600
2957.11	*283C-K	4.94	600
2957.12	283C-L	ND	600
2957.13	283C-DUP	ND	600

Note:
mg/kg: Milligrams per Kilogram.
ND: Not Detected.
*: Sample location further remediated and resampled.
NRDCSCC refers to the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria

TABLE 4

SUMMARY OF ANALYTICAL RESULTS FOR LEAD
BUILDING 283C
FORT MONMOUTH, NEW JERSEY

Site: B283-C
Lab ID #: 2980.01-.12
Matrix: Soils

Sample Received: 9/10/97
Analysis Start: 9/15/97
Analysis Completed: 9/15/97

LABORATORY I.D. #	SAMPLE LOCATION	RESULT (mg/Kg)	NRDCSCC (mg/Kg)
2980.01	283C-A	ND	600
2980.02	283C-B	ND	600
2980.03	283C-C	ND	600
2980.04	283C-D	ND	600
2980.05	283C-E	ND	600
2980.06	283C-F	ND	600
2980.07	283C-G	ND	600
2980.08	283C-H	ND	600
2980.09	283C-I	ND	600
2980.10	283C-J	ND	600
2980.11	283C-K	ND	600
2980.12	283C-DUP	ND	600

Note:
mg/kg: Milligrams per Kilogram.
ND: Not Detected.
NRDCSCC refers to the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria

TABLE 4

SUMMARY OF ANALYTICAL RESULTS FOR LEAD
BUILDING 283C
FORT MONMOUTH, NEW JERSEY

Site: B283-C
Lab ID #: 2992.01-.05
Matrix: Soils

Sample Received: 9/16/97
Analysis Start: 9/19/97
Analysis Completed: 9/19/97

LABORATORY I.D. #	SAMPLE LOCATION	RESULT (mg/Kg)	NRDCSCC (mg/Kg)
2992.01	283C-A	3.35	600
2992.02	283C-B	ND	600
2992.03	283C-D	2.83	600
2992.04	283C-E	1.36	600
2992.05	283C-DUP	ND	600

Note:
mg/kg: Milligrams per Kilogram.
ND: Not Detected.
NRDCSCC refers to the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria

TABLE 4

SUMMARY OF ANALYTICAL RESULTS FOR LEAD
BUILDING 283C
FORT MONMOUTH, NEW JERSEY

Site: B283-C
Lab ID #: 3008.01-.08
Matrix: Soils

Sample Received: 9/23/97
Analysis Start: 9/30/97
Analysis Completed: 9/30/97

LABORATORY I.D. #	SAMPLE LOCATION	RESULT (mg/Kg)	NRDCSCC (mg/Kg)
3008.01	283C-A	ND	600
3008.02	283C-B	ND	600
3008.03	283C-C	ND	600
3008.04	283C-D	ND	600
3008.05	283C-E	ND	600
3008.06	283C-F	ND	600
3008.07	283C-G	ND	600
3008.08	283C-DUP	ND	600

Note:
mg/kg: Milligrams per Kilogram.
ND: Not Detected.
NRDCSCC refers to the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria

TABLE 4

SUMMARY OF ANALYTICAL RESULTS FOR LEAD
BUILDING 283C
FORT MONMOUTH, NEW JERSEY

Site: B283-C
Lab ID #: 3014.01-.03
Matrix: Soils

Sample Received: 9/26/97
Analysis Start: 9/30/97
Analysis Completed: 9/30/97

LABORATORY I.D. #	SAMPLE LOCATION	RESULT (mg/Kg)	NRDCSCC (mg/Kg)
3014.01	283C-A	ND	600
3014.02	283C-B	ND	600
3014.03	283C-DUP	ND	600

Note:
mg/kg: Milligrams per Kilogram.
ND: Not Detected.
NRDCSCC refers to the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria

TABLE 4

SUMMARY OF ANALYTICAL RESULTS FOR LEAD
BUILDING 283C
FORT MONMOUTH, NEW JERSEY

Site: B283-C
Lab ID #: 3032.01-.05
Matrix: Soils

Sample Received: 10/03/97
Analysis Start: 10/09/97
Analysis Completed: 10/10/97

LABORATORY I.D. #	SAMPLE LOCATION	RESULT (mg/Kg)	NRDCSCC (mg/Kg)
3032.01	283C-A	6.66	600
3032.02	283C-B	ND	600
3032.03	283C-C	12.66	600
3032.04	283C-D	1.99	600
3032.05	283C-DUP	4.50	600

Note:
mg/kg: Milligrams per Kilogram.
ND: Not Detected.
NRDCSCC refers to the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria

TABLE 4

SUMMARY OF ANALYTICAL RESULTS FOR LEAD
BUILDING 283C
FORT MONMOUTH, NEW JERSEY

Site: B283-C
Lab ID #: 3693.04
Matrix: Soils

Sample Received: 7/01/98
Analysis Start: 7/07/98
Analysis Completed: 7/08/98

LABORATORY I.D. #	SAMPLE LOCATION	RESULT (mg/Kg)	NRDCSCC (mg/Kg)
3693.04	B-1	ND	600

Note:
mg/kg: Milligrams per Kilogram.
ND: Not Detected.
NRDCSCC refers to the New Jersey Non-Residential Direct Contact Soil Cleanup Criteria

TABLE 5

SUMMARY OF ANALYTICAL RESULTS FOR GROUNDWATER
BUILDING NO. 283C
FORT MONMOUTH, NEW JERSEY

Well	Sample Date	Aluminum	Iron	Lead	Manganese	Nickel
UNITS		ug/L	ug/L	ug/L	ug/L	ug/L
NJDEP CRITERIA		200	300	5	50	100
283MW01	06/28/00	2070.00	1450.00	ND	22.20	10.40
283MW01	08/10/00	1930.00	739.00	2.38	23.80	5.91

Note:

Gray shading indicates exceedance of New Jersey Ground Water Quality Criteria (GWQC) defined in NJAC 7:9-6.

Abbreviations:

MW:	Monitoring Well.
ND:	Not Detected.
ug/L:	Micrograms per liter.

TABLE 5

SUMMARY OF ANALYTICAL RESULTS FOR GROUNDWATER
BUILDING NO. 283C
FORT MONMOUTH, NEW JERSEY

Well	Sample Date	Acetone	Chloromethane	Benzene	Toulene	Ethylbenzene	Xylenes (total)	Phenols	2,4-Dimethyl phenol	Naphthalene	2-Methyl naphthalene
UNITS:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
NJDEP CRITERIA:		700	30	1	1000	700	40	4000	100	NLE	NLE
283MW02	09/20/99	ND	15.51	536.90	598.40	797.40	3831.40	ND	3.88	119.20	25.25
283MW02	12/27/99	ND	ND	720.56	413.22	422.50	2125.86	ND	ND	183.38	26.28
283MW02	03/23/00	ND	ND	827.72	511.78	725.71	4295.69	5.11	3.90	82.44	7.43
283MW02	06/28/00	7.16	ND	908.16	663.58	1129.23	5960.70	ND	ND	174.92	25.10
283MW02	08/10/00	15.55	ND	152.00	381.19	747.50	4009.44	ND	1.48	101.97	25.13

Note:

Gray shading indicates exceedance of New Jersey Ground Water Quality Criteria (GWQC) defined in NJAC 7:9-6.

Abbreviations:

MW: Monitoring Well.
ND: Not Detected.
ug/L: Micrograms per liter.
NLE: No limit established.

TABLE 5

SUMMARY OF ANALYTICAL RESULTS FOR GROUNDWATER
BUILDING NO. 283C
FORT MONMOUTH, NEW JERSEY

Well	Sample Date	Nitro-benzene	Aluminum	Arsenic	Iron	Lead	Thallium	Manganese	Mercury	Nickel	Selenium
UNITS:		ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
NJDEP CRITERIA:		10	200	8	300	5	10	50	2	100	50
283MW02	09/20/99	ND	309.00	4.74	2330.00	22.00	8.76	14.50	ND	4.11	6.49
283MW02	12/27/99	ND	123.00	ND	2060.00	6.92	ND	44.00	0.30	3.62	4.73
283MW02	03/23/00	ND	241.00	ND	2010.00	15.80	ND	11.90	0.20	6.43	7.29
283MW02	06/28/00	ND	81.40	ND	2130.00	11.50	ND	8.31	ND	6.01	4.36
283MW02	08/10/00	1.17	812.00	3.40	2060.00	31.90	ND	5.97	ND	ND	8.40

Note:

Gray shading indicates exceedance of New Jersey Ground Water Quality Criteria (GWQC) defined in NJAC 7:9-6.

Abbreviations:

MW: Monitoring Well.

ND: Not Detected.

ug/L: Micrograms per liter.

TABLE 5

SUMMARY OF ANALYTICAL RESULTS FOR GROUNDWATER
BUILDING NO. 283C
FORT MONMOUTH, NEW JERSEY

Well	Sample Date	Benzene	Aluminum	Arsenic	Manganese	Nickel
UNITS:		ug/L	ug/L	ug/L	ug/L	ug/L
NJDEP CRITERIA:		1	200	8	50	100
283MW03	06/28/00	9.25	3920.00	ND	36.90	9.39
283MW03	08/10/00	11.76	302.00	3.56	30.80	2.93

Note:

Gray shading indicates exceedance of New Jersey Ground Water Quality Criteria (GWQC) defined in NJAC 7:9-6.

Abbreviations:

MW:	Monitoring Well.
ND:	Not Detected.
ug/L:	Micrograms per liter.

TABLE 5

SUMMARY OF ANALYTICAL RESULTS FOR GROUNDWATER
BUILDING NO. 283C
FORT MONMOUTH, NEW JERSEY

Laboratory I.D.	Sample Date	Benzene	Toluene	Ethylbenzene	m+p-Xylenes	o-Xylene
UNITS:		ug/L	ug/L	ug/L	ug/L	ug/L
NJDEP CRITERIA		1	200	700	NLE	NLE
B1	07/01/98	2238.10 D	1600.00 D	396.85 D	936.96 D	654.05 D

Note:

Gray shading indicates exceedance of New Jersey Ground Water Quality Criteria (GWQC) defined in NJAC 7:9-6.

Abbreviations:

MW:	Monitoring Well.
ND:	Not Detected.
ug/L:	Micrograms per liter.
D:	Value from dilution.
NLE:	No limit established.

FIGURES

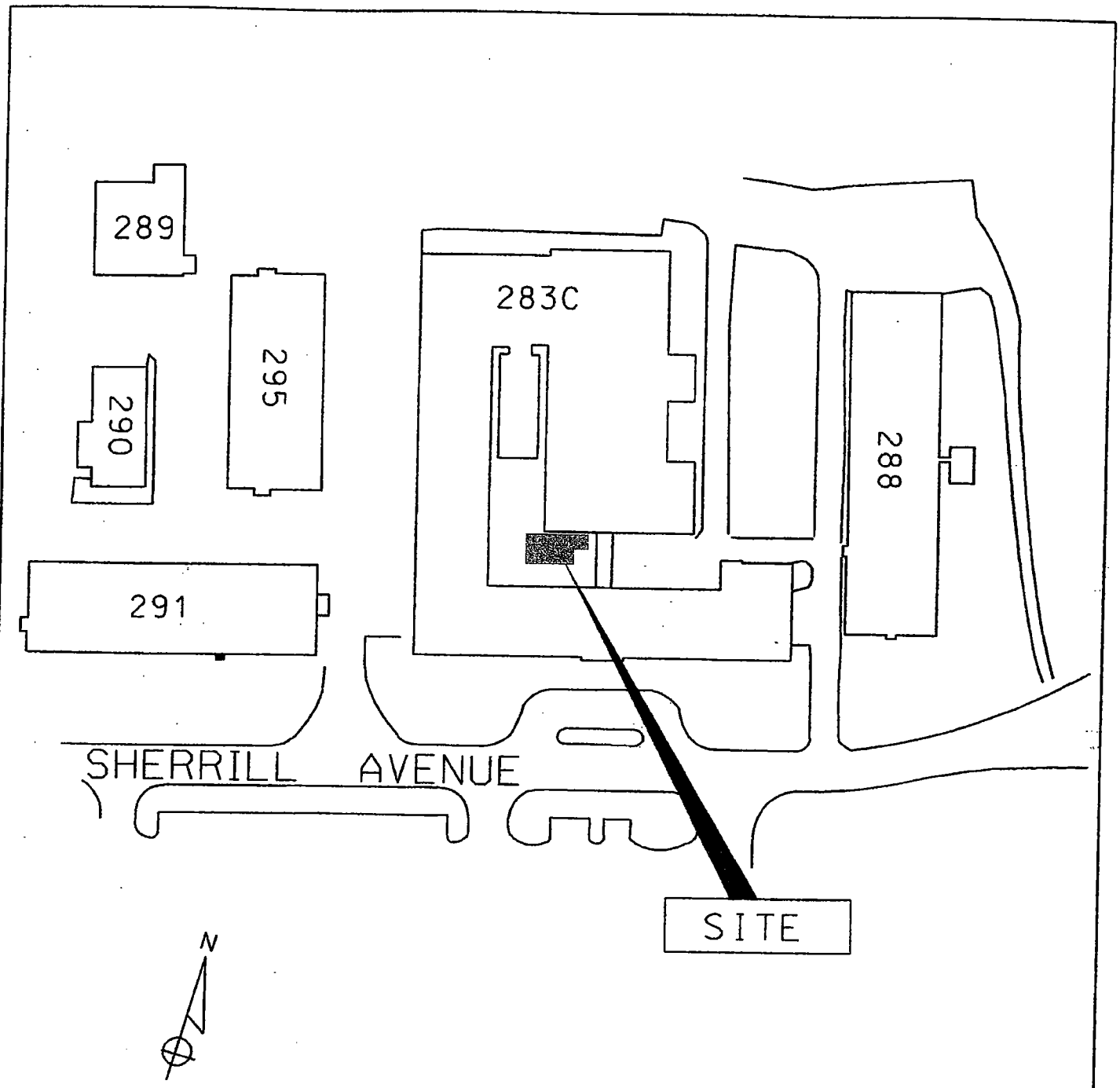


FIGURE 2
SITE MAP
BUILDING 283C
FORT MONMOUTH ARMY BASE
MONMOUTH COUNTY, NJ

VERSAR
ENGINEERS, MANAGERS, SCIENTISTS & PLANNERS
BRISTOL, PA.

SCALE: 1"=100'

DATE: AUGUST 1997

283C FIG2

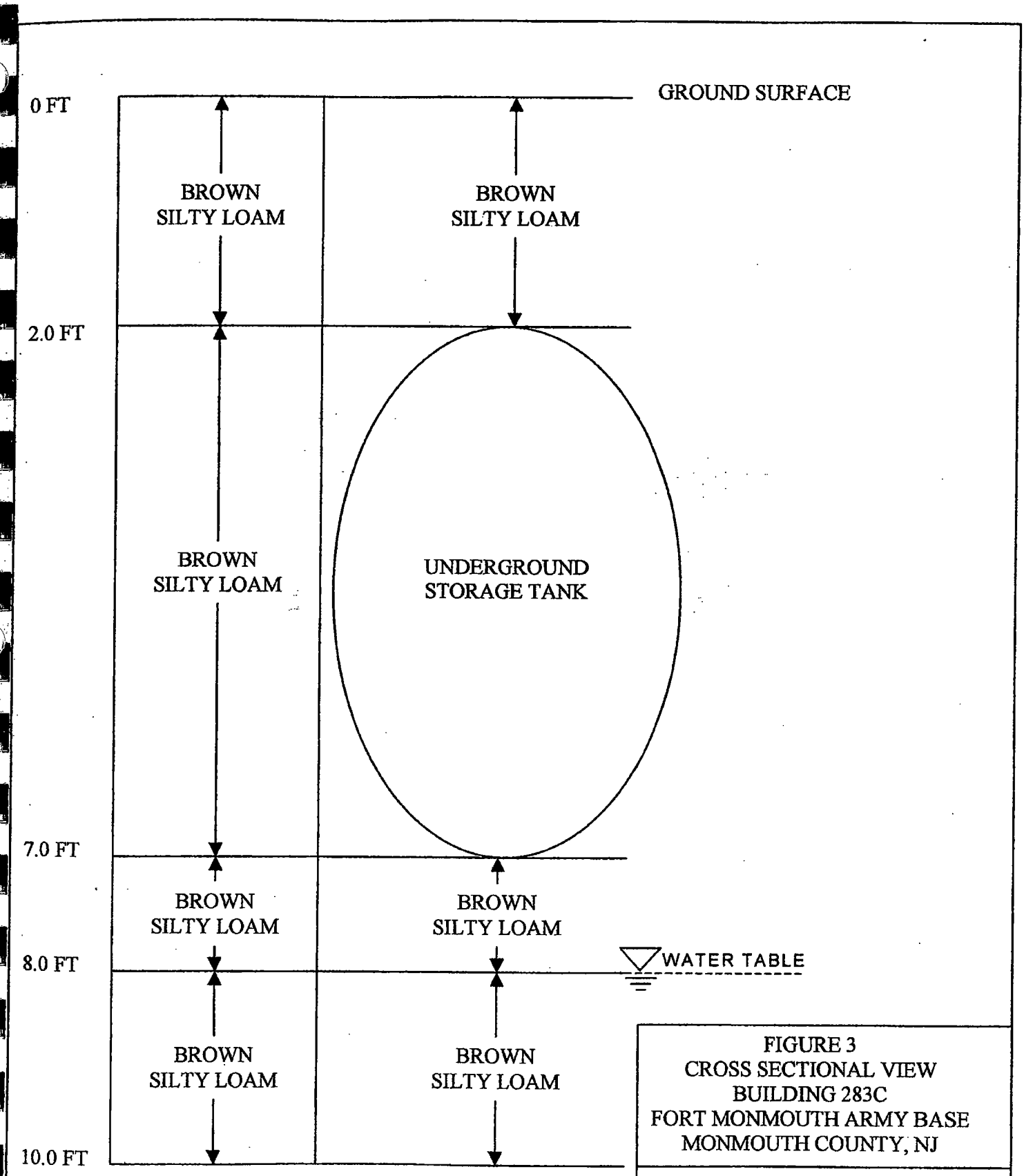
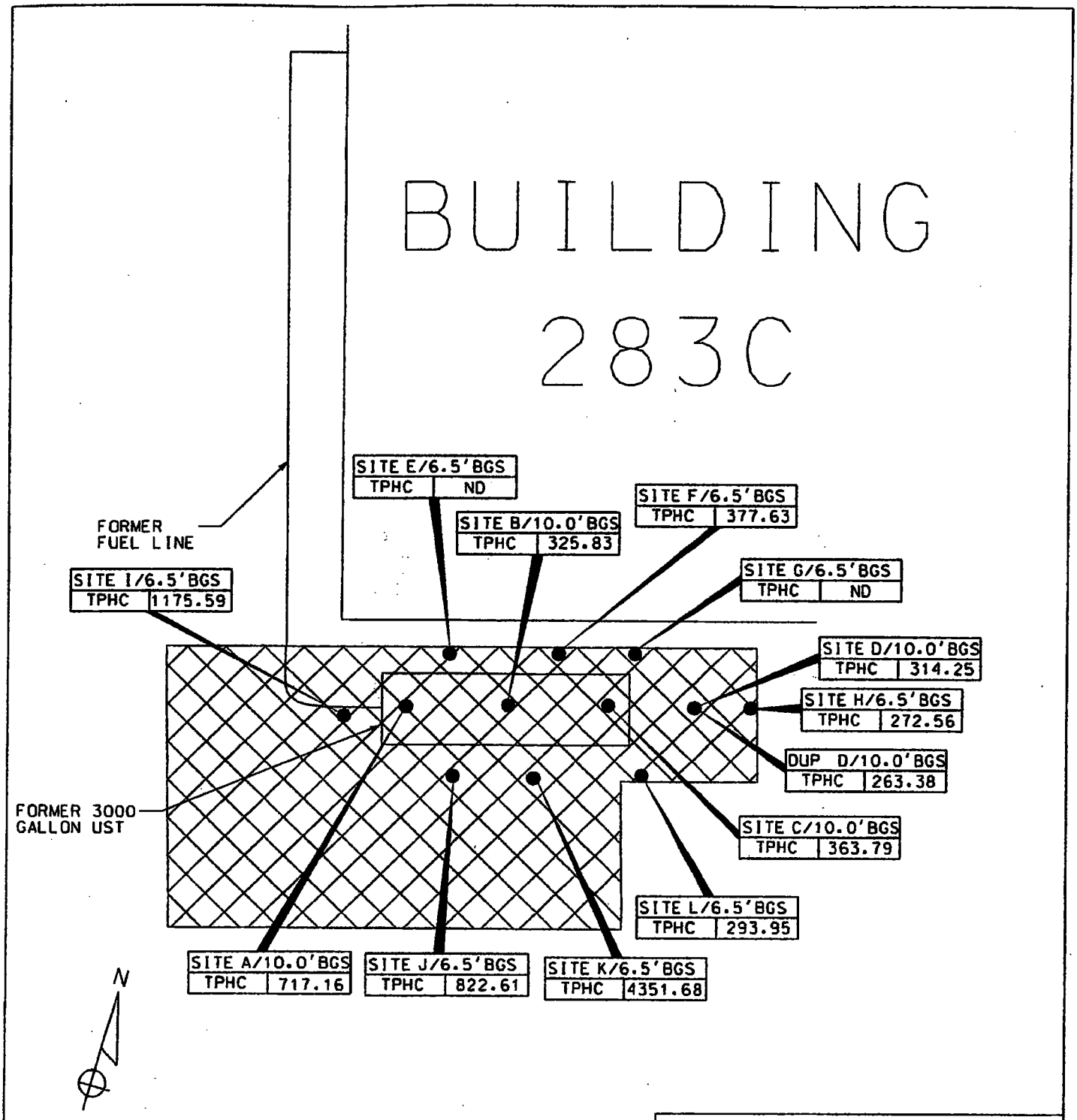


FIGURE 3
CROSS SECTIONAL VIEW
BUILDING 283C
FORT MONMOUTH ARMY BASE
MONMOUTH COUNTY, NJ

VERSAR
Engineers, Managers, Scientists & Planners
Bristol, Pennsylvania

SCALE: NTS | DATE: August 1997



LEGEND

● SOIL SAMPLE LOCATION (SEPTEMBER 3, 1997)

▨ LIMIT OF EXCAVATION (OCTOBER 3, 1997)

NOTES:

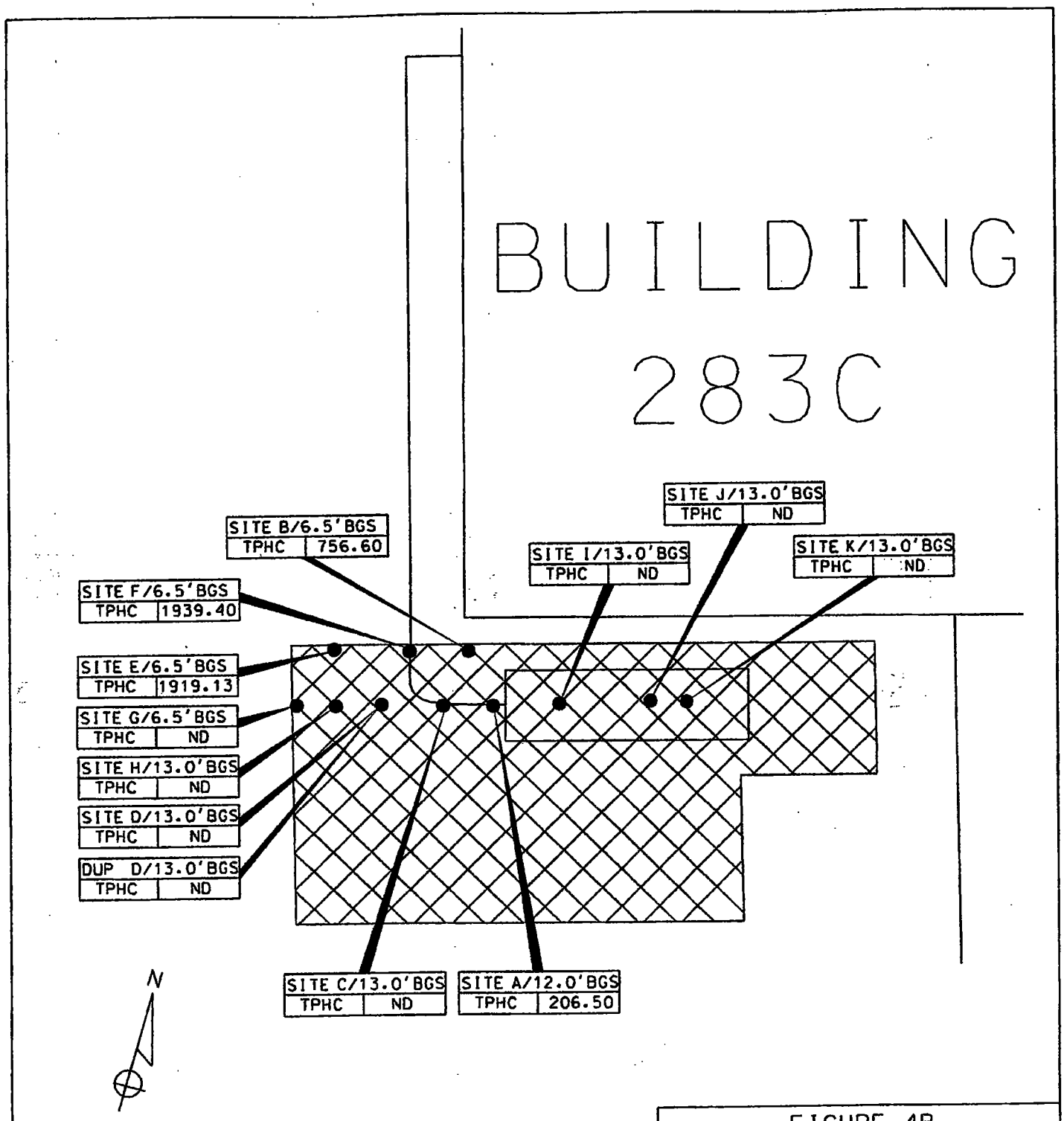
1. ALL RESULTS IN MG/KG.
2. SEE TABLE 2 FOR NJDEP SOIL CLEANUP CRITERIA
3. BGS = BELOW GROUND SURFACE

FIGURE 4A
SOIL SAMPLING LOCATION MAP
BUILDING 283C
FORT MONMOUTH ARMY BASE
MONMOUTH COUNTY, NJ

VERSAR
ENGINEERS, MANAGERS, SCIENTISTS & PLANNERS
BRISTOL, PA.

SCALE: 1"=10' | DATE: AUGUST 1997

283C FIG4A



LEGEND

- SOIL SAMPLE LOCATION (SEPTEMBER 9, 1997)
- LIMIT OF EXCAVATION (OCTOBER 3, 1997)

NOTES:

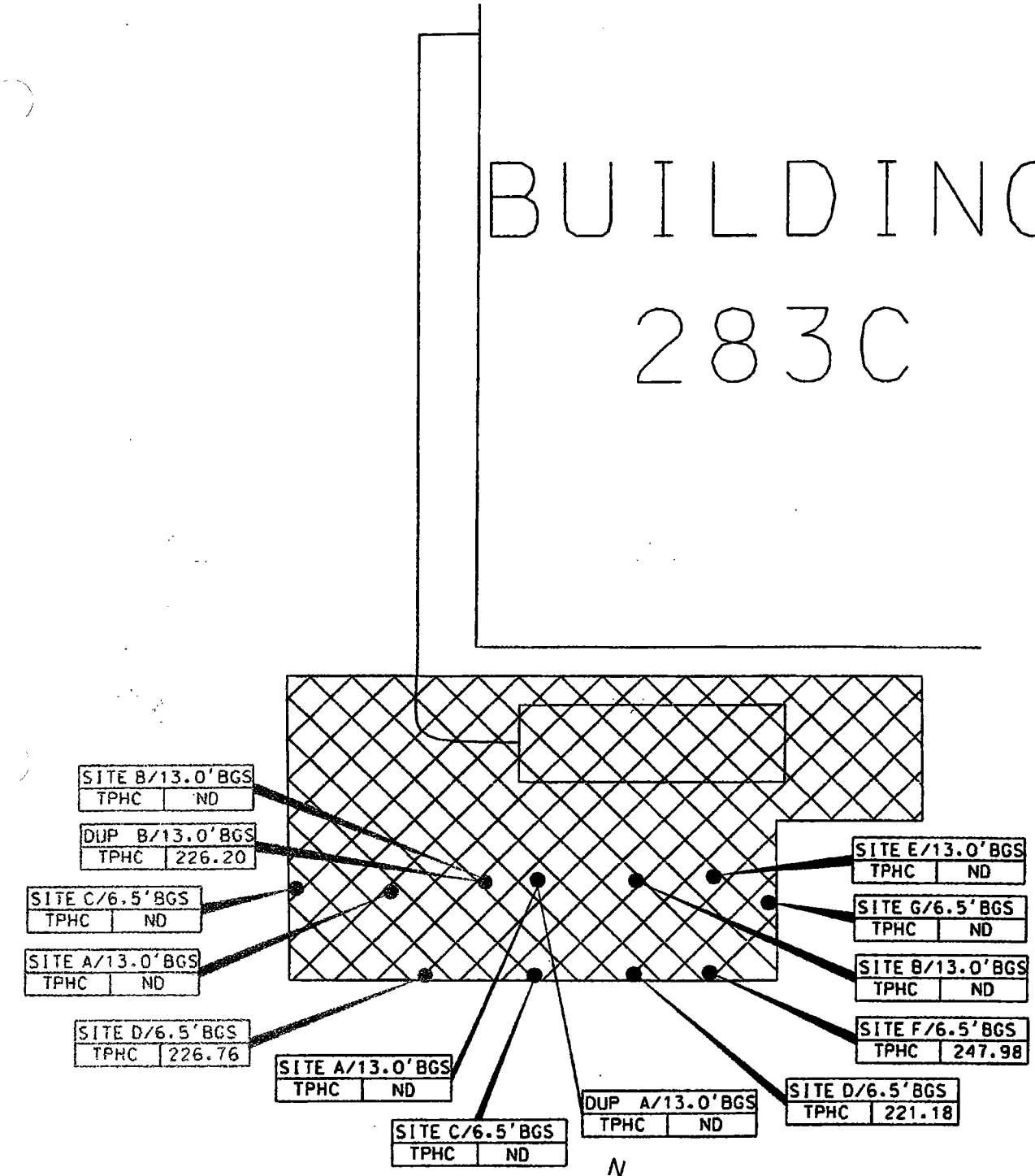
1. ALL RESULTS IN MG/KG.
2. SEE TABLE 2 FOR NJDEP SOIL CLEANUP CRITERIA
3. BGS = BELOW GROUND SURFACE

FIGURE 4B
SOIL SAMPLING LOCATION MAP
BUILDING 283C
FORT MONMOUTH ARMY BASE
MONMOUTH COUNTY, NJ

VERSAR
ENGINEERS, MANAGERS, SCIENTISTS & PLANNERS
BRISTOL, PA.

SCALE: 1"=10' | DATE: AUGUST 1997

283C FIG4B



LEGEND

- SOIL SAMPLE LOCATION (SEPTEMBER 15, 1997)
- SOIL SAMPLE LOCATION (SEPTEMBER 22, 1997)
- LIMIT OF EXCAVATION (OCTOBER 3, 1997)

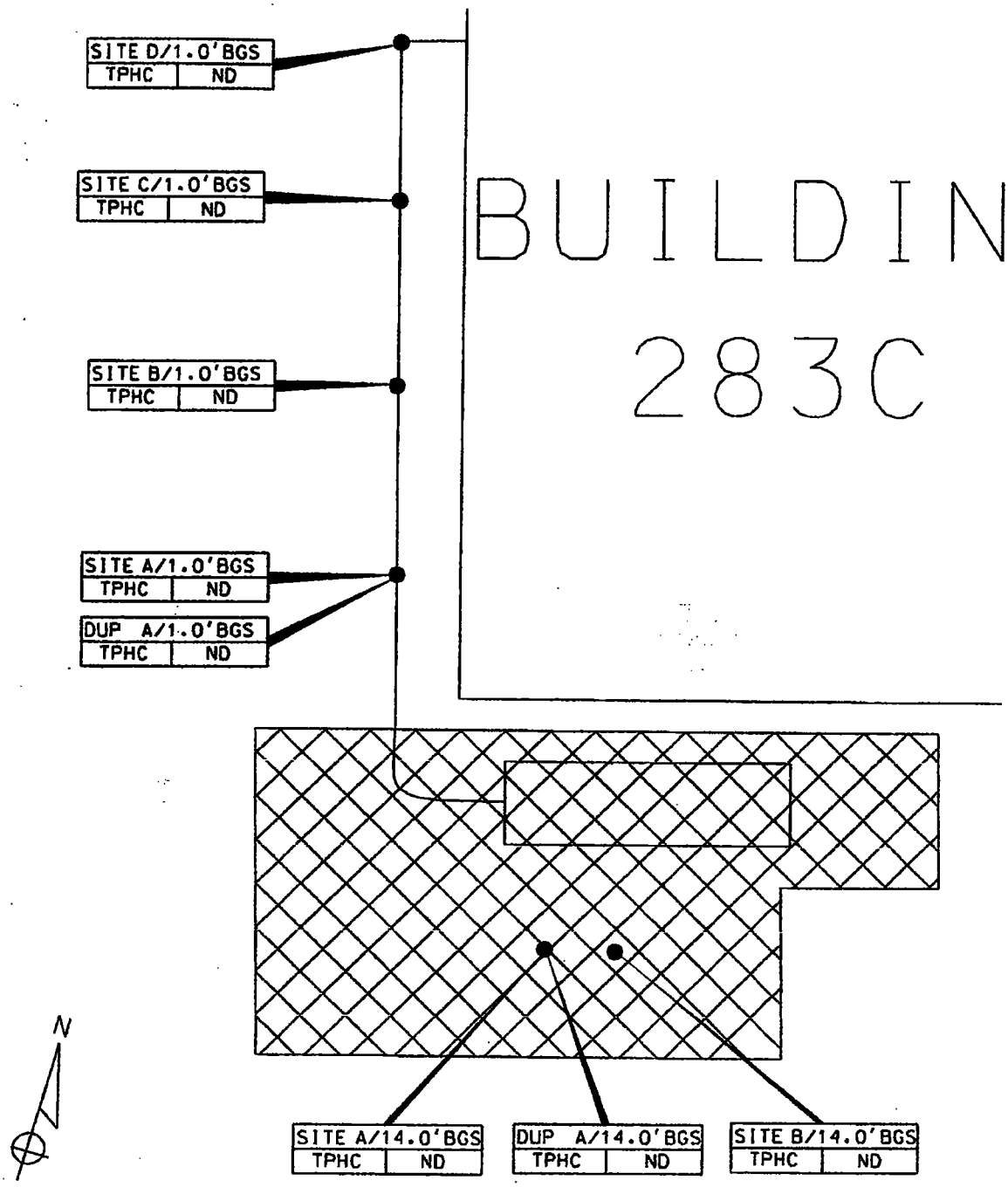
NOTES:

1. ALL RESULTS IN MG/KG.
2. SEE TABLE 2 FOR NJDEP SOIL CLEANUP CRITERIA
3. BGS = BELOW GROUND SURFACE

FIGURE 4C
SOIL SAMPLING LOCATION MAP
BUILDING 283C
FORT MONMOUTH ARMY BASE
MONMOUTH COUNTY, NJ

VERSAR
ENGINEERS, MANAGERS, SCIENTISTS & PLANNERS
BRISTOL, PA.

SCALE: 1"=10' | DATE: AUGUST 1997



LEGEND

- ● SOIL SAMPLE LOCATION (SEPTEMBER 26, 1997)
- ● SOIL SAMPLE LOCATION (OCTOBER 3, 1997)
- ▨ LIMIT OF EXCAVATION (OCTOBER 3, 1997)

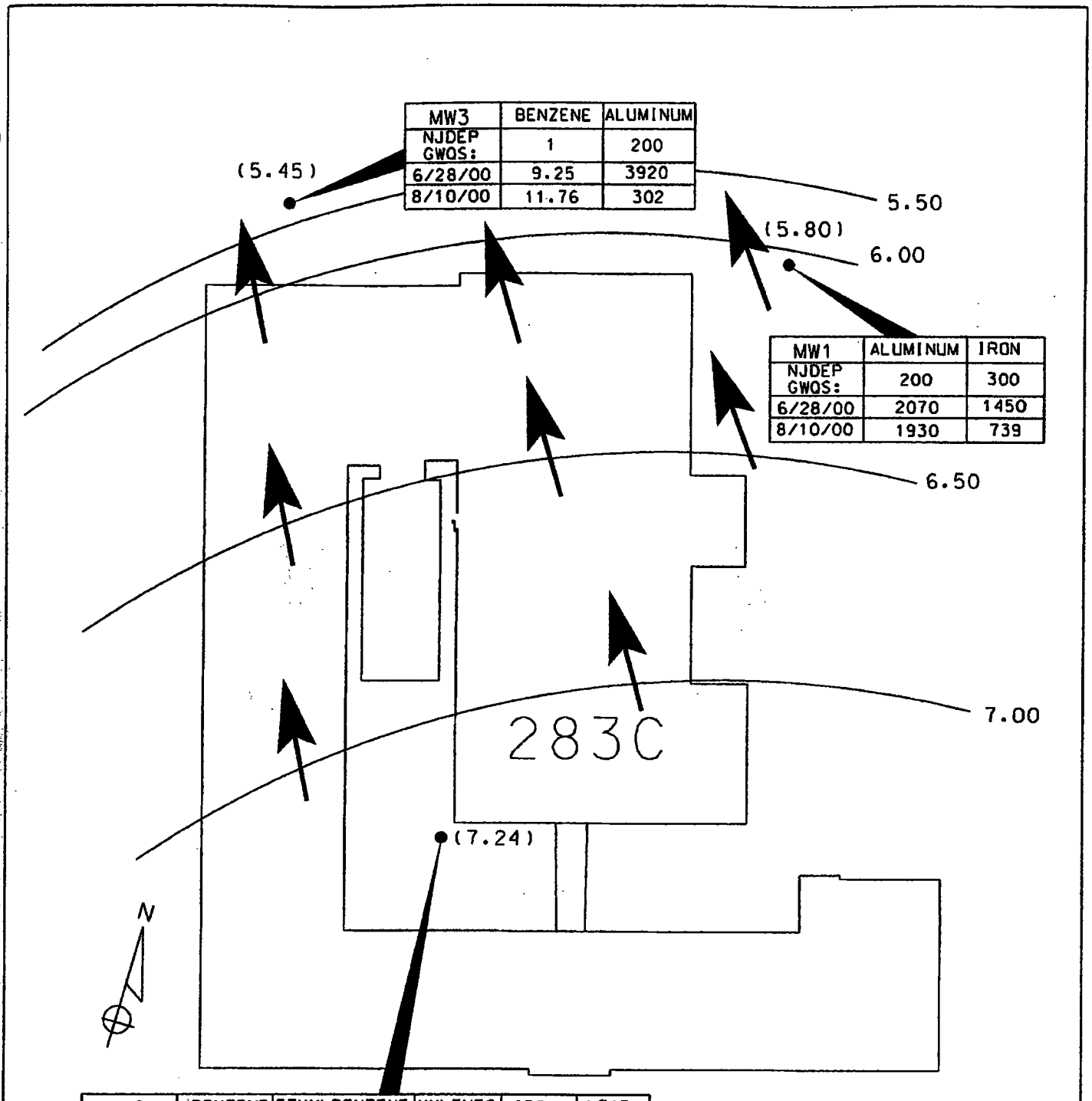
NOTES:

1. ALL RESULTS IN MG/KG.
2. SEE TABLE 2 FOR NJDEP SOIL CLEANUP CRITERIA
3. BGS = BELOW GROUND SURFACE

FIGURE 4D
SOIL SAMPLING LOCATION MAP
BUILDING 283C
FORT MONMOUTH ARMY BASE
MONMOUTH COUNTY, NJ

VERSAR
ENGINEERS, MANAGERS, SCIENTISTS & PLANNERS
BRISTOL, PA.

SCALE: 1"=10' | DATE: AUGUST 1997



MW3	BENZENE	ALUMINUM
NJDEP GWQS:	1	200
6/28/00	9.25	3920
8/10/00	11.76	302

MW1	ALUMINUM	IRON
NJDEP GWQS:	200	300
6/28/00	2070	1450
8/10/00	1930	739

MW2	BENZENE	ETHYLBENZENE	XYLENES	IRON	LEAD
NJDEP GWQS:	1	700	40	300	10
9/20/99	536.9	797.4	3831.4	2330	22.0
12/27/99	720.56	422.50	2125.86	2060	6.92
3/23/00	827.72	725.71	4295.69	2010	15.3
6/28/00	908.16	1129.23	5960.70	2130	11.5
8/10/00	152.00	717.50	4009.44	2060	31.9

LEGEND

⌒ ESTIMATED GROUNDWATER ELEVATION CONTOUR (FT)

(7.24) GROUNDWATER ELEVATION ON AUGUST 10, 2000

NOTE:

1. ALL RESULTS IN UG/L

FIGURE 5
WELL LOCATION AND GROUNDWATER CONTOUR
FORT MONMOUTH ARMY BASE
MONMOUTH COUNTY, NJ

VERSAR
ENGINEERS, MANAGERS, SCIENTISTS & PLANNERS
BRISTOL, PA.

SCALE: 1"= 50'

DATE: AUGUST 1997

FINAL

Remedial Investigation Report and Remedial Action Workplan

Site 283

U. S. Army Garrison Fort Monmouth
Fort Monmouth, New Jersey

Directorate of Public Works

October 28, 2005

Versar, Inc.
4700 South McClintock Drive, Suite 150
Tempe, Arizona 85282

Contract No. DACA 51-02-D-0007
Delivery Order No. 2V26

United States Army
Fort Monmouth, New Jersey

Remedial Investigation Report and Remedial Action Workplan

Site 283

Fort Monmouth, New Jersey

October 28, 2005

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October 28, 2005

VERSAR PROJECT NO. 110571.0571.426

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EXECUTIVE SUMMARY

VERSAR, Inc. (Versar) has been contracted by the United States (U.S.) Army Garrison, Fort Monmouth (Fort Monmouth), Directorate of Public Works (DPW), Fort Monmouth, New Jersey to prepare a Remedial Investigation Report (RIR)/Remedial Action Workplan (RAWP) to document groundwater and surface water conditions at Site 283 located in the Main Post Area of Fort Monmouth, New Jersey. This report addresses the remedial investigation activities performed to investigate groundwater conditions from September 1999 through February 2004.

Site 283 is located in the north part of the Main Post Area of Fort Monmouth, on the north side of Sherrill Avenue. Site 283 is located approximately 200 feet south of Parkers Creek. Two Underground Storage Tank (UST) closure reports have been submitted to the New Jersey Department of Environmental Protection (NJDEP) regarding USTs in the immediate vicinity of Site 283.

The *UST Closure and Site Investigation Report, Building 283B, Main Post-West Area, NJDEP Registration No. 0081533-59* documents the removal of one tar-coated steel UST located north of former Building 283. Following soil excavation and removal of UST No. 0081533-59, post-excavation samples were collected and contained either non-detectable concentrations of total petroleum hydrocarbons (TPHC) or concentrations below the NJDEP cleanup criteria. Based on these post-excavation soil sampling results, the soil removed during the UST excavation was backfilled into the excavation.

The *UST Closure and Site Investigation Report, Building 283C, NJDEP Registration No. 0081533-229* documents the removal of one UST located in the courtyard area of Building 283. Following removal, numerous holes were observed on UST during inspection by the subsurface evaluator. Soils at the location of the holes were dark in color, and a sheen was observed on the groundwater. Following the removal of the UST, a spill was reported to the NJDEP and Case No. 97-08-28-1330-33 was assigned.

Six rounds of soil excavation and sampling were conducted at the UST excavation site. Approximately 398 cubic yards of potentially contaminated soil were removed and disposed off-site. One additional soil sample was collected from a Geoprobe® boring. During the six rounds of post-excavation sampling and one round of Geoprobe® soil sampling, TPHC was detected in 19 of 40 post-excavation soil samples at concentrations below the NJDEP criteria. Of the six volatile organic compounds (VOCs) detected in the soil samples, one VOC was detected at concentrations exceeding the NJDEP Residential Direct Contact Soil Cleanup Criteria (RDCSCC) in four of 13 soil samples. Lead was detected in 11 of 40 soil samples below the RDCSCC.

In response to the post-excavation soil sampling results and visual observations of potentially contaminated soil in the excavation area, three monitoring wells (283-MW1, 283-MW2 and 283-MW3) were installed at the excavation area of the UST in the vicinity of Building 283.

The Versar UST Closure and Site Investigation (SI) Report included sampling results collected from the three monitoring wells at Site 283. Benzene, ethylbenzene, total xylenes, aluminum, iron and lead were detected in groundwater samples collected at Site 283 at concentrations exceeding their respective NJDEP Groundwater Quality Criteria (GWQC).

In 1995, Roy F. Weston, Inc. (Weston) conducted soil sampling, monitoring well installation and sampling and geophysical surveying as part of an SI of the Fort Monmouth military installation. Weston established background concentrations for soil and groundwater for the Fort Monmouth installation, as reported in the Weston SI Report (1995). As presented in the Weston SI Report, several natural and anthropogenic factors contribute to the wide range in concentrations of metals in soils, which further impact the concentration of metals in groundwater. A low-flow sampling methodology was proposed for use by the DPW and accepted by the NJDEP to assess the impact of entrained sediments on the dissolved phase metals concentrations at Fort Monmouth.

Fort Monmouth DPW has conducted a Remedial Investigation (RI), including a groundwater sampling program, to define the areal extent of potential pollutants and evaluate impacts to groundwater in the vicinity of Site 283. A total of three monitoring wells comprise the quarterly groundwater monitoring program conducted by the DPW. As part of the remedial investigation of the Site 283, quarterly groundwater monitoring was conducted from September 1999 through February 2004.

During the 21 quarterly sampling events, three VOCs and eight Target Analyte List (TAL) metals were detected in groundwater samples at concentrations above their respective NJDEP GWQC. Based on the magnitude of their exceedances, the frequency of their occurrences and their wide-ranging results, benzene, ethylbenzene, total xylenes and lead are identified as the contaminants of concern (COCs) in groundwater at Site 283.

The RI also included the collection of groundwater depth measurements, the performance of slug tests, evaluation of aquifer classification, and the completion of a sensitive receptor survey. The results of the field and laboratory investigations were used to develop a conceptual site model to provide a basis for the development of a three-dimensional computer model. The conceptual site model considers the site-specific topography, groundwater recharge, groundwater flow conditions and the geologic formations present at the site. A MODFLOW computer model was used to simulate groundwater flow and contaminant transport beneath the site. The purpose of developing a groundwater model for Site 283 was to predict the migration of the identified COCs in site groundwater.

Due to the low concentrations of lead in groundwater at Site 283 and the slow migration rates for lead in the groundwater, there is little potential for significant lead impact by migration into Parkers Creek.

Based on biodegradation rates and the MODFLOW simulation, benzene, ethylbenzene and total xylenes could migrate from Site 283 northward towards Parkers Creek. The presence of underground utility lines beneath the surface at Site 283 and the fill material associated with these utilities implies the possibility that underground utilities could be conduits for contaminant migration.

The construction of three additional groundwater monitoring wells is suggested. The installation and quarterly monitoring of these additional monitoring wells will aid in more accurately determining if the present underground utilities are avenues for off-site transport of COCs and the extent of off-site migration of COCs at Site 283.

To evaluate surface water quality and ensure that groundwater seepage from Site 283 is not adversely impacting surface water, surface water samples should be collected and analyzed for COCs at locations in Parkers Creek, located north of Site 283.

Continued groundwater and surface water monitoring at Site 283 are recommended. Additional groundwater and surface water quality sampling results obtained from samples collected at Site 283 will be reported in Remedial Action Progress Reports (RAPRs).

A Limited Action with Enhanced Bioremediation and MNA alternative has been selected for Site 283 based upon its appropriateness for remediation of the relatively high concentrations of several COCs present at the site in a time frame acceptable to the NJDEP. ORC Advanced™ and MNA are very low in cost, and the COC concentrations at Site 283 do not require a permanent alternative. This alternative is equally effective in the short- and long-term, is easy to implement and can attain compliance with NJDEP criteria. Historical groundwater sampling results at Site 1122 indicate that natural attenuation is occurring at an acceptable rate, and the ORC Advanced™ injection program will accelerate this process. The ORC Advanced™ will be applied as specified by Regenesis.

Quarterly groundwater sampling at Site 283 will include groundwater samples collected from monitoring wells 283-MW1, 283-MW2 and 283-MW3 and the newly constructed monitoring wells 283-MW4, 283-MW5 and 283-MW6. The groundwater samples collected from these monitoring wells will be analyzed by the FMETL for VOCs plus 15 TICs and lead.

Quarterly surface water sampling at Site 283 will include surface water samples collected from locations in Parkers Creek, which is north of Site 283. Surface water samples collected from these locations will be analyzed by the FMETL for VOCs plus 15 TICs and lead.

The remedial action will be performed in accordance with the Quality Assurance Project Plan (QAPP) and the site-specific Health and Safety Plan (SSHSP) for Site 283.

1.0 INTRODUCTION

Versar has been contracted by the U.S. Army Garrison, Fort Monmouth, DPW, Fort Monmouth, New Jersey to prepare an RIR/RAWP to document groundwater and surface water conditions at Site 283 located in the Main Post Area of Fort Monmouth, New Jersey. This report addresses remedial investigation activities performed at this site to investigate groundwater conditions from September 1999 through February 2004.

1.1 Objectives

The objectives of this RIR/RAWP are to define aquifer chemical and physical characteristics and to determine the requirement for further remedial activities at Site 283. The remedial investigation was conducted in accordance with NJDEP *Technical Requirements for Site Remediation* (July 1999), NJAC 7:26E, et seq.

The remedial investigation and subsequent preparation of the RIR encompassed the following:

- Characterization of groundwater quality at Site 283 through 19 quarterly groundwater sampling events conducted from September 1999 through February 2004 and two low-flow sampling events in August and October 2000.
- Comparison of the groundwater sampling results with the NJDEP GWQC.
- Investigation and evaluation of the designated aquifer uses, the associated aquifer classification, and the appropriate groundwater quality criteria for groundwater resources beneath Site 283. The NJDEP Ground Water Quality Standards (GWQS) (NJAC 7:9-6, January 7, 1993) specify the quality criteria and designated uses for groundwater and also contain technical and general policies to ensure that the designated uses can be adequately protected.
- Performance of slug tests at Site 283 during August 2001 to characterize hydraulic conductivity and groundwater flow regime.
- Development of a groundwater flow and transport model for Site 283 based on hydrogeologic data, field investigation programs and technical research to evaluate the migration of potential COCs beneath Site 283.
- Formulation of an RAWP for Site 283.

1.2 Report Organization

This report is organized to minimize repetition. **Section 2.0** provides background information and a general description of Site 283 located in the Main Post Area of Fort Monmouth. **Section 3.0** describes and summarizes the field activities conducted at Site 283, including groundwater sampling from monitoring wells and aquifer testing. **Section 4.0** presents the physical characterization of Site 283 including lithology and groundwater conditions. The chemical characterization of Site 283 is presented in **Section 5.0**, which includes groundwater sampling results and the determination of potential COCs. **Section 6.0** discusses the potential for contaminant migration in the vicinity of Site 283 and presents groundwater modeling involving the COCs. Conclusions and recommendations for Site 283 are presented in **Section 7.0**. **Section 8.0** presents the RAWP for Site 283.

2.0 SITE BACKGROUND AND ENVIRONMENTAL SETTING

The following sections describe Site 283 background and environmental setting of the area surrounding Fort Monmouth and Site 283. Included is a description of location, background, current conditions and environmental setting at Site 283.

2.1 Site Location and Description

Fort Monmouth is located in the central-eastern portion of New Jersey in Monmouth County, approximately 45 miles south of New York City and 70 miles northeast of Philadelphia (**Figure 2-1**). In addition to the Main Post, the installation includes two subposts, the Charles Wood Area and the Evans Area. The Main Post encompasses approximately 630 acres and is bounded by State Highway 35, Parkers Creek, Lafetra Brook, the New Jersey Transit Railroad and a residential area to the south. The post was established in 1918 during World War I (WWI) as an Army Signal Corps training center. The Main Post currently provides administrative, training, and housing support functions, as well as providing many of the community facilities for Fort Monmouth. The primary mission of Fort Monmouth is to provide command, administrative, and logistical support for Headquarters, U.S. Army Communications and Electronics Command (CECOM). CECOM is a major subordinate command of the U.S. Army Materiel Command (AMC) and is the host tenant at Fort Monmouth.

Site 283 is located in the north part of the Main Post area of Fort Monmouth, on the north side of Sherrill Avenue (**Figure 2-2**). Site 283 is located approximately 200 feet south of Parkers Creek.

2.2 Site Background

In the early 1990s, the DPW developed a UST program for managing approximately 506 storage tanks located throughout the Fort Monmouth installation (Main Post, Charles Wood and Camp Evans areas). This program was undertaken to work toward replacing the use of heating oil as a major energy source and to convert to natural gas. The DPW's approach involved installing new gas lines, new gas-fed boilers, and removing non-regulated (residential) USTs. Since 1990, approximately 97 percent of the aforementioned USTs at Fort Monmouth have been removed.

As part of the DPW's UST management program, two UST closure reports (dated September 1998 and October 2000) have been submitted to the NJDEP regarding USTs in the immediate vicinity of Site 283. These two reports are presented in **Appendix A** and **Appendix B** and are discussed below in **Sections 2.2.1** and **2.2.2**, respectively.

In 1995, the DPW submitted an SI report for the Main Post and Charles Wood areas. This site investigation report is discussed below in **Section 2.2.3**. The section of the SI Report pertaining to Site 283 is included in **Appendix C**.

The groundwater monitoring program presented in this report includes three monitoring wells (283-MW1, 283-MW2 and 283-MW3) installed as part of UST closures at Site 283. The locations of these three monitoring wells are shown in **Figure 2-3**. A well

construction summary is provided in **Table 2-1**. Monitoring well records are provided in **Appendix D**.

2.2.1 UST Closure and SI Report, Building 283B (SMC, 1998)

According to the *UST Closure and Site Investigation Report, Building 283B, Main Post-West Area, NJDEP Registration No. 0081533-59*, SMC, September 1998 (**Appendix A**), there was one tar-coated steel UST (UST No. 0081533-59) located north of former Building 283. UST No. 0081533-59 was a 10,000-gallon No.2 fuel oil UST. On August 11, 1997, UST number 0081533-59 was cleaned, excavated and disposed of in accordance with NJDEP requirements. No holes or punctures were observed on the tank during the inspection by the subsurface evaluator. There was no evidence of leakage into surrounding soils based on visual observations and field screening using an organic vapor analyzer (OVA).

Following soil excavation and removal of UST No. 0081533-59, seven post-excavation samples were collected and analyzed for TPHC. All samples contained either non-detectable concentrations of contaminants or concentrations below 1,000 mg/kg (the NJDEP cleanup criteria for TPHC is 10,000 mg/kg). Based on these post-excavation soil sampling results, the soil that was excavated during the UST excavation was backfilled into the excavation.

2.2.2 UST Closure and SI Report, Building 283C (Versar, 2000)

According to the *UST Closure and Site Investigation Report, Building 283C, NJDEP Registration No. 0081533-229*, Versar, October 2000, (**Appendix B**), there was one UST (No. 0081533-229) located in the courtyard area of Building 283 (**Figure 2-4**). UST No. 0081533-229 was a 3,000-gallon steel tank which contained gasoline. On August 28, 1997, UST No. 0081533-229 was cleaned, excavated and disposed of in accordance with NJDEP closure requirements. Soils surrounding the tank were screened visually and with air monitoring equipment for evidence of contamination. Following removal, numerous holes were observed in the UST during inspection by the subsurface evaluator. Soils at the location of the holes were dark in color and appeared to be contaminated. Groundwater was encountered at 8 feet bgs and a sheen was observed on the groundwater. Following the removal of UST No. 0081533-229, a spill was reported to the NJDEP and Case No. 97-08-28-1330-33 was assigned.

Soil Sampling and Excavation

Between September 3, 1997 and October 3, 1997, six rounds of soil excavation and sampling were conducted at the UST excavation site of UST No. 0081533-229. Approximately 398 cubic yards of potentially contaminated soil were removed and disposed off-site. Soils were removed from the excavation to a maximum depth of 14 feet bgs until no evidence of contamination remained (visual or with an OVA). On July 1, 1998, one additional soil sample was collected from a Geoprobe® boring at a depth of 7.5 bgs. During the six rounds of post-excavation sampling and the one round of Geoprobe® soil sampling, a total of 40 soil samples were collected and analyzed for TPHC, VOCs plus 15 TICs and lead.

TPHC was detected in 19 of 40 post-excavation soil samples at concentrations below the NJDEP cleanup criteria of 10,000 mg/kg. There were six VOCs detected in soil samples collected at the UST excavation site of UST No. 0081533-229 (acetone, benzene, ethylbenzene, methylene chloride, toluene and total xylenes). Of these six VOCs, one VOC (benzene) was detected at concentrations exceeding the NJDEP RDCSCC. Benzene was detected above the RDCSCC of 3 mg/kg in four of 13 soil samples collected on September 3, 1997, at a maximum concentration of 21 mg/kg. Lead was detected in 11 of 40 soil samples below the RDCSCC of 400 mg/kg at a maximum concentration of 59.83 mg/kg.

Groundwater Sampling
In response to the post-excavation soil sampling results and visual observations of potentially contaminated soil in the excavation area, one shallow overburden monitoring well (283-MW2) was installed at the excavation area of UST No. 0081533-229 on July 28, 1999. Well 283-MW2 was installed to a maximum finished depth of 20 feet bgs. This well was screened from a depth of 5-20 feet bgs with 4-inch diameter 20-slot PVC.

On March 28, 2000, two additional monitoring wells (283-MW1 and 283-MW3) were installed in the vicinity of Building 283. Well 283-MW1 was installed to a maximum finished depth of 25 feet bgs and was screened from a depth of 5-25 feet bgs with 4-inch diameter 10-slot PVC. Well 283-MW3 was installed to a maximum finished depth of 20 feet bgs and was screened from a depth of 5-20 feet bgs with 4-inch diameter 10-slot PVC. The locations of these three monitoring wells are shown in **Figure 2-3**. Monitoring well records are provided in **Appendix D**. Well construction details are summarized in **Table 2-1**.

In the UST Closure and SI Report, October 2000 (**Appendix B**), Versar reported sampling results collected from the three monitoring wells (283-MW1, 283-MW2 and 283-MW3) at Site 283. Groundwater samples were collected by the DPW from well 283-MW2 during five quarterly sampling rounds between September 1999 and August 2000. Groundwater samples were collected by the DPW from wells 283-MW1 and 283-MW3 during two quarterly sampling rounds in June and August 2000. The groundwater samples collected at the three monitoring wells were analyzed for VOCs plus 15 tenatively identified compounds (TICs), SVOCs plus 15 TICs, pesticides, polychlorinated biphenyls (PCBs) and TAL metals. In the October 2000 report, Versar also presented one groundwater flow map that shows groundwater flow to the northwest. Groundwater sampling results for wells 283-MW1, 283-MW2 and 283-MW3, as presented in the Versar October 2000 report, are included in **Appendix B** and are included as part of this report (**Section 5.0**). In the October 2000 report, Versar reported that benzene, ethylbenzene, total xylenes, aluminum, iron and lead were detected in groundwater samples collected at Site 283 at concentrations exceeding their respective NJDEP GWQC.

2.2.3 SI Report for Main Post and Charles Wood Areas (Weston, 1995)
Roy F. Weston, Inc. (Weston), as part of the SI of the Fort Monmouth military installation, conducted soil sampling, monitoring well installation and sampling and

geophysical surveying. In addition to sampling of soil and groundwater at sites throughout the Main Post and Charles Wood areas of Fort Monmouth, Weston established background concentrations of chemical constituents in soil and groundwater for the Fort Monmouth installation, as reported in the Weston SI Report (1995) (**Appendix C**). These background concentrations have been used by the DPW for comparing sampling results for native constituents of soil and groundwater (see **Section 5.3**).

As presented in the Weston SI Report, several natural and anthropogenic factors contribute to the wide range in concentrations of metals in soils, which further impact the concentration of metals in groundwater. Soils derived from the glauconitic sands contain abundant aluminum, calcium, potassium, iron, magnesium and manganese (among others), which are likely to be present at elevated concentrations in the groundwater, particularly when sediments are entrained in the collected groundwater samples. A low-flow sampling methodology was proposed for use by the DPW and accepted by the NJDEP to assess the impact of entrained sediments on the dissolved phase metals concentrations at the Main Post and Charles Wood areas of Fort Monmouth. Using a low-flow sampling methodology to reduce the presence of entrained sediment has generally yielded substantial reductions in the dissolved phase concentrations of metals, such as arsenic, antimony, beryllium, cadmium, chromium, cobalt, lead, mercury, selenium, silver, thallium and vanadium at Fort Monmouth sites. Significant decreases in the concentrations of metals characteristic of glauconitic sand also were observed. These included aluminum, barium, calcium, copper, iron, magnesium, manganese, nickel, potassium, sodium and zinc.

2.3 Site Conditions

Versar conducted a site walk-through on April 28, 2004 to assess site conditions at Site 283. The site currently consists of Building 283, which is used by Fort Monmouth as an office building for military personnel. Underground utilities at Site 283 are shown in **Figure 2-5**. Due to security reasons, site photographs were not taken during the Site 283 walk-through.

2.4 Environmental Setting

The following is a description of the geological/hydrogeological setting of the area surrounding Site 283. Included is a description of the regional geology of the area surrounding Fort Monmouth, as well as descriptions of the local geology and hydrogeology of the Main Post.

2.4.1 Regional and Local Geology

Monmouth County lies within the New Jersey Section of the Atlantic Coastal Plain physiographic province. Site 283 is located in what may be referred to as the Outer Coastal Plain subprovince, or the Outer Lowlands. The geologic map of New Jersey is provided as **Figure 2-6**.

In general, New Jersey Coastal Plain formations consist of a seaward-dipping wedge of unconsolidated deposits of clay, silt, sand and gravel. These formations typically strike

northeast-southwest with a dip ranging from 10-60 feet per mile and were deposited on Precambrian and lower Paleozoic rocks (Zapecza, 1989). These sediments, predominantly derived from deltaic, shallow marine and continental shelf environments, date from Cretaceous through the Quaternary Periods. The mineralogy ranges from quartz to glauconite.

The formations record several major transgressive/regressive cycles and contain units, which are generally thicker to the southeast and reflect a deeper water environment. More than 20 regional geologic units are present within the sediments of the Coastal Plain. Regressive, upward coarsening deposits are usually aquifers (e.g., Englishtown and Kirkwood Formations, and the Cohansey Sand), while the transgressive deposits act as confining units (e.g., the Merchantville, Marshalltown and Navesink Formations). The individual thickness for these units varies greatly (e.g., from several feet to several hundred feet). The Coastal Plain deposits thicken to the southeast from the Fall Line (e.g., a boundary zone between older, resistant rocks and younger, softer plain sediments) to greater than 6,500 feet in Cape May County (Brown and Zapecza, 1990).

Based on the regional geologic map (Jablonski, 1968), the Cretaceous age Red Bank and Tinton Sands outcrop at the Main Post area. The Red Bank Sand conformably overlies the Navesink Formation and dips to the southeast at 35 feet per mile. The upper member (Shrewsbury) of the Red Bank Sand is a yellowish-gray to reddish brown clayey, medium-to-coarse-grained sand that contains abundant rock fragments, minor mica and glauconite (Jablonski). The lower member (Sandy Hook) is a dark gray to black, medium-to-fine grained sand with abundant clay, mica and glauconite.

The Tinton Sand conformably overlies the Red Bank Sand and ranges from a clayey medium to very coarse-grained feldspathic-quartz and glauconite-sand to a glauconitic-coarse sand. The color varies from dark yellowish orange or light brown to moderate brown and from light olive to grayish olive. Glauconite may constitute 60-80 percent of the sand fraction in the upper part of the unit. The upper part of the Tinton Sand is often highly oxidized and iron oxide encrusted (Minard, 1969). Groundwater occurs beneath the site at a depth of approximately 5-8 feet bgs.

The Kirkwood Formation (part of the Kirkwood-Cohansey system) crops out southeast of the Main Post and dips to the southeast at a slope of 20 feet per mile (Jablonski, 1968). The Kirkwood Formation consists of alternating layers of sand and clay. The upper unit is a light gray to yellowish-brown, fine-grained quartz sand with quartz nodules and small pebbles. The lower unit is a brown silt in Monmouth County (Jablonski, 1968).

As presented in the 1995 Weston SI Report, several natural and anthropogenic factors contribute to the wide range in concentrations of metals in soils, which further impact the concentration of metals in groundwater. Soils derived from the glauconitic sands contain abundant aluminum, calcium, potassium, iron, magnesium and manganese (among others), which are likely to be present at elevated concentrations in the groundwater, particularly when sediments are entrained in the collected groundwater samples.

As presented in **Appendix D**, the lithologic logs from monitoring well installations at Site 283 indicate that the lithology consists of asphalt, topsoil, fill and native material. The fill observed in two of the three borings at Site 283 was encountered at 2-7 feet bgs and consists of cinders, slag, coal fragments and brown coarse-medium-fine sand with some medium-fine gravel. The native material encountered in the borings at Site 283 consists of brown to orange sand, silt and clay. Water-level elevation data collected during this RI indicate groundwater flow was north-northwest toward Parkers Creek. Further discussion of the subsurface conditions is presented in **Section 4.0**.

2.4.2 Hydrogeology

Fort Monmouth lies in the Atlantic and Eastern Gulf Coastal Plain groundwater region (Meisler et al., 1988). This groundwater region is underlain by undeformed, unconsolidated to semi-consolidated sedimentary deposits. The chemistry of the water near the surface is variable with low dissolved solids and high iron concentrations. The water chemistry in areas underlain by glauconitic sediments (such as Red Bank, Tinton and Hornerstown Sands) is dominated by calcium, magnesium, manganese, aluminum and iron. The sediments in the area of Fort Monmouth were deposited in fluvial-deltaic to near shore environments.

The water table aquifer in the Main Post Area is identified as part of the "Navesink-Hornerstown Confining Units," or minor aquifers. The minor aquifers include the Navesink formation, Red Bank Sand, Tinton Sand, Hornerstown Sand, Vincentown Formation, Manasquan Formation, Shark River Formation, Piney Point Formation and the basal clay of the Kirkwood Formation. These geologic formations comprise a "Composite Confining Bed" for the Wenonah Mount Laurel Aquifer (Zapecza, 1984).

Wells installed in the Red Bank and Tinton Sands produce 2-25 gallons per minute (gpm) (Jablonski, 1968). Groundwater is typically encountered at the Main Post and in the surrounding areas at shallow depths below ground surface (2-9 feet bgs). Water in the surficial aquifer generally flows east toward the Atlantic Ocean.

As presented in **Figure 2-7**, Fort Monmouth is located within the outcrop area of the "Navesink-Hornerstown Confining Unit" (Martin, 1998), which also includes the Red Bank Sand, Tinton Sand, Vincentown Formation, Manasquan Formation, Shark River Formation, Piney Point Formation and the basal clay of the Kirkwood Formation. The Navesink-Hornerstown Confining Unit is approximately 125 feet thick at Site 283.

Based on a review of the NJDEP GWQS (NJAC 7:9-6), January 7, 1993, Versar has determined that the site is underlain by a Class III-A aquifer. A formal presentation of this finding was made to the NJDEP on April 17, 2001. The primary designated use for Class III-A groundwater is the release or transmittal of groundwater to adjacent classification areas and surface water, as relevant. Secondary designated uses in Class III-A include any reasonable use.

Shallow groundwater may be locally influenced within the Main Post Area by the following factors:

- Tidal influence (based on proximity to the Atlantic Ocean, rivers and tributaries);
- Topography;
- Nature of the fill material within the Main Post Area ;
- Presence of clay and silt lenses in the natural overburden deposits;
- Local groundwater recharge areas (e.g., streams, lakes); and
- Roadways, utility conduits and stormwater culverts.

Due to the fluvial nature of the overburden deposits (e.g., sand and clay lenses), shallow groundwater flow direction is best determined on a case-by-case basis. Groundwater in the vicinity of Site 283 appears to be flowing in a north-northwest direction toward Parkers Creek (see **Section 4.2**).

2.4.3 Soils

According to the U.S. Department of Agriculture (USDA), Soil Conservation Service, Monmouth County Soil Survey (April 1989), the majority of the Main Post is covered by urban land (**Figure 2-8**). The soil survey describes urban land as areas where concrete, asphalt, buildings, shopping centers, airports or other impervious surfaces cover 80 percent or more of the surface. In addition, the survey indicated that the natural subsurface soils have largely been replaced with artificial or foreign fill materials (developed land with disturbed soils).

The following soil series and classification units are mapped in the Main Post Area:

- DoB Downer sandy loam (with 2 to 5 percent slopes)
- FrB Freehold sandy loam (with 2 to 5 percent slopes)
- FUB Freehold sandy loam/urban land complex (with 0-10 percent slopes)
- HV Humaquepts, frequently flooded
- KvA Kresson loam (with 0-5 percent slopes)
- UA Udorthents, smoothed
- UD Udorthents – urban land complex (with 0-3 percent slopes)

The Downer series soils are well-drained soils that are found on uplands and terraces. The soils are formed in acid, silty coastal plain sediments. The Freehold soils are also well drained and are formed in acid, loamy, coastal plain sediments that, by volume, are 1-10 percent glauconite and are found on uplands. The Humaquepts soils are somewhat poorly- to very poorly- drained soils that are formed in stratified, sandy, or loamy sediments of fluvial origins. The Humaquepts soils are located on the floodplain and are subject to flooding several times each year. The Kresson loam is a nearly level to gently sloping soil and is somewhat poorly drained. The soil is found on low divides and in depressions. The Udorthents soils have been altered by excavation or filling activities. In filled areas, these soils consist of loamy material that is more than 20 inches thick. The filled areas include floodplain, tidal marshes and areas with moderately, well drained to very poorly drained soils. Some Udorthent soils contain concrete, asphalt, metal and

glass. The soils in the vicinity of Site 283 are classified as UA – Udorthents, smoothed, which may also include old sand and gravel pits that have been smoothed or filled in (**Figure 2-8**).

2.4.4 Topography and Surface Drainage

Over the last 80 years, the natural topography of Fort Monmouth has been altered by excavation and filling activities conducted by the military. The land surface at the Main Post is relatively flat and ranges in elevation from approximately 4 feet above mean sea level (amsl) in the east at Oceanport Creek to 32 feet amsl at the western end of the post, near Highway 35. The eastern half of the post is generally 10 feet above amsl in elevation.

Surface water runoff from the western part of the Main Post flows into the Lafetra Creek to the north or into the Mill Creek to the south. The USGS topographic map (**Figure 2-1**) shows the Lafetra Creek as Parkers Creek Branch and Mill Creek as Wampum. Both Mill Creek and Lafetra Creek originate off-post. Mill Creek is channelized and flows along the southern boundary of the Main Post, turning north just past the Auto Craft Shop. Lafetra Creek forms the northern boundary of the Main Post and joins Mill Creek to form Parkers Creek. Parkers Creek flows eastward along the northern boundary and joins Oceanport Creek east of the post. Most of Parkers Creek, Lafetra Creek and Mill Creek are tidally influenced.

The U.S. Fish and Wildlife Service (FWS) National Wetland Inventory Long Branch quadrangle maps indicate the presence of wetlands at the Main Post. Parkers Creek and Oceanport Creek are classified as estuarine intertidal aquatic beds. The area of Parkers Creek and the part of Oceanport Creek/Husky Brook are classified as estuarine intertidal emergent wetlands. Lafetra Creek and Mill Creek are classified as riverine lower perennial open water/unknown bottom.

Site 283 is located approximately 200 feet south of Parkers Creek, which empties to the east into Shrewsbury River. The USGS topographic map (**Figure 2-1**) shows that the land surface of the site is relatively flat at an elevation of less than 20 feet amsl. Surface water runoff from Site 283 is likely northward into Parkers Creek.

3.0 SITE ACTIVITIES

Fort Monmouth DPW has conducted remedial investigation activities, including a groundwater sampling program, to define the areal extent of potential pollutants and evaluate impacts to groundwater in the vicinity of Site 283. Remedial investigation activities were performed from September 1999 and continued through February 2004. These activities were managed by the Fort Monmouth DPW and performed by TECOM-Vinnell Services (TVS) and Versar. The details of remedial investigation activities that occurred at Site 283 are described in the following sections.

3.1 Well Installation

A total of three monitoring wells (283-MW1, 283-MW2 and 283-MW3) comprise the quarterly groundwater monitoring program conducted by the DPW. As discussed in **Section 2.2.2**, these monitoring wells were installed as part of the closure for former UST No. 0081533-229. Well 283-MW2 was installed in July 1999, and wells 283-MW1 and 283-MW3 were installed in March 2000. The locations of these monitoring wells (**Figure 2-3**) were strategically selected by the DPW to monitor possible contaminants released into the groundwater due to the former UST located at Site 283. The monitoring well construction details are discussed in **Section 2.2** and are summarized in **Table 2-1**. Well boring logs and monitoring well records are provided in **Appendix D**.

3.2 Groundwater Sample Collection Activities

As part of the remedial investigation of Site 283 quarterly groundwater monitoring was conducted from September 1999 through February 2004. Sampling activities were performed in accordance with the *Fort Monmouth Standard Sampling Operating Procedure* (December 1997). Monitoring well 283-MW2 was sampled during 19 quarterly sampling rounds (#1 through #19) from September 1999 through February 2004. Monitoring wells 283-MW1 and 283-MW3 were incorporated later into the quarterly monitoring program and sampled from June 2000 through February 2004 during 16 quarterly rounds (#4 through #19).

During the 19 rounds of quarterly groundwater sampling, a total of 96 groundwater samples, including 11 duplicate samples, 17 field blanks and 17 trip blanks for quality assurance/quality control (QA/QC), were collected from the three monitoring wells at Site 283. The quarterly groundwater samples were analyzed by the Fort Monmouth Environmental Testing Laboratory (FMETL) for VOCs plus 15 TICs using USEPA Method 624, SVOCs plus 25 TICs using USEPA Method 625, pesticides and PCBs using USEPA Method 608, and TAL metals using USEPA Methods 3112B and 3120B. A summary of the groundwater sampling activities, including rounds, well IDs, sample IDs, sample locations, collection/analysis date, analytical parameters and analysis method, is provided in **Table 3-1**. Copies of the groundwater sampling chain-of-custody forms and laboratory data sheets are presented in **Appendix E**. The results of the quarterly groundwater monitoring program are discussed in **Section 5.1** and are presented in **Table 5-1**.

In consideration of the potential benefits of the low-flow sampling procedure (see **Section 2.2.3**), two additional rounds of low-flow sampling were conducted on August 31, 2000 (Low Flow #1) and October 13, 2000 (Low Flow #2) using an NJDEP-accepted low-flow groundwater sampling technique A total of ten samples, including two duplicate samples and two field blanks, were collected and analyzed for TAL metals to determine whether metal concentrations observed in the groundwater samples at Site 283 are due to entrained soil particles (e.g., high turbidity) rather than dissolved phased groundwater constituents. The samples collected during the two low-flow sampling rounds were analyzed by the FMETL for TAL metals utilizing USEPA Methods 3120B and 3112B. A summary of the groundwater sampling activities, including rounds, well IDs, sample IDs, sample locations, collection/analysis date, analytical parameters and analysis method, is provided in **Table 3-1**. Copies of the groundwater sampling chain-of-custody forms and laboratory data sheets are presented in **Appendix E**. The results of the low-flow sampling rounds for Site 283 are discussed in **Sections 5.1** and presented in **Table 5-1**.

Sampling equipment was thoroughly decontaminated before and after each use, in accordance with the *Fort Monmouth Standard Sampling Operating Procedure* (1997). Following collection, the groundwater samples were immediately placed in laboratory-supplied bottleware. The sample containers were labeled, sealed, packed in ice and transported to the FMETL under proper chain-of-custody procedures.

During each of the monitoring well sampling rounds, aquifer chemical characteristics including pH, temperature, conductivity and dissolved oxygen (DO) were recorded prior to sampling. These chemical characteristics are included in the laboratory data packages. The aquifer pH and DO data are presented in **Section 5.3** and discussed in **Section 6.1**.

3.3 Groundwater Depth Measurements

During each of the groundwater monitoring rounds conducted at Site 283 (including the 19 quarterly monitoring rounds and two low-flow rounds), measurements of the depth to water was recorded with an accuracy of 0.01 feet. These depth to groundwater measurements, recorded from September 1999 through February 2004, are presented in **Table 3-2**. The groundwater elevation at each well was calculated by subtracting the measured depth to groundwater from the elevation of the top of the well casing. Groundwater elevations are discussed in **Section 4.2**.

3.4 Slug Testing Procedures

Versar conducted slug testing at the three monitoring wells located at Site 283 on August 15, 2001. Slug testing was performed to estimate hydrogeologic properties of the shallow soils at this site, such as groundwater velocity, to be used for contaminant transport modeling. The equipment used to perform the slug testing included a Hermit Environmental Data logger (Model 1000C), a 10-psi pressure transducer, and a 4-foot long, 3.5-inch diameter PVC slug.

The slug testing was performed by first recording the depth to top of groundwater, then placing the slug and the transducer into the well and allowing the water to equilibrate to a

level close to the original water level. The new water level was set as the reference water level for the data logger during the slug test. The slug was then removed and the data logger recorded the changing water level over time. The collected data were then transferred to a personal computer for later review and reduction. The raw data are presented in **Appendix F**. The results are discussed in **Section 4.2**.

3.5 Sensitive Receptors/Well Search

Searches were conducted using various databases and historical information to identify receptors and groundwater wells that may be potentially affected by COC at Site 283. An Offsite Receptor Report (October 24, 2001) was prepared by Environmental Data Resources, Inc. (EDR) for COCs at a central point surrounding the Main Post (less than one mile from Site 283).

In addition, a search of the comprehensive well database maintained by the NJDEP Well Permitting and Regulations Section of the Bureau of Water Allocation was performed to identify groundwater wells that may potentially be affected by COCs at Site 283. The search was performed for a one-mile radius surrounding a point at the center of the M-18 Landfill site on the Main Post of Fort Monmouth (addressed in a separate RIR). The M-18 Landfill site is located approximately 100 feet north of Site 283.

A copy of the sensitive receptor survey is provided in **Appendix G** and a copy of the well search summary is provided in **Appendix H**. The results of the sensitive receptor survey and well search are discussed in **Section 6.2**.

4.0 SITE PHYSICAL CHARACTERISTICS

The following sections represent the findings of the geologic and hydrogeologic characterization program for Site 283. These sections include a detailed discussion of the physical properties of the unconsolidated soil, bedrock and groundwater underlying the study area. Groundwater elevation data collected by the DPW from September 1999 through February 2004 are also presented in this section.

4.1 Lithology

The lithology encountered at Site 283 consists of asphalt, topsoil, fill and native material. The fill observed in the borings at Site 283 consisted of cinders, slag, coal fragments, and brown coarse-medium-fine sand, some medium-fine gravel. Native material encountered in the borings at Site 283 consists of brown to orange sand, silt and clay. Two geologic cross-sections (A-A' and A-A") were prepared that depict the subsurface lithology in the study area. Geologic cross section A-A' depicts the profiles for monitoring wells 283-MW2 and 283-MW3. Geologic cross section A'-A" depicts the profiles for monitoring wells 283-MW1 and 283-MW3. The geologic cross-section location map is included as **Figure 4-1**. The data used to construct the cross sections are presented in **Table 4-1** (cross section A-A') and **Table 4-2** (cross section A-A"). The geologic cross-section A-A' is presented in **Figure 4-2** and the geologic cross-section A-A" is presented in **Figure 4-3**. The boring logs used to create the cross section data tables are contained in **Appendix D**.

The geologic cross-sections A-A' and A-A" depict eight lithologic units. Lithologic units 1 and 2 represent asphalt and topsoil, respectively. Lithologic units 3 and 4 represent fill material, and lithologic units 5, 6, 7 and 8 represent native materials. The lithology of the native material is consistent with the Tinton Sand Formation (Minard, 1969). The following underground utilities are shown in geologic cross-sections A-A' and A-A":

- One 20-inch diameter sanitary sewer is shown in both geologic cross-section A-A' and geologic cross-section A-A". The elevation of this sanitary sewer is approximately 2.75 feet amsl (inferred from invert elevations shown on **Figure 4-1)**.
- One 8-inch diameter storm sewer is shown in geologic cross-section A-A". The elevation of this storm sewer is unknown (shown on **Figure 4-3** as approximately 7 feet amsl).

4.2 Groundwater Flow

During the groundwater sampling program at Site 283 (19 quarterly rounds and two low-flow rounds), groundwater was encountered in monitoring wells at Site 283 at depths ranging from 4.62 to 8.54 feet bgs (**Table 3-2**) with a slight gradient toward the northwest. Groundwater velocity and flow directions were predicted based on groundwater elevation data and slug test results (see below), as well as the interpretation of groundwater contour maps prepared for selected sampling events.

4.2.1 Groundwater Flow Direction

In accordance with NJAC 7:26E-3.13(d) 2iv, 16 groundwater contour maps were generated based on groundwater elevations at the three monitoring wells. Three of these groundwater contour maps also include groundwater elevation data based on measurements at 11 monitoring wells located in the nearby M-18 Landfill site (wells 290-MW1, 290-MW2, 296-MW1, 296-MW2, 296-MW3, 296-MW4, 296-MW6, 296-MW7, 296-MW8, MP18-MW24 and MP18-MW25). The 16 groundwater contour maps were derived from groundwater depth measurements collected on June 28, 2000 (**Figure 4-4a**), August 10, 2000 (**Figure 4-4b**), October 17, 2000 (**Figure 4-4c**), January 5, 2001 (**Figure 4-4d**), April 4, 2001 (**Figure 4-4e**), July 24, 2001 (**Figure 4-4f**), December 11, 2001 (**Figure 4-4g**), March 8, 2002 (**Figure 4-4h**), May 16, 2002 (**Figure 4-4i**), September 10, 2002 (**Figure 4-4j**), December 3, 2002 (**Figure 4-4k**), February 27, 2003 (**Figure 4-4l**), May 19, 2003 (**Figure 4-4m**), August 4, 2003 (**Figure 4-4n**), November 13, 2003 (**Figure 4-4o**) and February 5, 2004 (**Figure 4-4p**). The groundwater underlying Site 283 consistently flows to the north-northwest towards Parkers Creek. No significant variations in groundwater flow conditions were observed in these 16 groundwater contour maps. The groundwater elevation data are presented in **Table 3-2**.

4.2.2 Hydrogeologic Properties

As discussed in **Section 3.4**, Versar conducted slug testing of the three monitoring wells located at Site 283 on August 14, 2001. Versar used the computer software *Aquifer Test* by Waterloo Hydrogeologic, Inc. (version 3.01, 2001) to reduce slug testing data using the Bouwer-Rice methodologies. Data plots generated by Aquifer Test are presented in **Appendix F**. A summary of the calculated conductivity values is presented in **Table 4-3**.

The calculated conductivity values range from 2.41 feet per day at monitoring well 283-MW2 to 4.38 feet per day at well 283-MW3, with a calculated geometric mean of 3.5 feet/day. The variability in the range of hydraulic conductivities is associated with the shallow depth of the monitoring wells, partial penetration into the aquifer and the heterogeneous nature of the fill material at Site 283. The geometric mean is used instead of the average due to the commonly high range of variability in hydraulic conductivity measurements.

The groundwater flow gradient for Site 283 was estimated using the groundwater elevation data discussed above. The groundwater flow gradient (i) is calculated by measuring the distance (L) between two equipotential lines h_1 and h_2 using the following equation:

$$i = \frac{h_1 - h_2}{L}$$

The groundwater flow gradient for Site 283, based on water level measurements collected on January 5, 2001, was estimated at approximately 0.0074 feet per foot.

Groundwater flow velocity (v) in the vicinity of Site 283 was then estimated using the groundwater flow gradient (i), an estimated hydraulic conductivity (K) for the

surrounding soils based on the slug test results, and an assumed porosity (α) in the following equation:

$$v = \frac{Ki}{\alpha}$$

The hydraulic conductivity (K) used in the calculation, 3.5 feet per day, is the geometric mean based on the results of slug testing performed by Versar (**Table 4-3**). The porosity (α) was estimated at 40% using average values for silt and sands (Heath, USGS, 1989). The groundwater velocity for Site 283 was calculated to be approximately 0.065 feet per day (approximately 24 feet per year) based on the January 5, 2001 water-level measurements.

5.0 SITE CHEMICAL CHARACTERIZATION

This section includes a discussion of the chemical characterization of Site 283 based on groundwater samples collected and analyzed during 21 rounds of monitoring well sampling. DPW personnel were responsible for the collection of samples during this remedial investigation. Sample analyses were performed by the FMETL, a New Jersey certified laboratory (Certification No. 13461).

5.1 Groundwater Sampling Results

This section presents a discussion of the results of laboratory analyses performed for the 21 rounds of groundwater samples collected from September 1999 through February 2004 from the three monitoring wells (283-MW1 through 283-MW3) at Site 283. These 21 rounds are a combination of 19 quarterly rounds (#1 through #19) conducted at well 283-MW2, 16 quarterly rounds (#4 through #19) at wells 283-MW1 and 283-MW3 and two additional low-flow rounds (Low Flow #1 and Low Flow #2) conducted at each of the wells (**Table 3-1**). The groundwater samples were collected and analyzed for VOCs plus 15 TICs, SVOCs plus 25 TICs, pesticides, PCBs and TAL metals. The two low-flow sampling rounds were conducted on August 31, 2000 (Low Flow #1), and October 13, 2000 (Low Flow #2) using a low-flow groundwater sampling technique for TAL metals. As discussed in **Section 2.2.3**, a low-flow sampling methodology was proposed for use by the DPW and accepted by the NJDEP to assess the impact of suspended sediments on the dissolved phase metal concentrations at Site 283.

As discussed in **Section 2.4.2**, Fort Monmouth is underlain by a Class III-A aquifer. The appropriate groundwater quality criteria for Class III-A are the criteria for the most stringent classification for vertically or horizontally adjacent groundwater that is not Class III-A (NJAC 7:9-6.7e). The NJDEP criteria used for comparison of groundwater analytical results were the higher of the Practical Quantitation Limits (PQLs) and the GWQC for Class II-A aquifers per NJAC 7:9-6, Table 1.

During the 21 quarterly sampling rounds, a total of seven VOCs were detected in site groundwater. Three VOCs were detected at concentrations that exceeded their respective GWQC in at least one sample, while the remaining four VOCs were detected below their respective GWQC. A total of nine SVOCs were detected in site groundwater below their respective GWQC. No pesticides or PCBs were detected in site groundwater. A total of 23 metals were detected in site groundwater. Eight metals were detected at concentrations that exceed their respective GWQC in at least one sample, while the remaining 15 metals were detected below their respective GWQC.

The detections of analytes in groundwater samples are presented in four subsections: VOCs (**Section 5.1.1**), SVOCs (**Section 5.1.2**), Pesticides and PCBs (**Section 5.1.3**) and TAL Metals (**Section 5.1.4**). Analytes detected in groundwater samples at Site 283 at concentrations above the NJDEP criteria are bold and highlighted in **Table 5-1** and are discussed below. Due to the occurrences of high concentrations of TICs (both VOCs and

SVOCs) in samples collected at well 283-MW2, the total concentrations of these TICs are provided in **Table 5-1** and are also discussed below.

5.1.1 VOCs

During 21 quarterly sampling rounds, three VOCs were detected in site groundwater at concentrations that exceeded their respective GWQC in at least one sample.

Benzene was detected at concentrations exceeding the GWQC of 1.0 ug/L in 19 rounds of sampling collected at two monitoring well locations. Concentrations ranged from 1.47 ug/L (sampling round #16) in 283-MW3 to 1,055.06 ug/L (sampling round #10) in 283-MW2.

Ethylbenzene was detected at concentrations exceeding the GWQC of 700 ug/L in nine rounds of sampling collected at one monitoring well location. Concentrations ranged from 711.17 ug/L (sampling round #10) in 283-MW2 to 1,160.45 ug/L (sampling round #7) in 283-MW2.

Total xylenes were detected at concentrations exceeding the GWQC of 1,000 ug/L in 18 rounds of sampling collected at one monitoring well location. Concentrations ranged from 1,427.1 ug/L (sampling round #19) in 283-MW2 to 5,960.7 ug/L (sampling round #4) in 283-MW2.

VOC TICs were detected in 19 rounds of sampling collected at three monitoring well locations. Concentrations ranged from 9 ug/L (sampling round #16) in 283-MW3 to 13,500 ug/L (sampling round #6) in 283-MW2. There are no NJDEP criteria for VOC TICs in groundwater.

5.1.2 SVOCs

No SVOCs were detected above the appropriate GWQC at the site.

SVOC TICs were detected at concentrations exceeding the GWQC of 100 ug/L in 19 rounds of sampling collected at three monitoring well locations. Concentrations ranged from 4 ug/L (sampling round #19) in 283-MW1 to 4,912 ug/L (sampling round #7) in 283-MW2.

5.1.3 Pesticides and PCBs

No pesticides or PCBs were detected above the appropriate GWQC at the site.

5.1.4 Metals

During 21 quarterly sampling rounds, eight metals were detected in site groundwater at concentrations that exceeded their respective GWQC in at least one sample.

Aluminum was detected at concentrations exceeding the GWQC of 200 ug/L in 21 rounds of sampling collected at three monitoring well locations. Concentrations ranged from 234 ug/L (sampling round #18) in 283-MW3 to 4,710 ug/L (sampling round #19) in 283-MW1.

Antimony was detected at concentrations exceeding the GWQC of 20 ug/L in one round of sampling collected at one monitoring well location at a concentration of 83.6 ug/L (sampling round #17) in 283-MW1.

Arsenic was detected at concentrations exceeding the GWQC of 8.0 ug/L in three rounds of sampling collected at three monitoring well locations. Concentrations ranged from 8.1 ug/L (sampling round #18) in 283-MW3 to 29.9 ug/L (sampling round #12) in 283-MW3.

Cadmium was detected at concentrations exceeding the GWQC of 4.0 ug/L in one round of sampling collected at one monitoring well location at a concentration of 5.1 ug/L (sampling round #8) in 283-MW3.

Iron was detected at concentrations exceeding the GWQC of 300 ug/L in 21 rounds of sampling collected at three monitoring well locations. Concentrations ranged from 306 ug/L (sampling round #6) in 283-MW1 to 40,500 ug/L (sampling round #8) in 283-MW3.

Lead was detected at concentrations exceeding the GWQC of 10 ug/L in 15 rounds of sampling collected at three monitoring well locations. Concentrations ranged from 11.5 ug/L (sampling round #4) in 283-MW2 to 33.1 ug/L (Low Flow #1) in 283-MW2.

Manganese was detected at concentrations exceeding the GWQC of 50 ug/L in one round of sampling collected at one monitoring well location at a concentration of 58.2 ug/L (sampling round #19) in 283-MW1.

Sodium was detected at concentrations exceeding the GWQC of 50,000 ug/L in seven rounds of sampling collected at one monitoring well location. Concentrations ranged from 50,800 ug/L (sampling round #14) to 80,100 ug/L (sampling round #19) in 283-MW1.

5.2 COCs

In order to determine the potential COCs in groundwater at Site 283, the first step was to identify exceedances of the NJDEP GWQC in monitoring well samples collected at Site 283. These exceedances are presented in **Section 5.1** above and in **Table 5-1**. There were four groundwater constituents identified as COCs (benzene, ethylbenzene, total xylenes and lead) at Site 283, as discussed in this section.

There were several factors that were used to eliminate or identify analytes as COCs. These factors include the magnitude of the exceedances, the frequency of the occurrences, comparisons to low-flow sampling results (for metals only), and comparisons to established background concentrations (see **Section 2.2.3**). **Table 5-2** summarizes the groundwater sampling results for the potential COCs. **Table 5-3** summarizes the process used to identify COCs in groundwater at Site 283.

There were three VOCs (benzene, ethylbenzene and total xylenes) that were detected at concentrations exceeding the NJDEP GWQC in groundwater samples collected at Site 283. These three compounds are considered to be COCs at Site 283, as discussed below:

- Benzene was detected at concentrations exceeding the GWQC of 1.0 ug/L in each of the seven quarterly groundwater monitoring rounds conducted at well 283-MW2 (at concentrations ranging from 130.8 ug/L to 1,009.73 ug/L). Benzene was also detected at concentrations above the GWQC of 1.0 ug/L in each of the four quarterly groundwater monitoring rounds conducted at well 283-MW3 (at concentrations ranging from 5.3 ug/L to 11.76 ug/L). Based on the magnitude of the exceedances and the frequency of the occurances, benzene is considered a COC in groundwater at Site 283.

- Ethylbenzene was detected at concentrations exceeding the GWQC of 700 ug/L in six of the seven quarterly groundwater monitoring rounds conducted at well 283-MW2 (at concentrations ranging from 717.50 ug/L to 1,160.45 ug/L). Based on the magnitude of the exceedances and the frequency of the occurances, ethylbenzene is considered a COC in groundwater at Site 283.

- Total xylenes were detected at concentrations exceeding the GWQC of 1,000 ug/L in each of the seven quarterly groundwater monitoring rounds conducted at well 283-MW2 (at concentrations ranging from 2,125.86 ug/L to 5,960.70 ug/L). Based on the magnitude of the exceedances and the frequency of the occurances, total xylenes is considered a COC in groundwater at Site 283.

There were SVOCs detected above their respective GWQC in groundwater samples collected at Site 283. Therefore, there are no SVOCs of concern at this site.

There were no pesticides or PCBs detected in groundwater samples collected at Site 283. Therefore, there are no pesticides or PCBs of concern at this site.

There were eight metals that were detected in Site 283 groundwater at concentrations exceeding the NJDEP GWQC (aluminum, antimony, arsenic, cadmium, iron, lead, managanese and sodium). The specific exceedances and the identification of each of these metals as a potential contaminant of concern are discussed below.

As discussed in **Section 2.2.3**, a low-flow sampling methodology was proposed for use by the DPW and accepted by the NJDEP to assess the impact of suspended sediments on the dissolved phase metals concentrations at Site 283. The seven different metals that were detected in Site 283 groundwater at concentrations exceeding the NJDEP GWQC are distinguished below into background and non-native metals. The indigenous metals are compared to the Main Post Maximum Background Concentrations (MBC) identified in the SI (Weston, 1995), which are presented in **Tables 5-1** and **5-3**. Non-native metals are discussed in relation to the NJDEP GWQC only.

Of the seven metals detected in Site 283 groundwater that exceed the GWQC, four metals (aluminum, iron, manganese and sodium) are common background constituents in Monmouth County soils. The water chemistry in areas underlain by glauconitic sediments (such as Red Bank, Tinton and Hornerstown Sands) is dominated by calcium, magnesium, manganese, aluminum and iron. Elevated concentrations of these metals are routinely observed in groundwater samples collected at Fort Monmouth. In consideration of these facts, the groundwater analytical results for these four metals were compared to their respective MBCs of 121,000 ug/L (aluminum), 431,000 ug/L (iron), 331 ug/L (manganese) and 21,500 (sodium) as follows:

- Aluminum is not considered to be a COC because aluminum was not detected in groundwater at concentrations exceeding the MBC.
- Iron is not considered to be a COC because iron was not detected in groundwater at concentrations exceeding the MBC.
- Manganese is not considered to be a COC because manganese was not detected in groundwater at concentrations exceeding the MBC.
- Sodium is not considered to be a COC because although sodium was detected above its MBC, it was detected infrequently in only one monitoring well.

There were four non-native metals that exceeded their respective GWQC (antimony, arsenic, cadmium and lead). The concentrations of antimony, arsenic, cadmium and lead that were detected in groundwater samples collected during the quarterly sampling rounds were compared to sampling results obtained during the two low-flow sampling rounds.

Two separate rounds of sampling (August 31, 2000 and October 13, 2000) were performed during the quarterly groundwater sampling program using the low-flow groundwater sampling technique as discussed in **Section 3.2**. This technique was used to determine if the detected metal concentrations observed in groundwater samples are a function of entrained sediments suspended in the groundwater during the course of well purging and sampling activities, or an accurate representation of dissolved phase aquifer/groundwater conditions. These comparisons provided the following results:

- Antimony was not detected during either of the low-flow sampling rounds conducted at any of the three monitoring wells. During the quarterly groundwater monitoring rounds (round #1 through #19), antimony was detected at a concentration exceeding the NJDEP GWQC of 20 ug/L during one of 16 quarterly sampling rounds conducted at well 283-MW1. Based on these results, antimony is not considered to be a COC in groundwater at Site 283.

- Arsenic was not detected during either of the low-flow sampling rounds conducted at any of the three monitoring wells. During the quarterly groundwater monitoring rounds (round #1 through #19), arsenic was detected at concentrations exceeding the NJDEP GWQC of 8.0 ug/L during one of 16 quarterly sampling rounds conducted at well 283-MW1, in three of 19 quarterly sampling rounds conducted at well 283-MW2 and in two of 16 quarterly sampling rounds

conducted at well 283-MW3. Based on these results, arsenic is not considered to be a COC in groundwater at Site 283.

- Cadmium was not detected during either of the low-flow sampling rounds conducted at any of the three monitoring wells. During the quarterly groundwater monitoring rounds (round #1 through #19), antimony was detected at a concentration exceeding the NJDEP GWQC of 4.0 ug/L during one of 16 quarterly sampling rounds conducted at well 283-MW3. Based on these results, antimony is not considered to be a COC in groundwater at Site 283.

- Lead was detected at concentrations exceeding the NJDEP criterion of 10 ug/L during one of the low-flow sampling rounds (Low Flow #1) conducted at well 283-MW1 (at a concentration of 20.1 ug/L), and in each of the two low-flow sampling rounds conducted at well 283-MW2 (at concentrations of 33.1 ug/L and 25.7 ug/L). During the quarterly groundwater monitoring rounds (round #1 through #19), lead was also detected at concentrations exceeding the NJDEP GWQC of 10 ug/L during 13 of 19 quarterly sampling rounds conducted at well 283-MW2, and in one of 16 quarterly sampling rounds conducted at well 283-MW3. Lead was also detected in 11 of 40 soil samples associated with the UST excavation at concentrations below the RDCSCC. Based on these results, lead is considered to be a COC in groundwater at Site 283.

The four COCs (benzene, ethylbenzene, total xylenes and lead) identified above are given further consideration with regard to contaminant migration potential in **Section 6.0** of this RIR/RAWP. No other potential contaminants of concern were identified in groundwater at Site 283. The concentrations of these COCs in groundwater at Site 283 are summarized on **Figure 5-1** and in **Table 5-2**.

The method detection limits (MDLs) for each of the sampling results in which there was a non-detect (ND) result are included in **Table 5-2**. The MDLs for each analysis is included in the laboratory data packages. These MDLs were used in the groundwater model as discussed in **Section 6.0**.

5.3 Aquifer pH and DO

During each of the monitoring well sampling rounds, the pH and DO of the groundwater were recorded prior to sampling. The average pH ranged from 4.82 in well 283-MW1 to 5.84 in well 283-MW3. The average DO ranged from 2.92in wells 283-MW1 and 283-MW3 to 3.15 in well 283-MW2. The aquifer pH and DO measurements are shown in **Table 5-4**. The pH and DO data is included in the laboratory data packages (**Appendix E**). The aquifer pH and DO is discussed in more detail in **Section 6.1**.

6.0 CONTAMINANT MIGRATION AND GROUNDWATER USE DESIGNATION

The purpose of developing a groundwater model for Site 283 was to predict the migration of the four identified COCs in site groundwater: benzene, ethylbenzene, total xylenes and lead. Predictions of the migration and change in COC concentration over time were made based on observed groundwater concentrations (summarized in **Section 5.0**). The initial COC concentrations, as well as future predictions (results) of the COC concentrations, are presented both in table form and graphically. The results of the groundwater models discussed in this section were then used to develop an RAWP to address the four COCs in groundwater at Site 283 (**Section 8.0**).

6.1 Groundwater Model Development

The models presented in this report involve predictions of future concentrations of COCs in groundwater at Site 283 with the assumption that no significant changes in physical conditions will occur at Site 283. This assumption of "natural attenuation" is used to predict both the time that the COC concentrations in groundwater will decrease below the GWQC, as well as the area that could be impacted by groundwater contamination. The modeling methods used for this investigation include a simple spreadsheet model and a three-dimensional MODFLOW simulation, which were chosen based on the physical and chemical properties of the COCs.

A conceptual site model was developed for Site 283 to provide a basis for the computer model development. The conceptual site model includes the topography, groundwater recharge, groundwater flow conditions and the geologic formations in the ground, as discussed in **Section 6.1.1**. **Section 6.1.2** addresses the biodegradation of organic compounds. A spreadsheet model used to predict the transport and decay of benzene at Site 283 is discussed in **Section 6.1.3**. The United States Geologic Survey (USGS) Modular Three-Dimensional Groundwater Flow Model, MODFLOW, was chosen for additional groundwater modeling for benzene and lead at Site 283 to incorporate the effects of dispersion and 3-dimensional (3-D) groundwater flow. The MODFLOW simulation includes the effect of dispersion, which accounts for the dilution of the groundwater due to mixing, 3-D groundwater flow, degradation (applied to benzene only) and retardation due to sorption. The MODFLOW simulation is discussed in **Sections 6.1.4** (Input Parameters), **6.1.5** (Calibration) and **6.1.6** (Results).

6.1.1 Conceptual Site Model

The land surface at the Main Post is relatively flat and ranges in elevation from 4 feet amsl in the east at Oceanport Creek to 32 feet amsl at the western end of the post, near Highway 35. The eastern half of the post is generally 10 feet amsl in elevation. Site 283 is located approximately 2,000 feet northwest of Oceanport Creek. The USGS topographic map (**Figure 2-1**) shows that the land surface of the site is relatively flat at an elevation of less than 20 feet amsl. Surface water runoff from the Site 283 is likely to flow north-northwest towards Parkers Creek, located approximately 200 feet north of the site.

According to Jablonski (1968), the average precipitation for Monmouth County is 44.67 inches per year. After precipitation reaches the ground, the water cycle begins and the water is lost to the atmosphere through evapotranspiration, discharged to receiving waters as surface runoff, or percolates into the soil as groundwater recharge. Groundwater is then separated into water utilization and groundwater flow ("base flow"). The average groundwater recharge for Site 283 was calculated from Jablonski (1968) to be approximately 13.28 inches per year, which is the sum of the base flow (11.56 inches per year), utilization from groundwater (0.84 inches per year), and the utilization from surface water (0.88 inches per year). As an approximation to natural conditions, the recharge of 13.28 inches was applied to the top layer of the MODFLOW model except in paved areas (as discussed below in **Section 6.1.4**).

As discussed in **Section 2.4.1**, the geologic formations that outcrop at the Fort Monmouth Army Base include the Tinton and Red Bank Sands, as well as the Hornerstown Formation. These formations, along with the Navesink Formation, are part of the Navesink-Hornerstown Confining Unit that overlies the Wenonah-Mount Laurel Aquifer (Zapecza, 1990). A geologic cross-section of the New Jersey Coastal plain that shows these formations is presented in **Figure 6-1.**

As discussed in **Section 4.1**, the lithology encountered during drilling of the monitoring wells at Site 283 consists of asphalt, topsoil, fill and native material. The fill observed in the borings at Site 283 consisted of cinders, slag, coal fragments and brown coarse-medium-fine sand, some medium-fine gravel. The native material encountered in the borings at Site 283 consists of brown to orange sand, silt and clay, which is consistent with the Tinton Sand formation as described in Minard (1969). Underground utilities (discussed in **Sections 2.2** and **4.1**) were not included as part of the groundwater migration models. However, underground utilities could have had some effect on the velocity and direction of shallow groundwater flow and could affect the flow of contaminants at Site 283. Possible effects of underground utilities are discussed with the MODFLOW results (**Section 6.1.6**).

Groundwater was encountered in each monitoring well at depths ranging from 4.62 to 8.54 feet bgs **(Table 3-2**) with a hydraulic gradient indicating flow north-northwest toward Parkers Creek (**Figure 4-4a** through **Figure 4-4p**). The groundwater flow gradient for Site 283 was estimated to be 0.0074 feet per foot. The calculated conductivity values range from 2.41 feet per day at monitoring well 283-MW1 to 4.38 feet per day at well 283-MW3, with a calculated geometric mean of 3.5 feet per day. The groundwater velocity for Site 283 was calculated to be approximately 0.065 feet per day (approximately 24 feet per year) based on the January 5, 2001 water-level measurements.

6.1.2 Biodegradation of Organic Compounds

The COCs in groundwater at Site 283 can be separated into two groups: organic and inorganic. The three organic COCs consist of benzene, ethylbenzene and total xylenes. The one inorganic COC is lead. The COCs that are organic may have the potential to degrade through biological means, whereas lead is not biodegradable. Published

degradation rates for the COCs that are organic compounds are shown in **Table 6-1**. A discussion of the appropriate degradation rate which was used in modeling groundwater migration at Site 283 is provided below.

Aerobic respiration is the first reaction in an environment that contains microorganisms capable of biodegradation (Wiedemeir, 1999). Aerobic degradation requires the presence of DO. Once the available DO is depleted and anaerobic conditions dominate the interior regions of the organic contaminant plume, anaerobic microorganisms can utilize other electron acceptors in the following order of preference: nitrate, manganese, iron (III), sulfate and finally, carbon dioxide. As each electron acceptor being utilized for biodegradation becomes depleted, the next most preferable electron acceptor is utilized. Each successive redox couple provides less energy to the microorganism. As discussed in **Section 5.3**, during each sampling event at each well, DO was recorded while the wells were being purged. **Table 5-4** shows the DO measurements for the monitoring wells at Site 283 during sampling events between September 1999 and February 2004.

If the subsurface environment becomes devoid of oxygen, the rate of aerobic biodegradation will typically be limited by oxygen supply rather than by nutrient concentration. For anaerobic biodegradation the microbial competition ultimately will determine the dominant process, but the dominant process can vary both temporally and spatially. Therefore, either iron (III) reduction, sulfate reduction or methanogenesis may dominate depending on seasonal variations in concentrations of DO and sulfate.

Using stoichiometry, a utilization factor can be developed showing the ratio of the oxygen consumed to the mass of DO consumed in the biodegradation reactions. Similarly, utilization factors can be developed to show the ratio of the mass of metabolic by-products (such as ferrous iron) that are generated to the mass of dissolved organic degraded in the biodegradation reactions. When the available electron acceptor/by-product concentrations are divided by the appropriate utilization factor, an estimate of the biodegradation capacity of the groundwater flowing through the source zone and plume can be developed as follows:

Biodegradation Capacity (mg/L) =
{(Average Upgradient Electron Acceptor Concentration) -
(Minimum Plume Zone Electron Acceptor Concentration)}/ Utilization Factor

The following factors (based on Wiedemeier, 1999) show that there is probably insufficient DO at Site 283 for aerobic decay of the COCs that are organic compounds (benzene, ethylbenzene and total xylenes) to occur at Site 283. The sum of benzene, toluene, ethylbenzene and total xylenes is used for this analysis. The calculation below provides insight related to the degradation rates for BTEX compounds at Site 283.

- The plume zone is assumed to be located in the vicinity of well 283-MW2.
- The electron acceptor for aerobic decay is DO.
- The utilization factor for aerobic degradation of BTEX is 3.14.

- The most recent total BTEX concentration observed at Site 283 on January 5, 2001 in monitoring well 283-MW2 was 7,634.65 ug/L. This total was calculated as a sum of the concentrations of the BTEX comounds (1,009.73 ug/L for benzene, 320.72 ug/L for toluene, 1,160.45 ug/L for ethylbenzene, and 5,143.75 ug/L for total xylenes).
- For aerobic decay to occur, the "Average Upgradient" DO would need to be sufficiently high, as follows. This relation was derived by rearranging the definition of biodegradation capacity discussed above:
  ⇒ {Average Upgradient DO} must be greater than (>)
  {total BTEX concentration at well 283-MW2} * {Utilization Factor}
  +{Minimum Plume Zone DO}
- Based on the expression above, the average upgradient DO would have to be greater than 23.9 mg/L.

Since 23.9 mg/L is much greater than any DO measurements made at Site 283 monitoring wells and other monitoring wells at Fort Monmouth (not presented in this report), the calculation above demonstrates that *aerobic* degradation of the COCs is not likely to occur at Site 283. There are several different possible electron acceptors that can be utilized in *anaerobic* decay. The models discussed below use the most conservative degradation rate for benzene of 730 days (Wiedemeier, 1999) (**Table 6-1**).

6.1.3 Spreadsheet Degradation Model for Benzene

As shown in **Table 6-1**, benzene has the longest half-life among the COCs that are organic compounds. Benzene concentrations in groundwater samples collected from monitoring well 283-MW2 at Site 283 have been consistently over 100 times greater than the GWQC (**Table 5-3**), which is the highest among the four identified COCs. In addition, benzene has the lowest sorption coefficient among the four identified COCs at Site 283 (**Table 6-2**), which implies that benzene is the most mobile of these COCs. Due to the fact that the two other organic COCs (ethylbenzene and total xylenes) are less mobile than benzene, have lower concentrations relative to their respective GWQC, and have faster degradation rates, the model predictions for organic compounds (discussed below) are limited to benzene.

Two *Microsoft Excel* spreadsheets were prepared to predict the biodegradation and migration of benzene at Site 283. The biodegradation model incorporates the effects of horizontal groundwater flow, first-order biodegradation and retardation. The gradients used in these spreadsheets were derived from the groundwater contour map for January 5, 2001 (**Figure 4-4d**). Predictions were made based on analytical results at well 283-MW2 (**Table 6-3**) and well 283-MW3 (**Table 6-4**).

Due to the lack of a decreasing trend in the benzene detections, a site-specific decay rate for benzene was not calculated. As discussed in **Section 6.1.2**, the half-life of 730 days was obtained from published results (Howard, 1991) and used in the model below. This half-life corresponds to a degradation rate constant (k) of 0.00095 (1/day).

At monitoring well 283-MW2, the initial benzene concentration of 838.48 ug/L was based on the average of the two most recent concentrations detected at well 283-MW2 (10/17/00 and 01/05/01). This initial concentration led to a predicted time of 20 years for compliance with the NJDEP criteria (1.0 ug/L). The migration distance to achieve compliance at well 283-MW2 is predicted to be 270 feet based on the hydraulic conductivity of 3.5 feet per day, the hydraulic gradient of 0.0074, the effective porosity of 0.4, the bulk density of 1.65 kg/L, and the sorption coefficient of 0.1851 L/kg (**Table 4-3**).

At monitoring well 283-MW3, the initial benzene concentration of 7.58 ug/L was based on the average of the two most recent concentrations detected at well 283-MW3 (10/17/00 and 01/05/01). This initial concentration led to a predicted time of 5.9 years for compliance with the NJDEP criteria (1.0 ug/L). The migration distance to achieve compliance at well 283-MW3 is predicted to be 400 feet based on a hydraulic conductivity of 3.5 feet per day, the hydraulic gradient of 0.037, the effective porosity of 0.4, the bulk density of 1.65 kg/L, and the sorption coefficient of 0.1851 L/kg (**Table 4-3**). The hydraulic gradient of 0.037 is five times greater than the gradient at well 283-MW2. This difference in gradient is due to the change in topography just north of Building 283 and approaching Parkers Creek. Based on the result of the spreadsheet model shown in **Table 6-4**, benzene (as well as other organic contaminants) could migrate north from Building 283 and seep into Parkers Creek sometime within the next 5.7 years.

The spreadsheets discussed in this section do not include the effects of dilution due to dispersion and 3-D groundwater flow. The groundwater flow used in these spreadsheet calculations is assumed to flow through surficial materials with hydraulic conductivity of 3.5 feet per day. The additional factors of 3-D flow and dispersion were simulated using MODFLOW as discussed below.

6.1.4 MODFLOW Input Parameters

Visual MODFLOW Version 2.8.2 (Waterloo Hydrogeologic, Inc.) was used to simulate the groundwater flow at Site 283 and *MT3D 1999* (1999, Papadopolos & Associates, Inc.) was used to simulate the movement of the contaminants over time at Site 283. *Surfer for Windows Version 7* (Golden Software, Inc.) was used to create the map of the ground surface that was used in the simulation and the maps of initial benzene and lead concentrations. As discussed above, the predicted concentration and migration of benzene represents the most conservative approach for modeling the organic COCs in groundwater at Site 283. Input parameters for the MODFLOW model for Site 283 are presented in **Table 6-5**.

Physical Boundaries and Grid

The model grid for Site 283 is presented in **Figure 6-2** with topographic contours shown as brown lines, Parkers Creek highlighted as solid blue (groundwater constant head boundary condition of 0 feet amsl), areas assigned zero groundwater recharge highlighted in yellow, and the Fort Monmouth Base Map shown in black. The Fort Monmouth Base

Map was used to determine the location of Parkers Creek and areas of no recharge (paved areas and buildings).

The model area for Site 283 was 2,400 feet (west to east) by 1,800 feet (south to north). This area was divided into a grid with 137 columns and 113 rows. The grid cells are 20 by 20 feet in the majority of the model area and 10 feet by 10 feet in the vicinity of Site 283 monitoring wells. Ground surface elevation points were obtained from the Fort Monmouth topographic survey map and the surface water at the site was assumed to be at an elevation of 0 feet amsl. The ground surface was obtained for each of the MODFLOW grid cells by importing topographic data into *Visual MODFLOW*, which uses the "kriging" method to estimate topographic elevations in each model grid-values from a set of topographic measurements.

Groundwater recharge for Site 283 was estimated to be 13.28 inches, as discussed in **Section 6.1.1**. The recharge of 13.28 inches was applied to the entire MODFLOW model area as an approximation. Surface water drainage through storm sewers was not addressed in the MODFLOW model. The grid cells that are located within Oceanport Creek were designated the boundary condition of 0 feet amsl for the groundwater head.

The porosity and specific yield of 0.4 and 0.2, respectively, were taken from Heath (USGS, 1989). The bulk density of 46.7 kg/feet^3 was derived from the porosity (0.4), and a typical soil particle density of 2.65 g/ml (Brady and Weil 1996).

Groundwater Flow Parameters

The parameters used in the groundwater flow model were based on Fort Monmouth survey data, published literature on the hydrogeology of the region, as well as field measurements of groundwater elevation at the site (discussed in **Section 4.2**).

The model area for Site 283 was divided into five layers, which relate to three published hydrogeologic units and one five-foot layer of surficial of fill. **Figure 6-3** presents a cross section of the model area showing these layers. Each color on this figure represents a different hydrogeologic unit and a different hydraulic conductivity. Four hydrogeologic units (surficial fill, the Navesink-Hornerstown Confining Unit, the Mount Laurel Aquifer and the Marshalltown-Wenonah Confining Unit) were used in the MODFLOW simulation for Site 283. Conductivity values for the lower three hydrogeologic units were taken to be the geometric mean of published conductivity values (Martin, 1998). The thicknesses of these lower four layers correspond to the published thicknesses of geologic formations (as presented in Zapecza, 1990, plates 16, 17 and 18). The five model layers are discussed below:

- The top layer, identified as Layer 1, is 5 feet thick, and corresponds to fill material. The fill thickness of 10 feet was assigned to the entire model area as a simplification. This assumed thickness approximates the observations of fill in soil borings at Fort Monmouth including fill surrounding underground utilities (**Figures 4-2** and **4-3**). Layer 1 was assigned a hydraulic conductivity of 3.5 feet

per day, which is the geometric mean of the conductivity values obtained from slug tests (**Table 4-3**).

- Layer 2 (approximately 20 feet thick) and Layer 3 (95 feet thick) correspond to the Navesink-Hornerstown Confining Unit. This confining unit was divided into two layers in order to assign initial concentrations of benzene and lead to depths less than 30 feet bgs. Layers 2 and 3 were assigned a hydraulic conductivity of 0.12 feet per day. The thickness of the Navesink-Hornerstown Confining Unit is approximately 125 feet at Site 283 (**Figure 2-7**).
- Layer 4, which corresponds to the Wenonah-Mount Laurel Aquifer, was assigned a thickness of 75 feet and a hydraulic conductivity of 15.96 feet per day.
- The bottom layer, Layer 5, corresponds to the Marshalltown-Wenonah Confining Unit and was assigned a thickness of 10 feet. The hydraulic conductivity of 0.00018 feet per day was assigned to this lowermost layer.

Contaminant Transport Inputs: Initial Concentrations

The physical and chemical parameters that effect contaminant transport were set up for two groundwater constituents at Site 283, benzene and lead. The contaminant transport parameters include initial concentrations of the COCs, dispersivity, bulk density, sorption type and sorption coefficients. In addition, the biodegradation rate corresponding to a half-life of 730 days (see **Section 6.1.2**) was used for the MODFLOW simulation of benzene. The initial concentrations of these COCs in each well are summarized in **Table 6-5**. The initial concentration maps used in MODFLOW are portrayed in **Figure 6-4** (benzene) and **Figure 6-5** (lead).

The initial concentration maps for benzene were derived with *Golden Software Surfer* for the MODFLOW model area by entering the average of the two most recent analytical results (October 17, 2000 and January 5, 2001). Because the detections of lead at Site 283 were more widespread and sporadic, the initial concentration map for lead was derived from the average of concentrations obtained during the nine sampling rounds (between September 20, 1999 and January 5, 2001). Points outside of Site 283 monitoring wells were assigned half the respective MDLs for derivation of the initial concentration maps.

Contaminant Transport Inputs: Aquifer Characteristics

The contaminant transport simulation for Site 283 incorporated the sorption of the COCs to the solid soil particles. The sorption coefficient, K_d, represents the fraction of a particular substance that is "sorbed" to the soil (absorption and/or adsorption) versus that fraction dissolved in the groundwater. The linear isotherm portrayed in the following equation describes the simplest relationship involving sorption:

$$S = K_d C$$

where S represents the sorbed fraction and C represents the dissolved concentration, and the sorption coefficient, K_d, is a constant that does not vary with the dissolved concentration. The ratio of the groundwater velocity to the velocity of a dissolved

substance is called the "retardation factor," or R_d. The retardation factor can be calculated using the following equation:

$$R_d = 1 + (r_d / \alpha) * (K_d)$$

where R_d is the retardation factor, r_d is the bulk density of the soil, α is the porosity, and K_d is the sorption coefficient (Domenico and Schwartz, 1998). For benzene, K_d was calculated using the relationship:

$$K_d = f_{oc} * K_{oc}$$

where f_{oc} is the fraction of organic carbon and K_{oc} is the organic carbon partition coefficient. The contaminant transport simulation was conducted using a linear isotherm and K_d values from the USEPA (1996). As shown in **Table 6-5**, the retardation factors for benzene and lead at Site 283 are 1.76 and 3,700, respectively.

Dispersion was incorporated in the model to predict the effects of dilution of the COCs at Site 283. The longitudinal dispersivity of 13.8 feet was used in the model, which was calculated using the method published by the USEPA (2001) based on an estimated plume length of 300 feet. The plume length of 300 feet was estimated to be 20 percent greater than the distance between wells 283-MW2 and 283-MW3 (equal to 1.2 times 250 feet).

6.1.5 MODFLOW Calibration

The model was first run to simulate groundwater conditions at Site 283, without the contaminant transport simulation. **Figure 6-6** shows the flow directions and groundwater elevation contours that were predicted during model calibration. **Figure 6-7** shows these groundwater flow results in cross section view. In **Figure 6-7**, groundwater is shown to be flowing downward through the Composite Confining Unit (Layers 2 and 3) and flowing more horizontal in Wenonah-Mount Laurel aquifer (Layer 5). This change in direction is because of the higher conductivity of the Wenonah-Mount Laurel aquifer.

These groundwater flow conditions represent steady-state, which was achieved by running the model until the head change variation was less than 0.01 feet between iterations. **Figure 6-8** presents a comparison of the groundwater elevations simulated in the model ("Calculated Heads") and field measurements ("Observed Heads") observed on January 5, 2001 at Site 283 (see **Table 3-2** for groundwater elevation data). The model calibration results shown in **Figure 6-8** provide evidence that the model accurately predicts groundwater flow conditions at Site 283 and that the output (predictions) of the model match closely with field measurements.

6.1.6 MODFLOW Results

The migration of the COCs in groundwater at Site 283 was simulated in MODFLOW, using the grid setup and input parameters discussed above. The MODFLOW simulation was run for a simulated time of 20 years (7,300 days) for both benzene and lead. The MODFLOW results are presented in **Figure 6-9** through **Figure 6-12** (benzene) and

Figure 6-13 and **Figure 6-14** (lead). The estimated times for benzene and lead to achieve compliance with the GWQC at Site 283 are summarized in **Table 6-6**.

As shown in **Figure 6-9**, the MODFLOW simulation predicts that the benzene concentration in groundwater at Site 283 will reduce below 1.0 ug/L in 19 years. The predicted time of 19 years for compliance with the GWQC is slightly less than the 20 years predicted using the biodegradation spreadsheet in **Table 6-1**. In well 283-MW2, the MODFLOW simulation predicts that benzene concentrations will diminish to less than the NJDEP criteria of 1.0 ug/L in approximately 18 years (**Figure 6-10**). In well 283-MW3, the MODFLOW simulation predicts that benzene concentrations will diminish to less than the NJDEP criteria of 1.0 ug/L in approximately 9 years (**Figure 6-11**). In the MODFLOW simulation, benzene migration was slowed due to sorption of benzene to subsurface soil and biodegradation. A cross-cross section view of the benzene concentrations in groundwater near well 283-MW2 is shown in **Figure 6-12**. This cross-section view shows that benzene has not migrated downward below Layer 3 and into Layer 4 (Layers 2 and 3 represent of the Composite Confining Unit and Layer 4 represents the Wenonah-Mount Laurel aquifer – see **Table 6-5**)

Although the MODFLOW simulation predicts that benzene migration will be minimal, it is possible that benzene migration may occur (or may have already occurred) northward and into Parkers Creek. This possibility is substantiated by the results of the spreadsheet model (**Section 6.1.3**) and by the presence of underground utility lines. As shown in **Figures 4-2** and **4-3**, several underground utility lines are present at elevations below the groundwater table at Site 283. Shallow groundwater might flow along these underground utility lines due to the higher conductivity associated with subsurface fill surrounding these pipes.

Based on the predicted change in concentration of lead in groundwater at Site 283 over 20 years (**Figure 6-13**), the estimated times for compliance with the NJDEP criteria is approximately 210 years. The results of the groundwater modeling indicate that lead migration will be minimal due to low hydraulic conductivity and strong retardation by the soils at Site 283.

6.2 Sensitive Receptor Survey Results

The sensitive receptor survey was completed by performing two tasks: an Offsite Receptor Report and an NJDEP well record search.

Offsite Receptor Report

An Offsite Receptor Report (dated October 24, 2001) was prepared for Site 283 by Environmental Data Resources, Inc. (EDR) of Southport, Connecticut. A copy of the Offsite Receptor Report, identifying sensitive receptors in the area, is provided in **Appendix G**.

The Offsite Receptor Report indicates that there are three schools (Steelman School, Wolf Hill Elementary School and Meadowbrook Elementary School) located less than

one mile from Site 283. These schools are not located downgradient of Site 283, and thus could not be affected by Site 283 groundwater quality.

Well Record Search

A search of the comprehensive well database maintained by the NJDEP Well Permitting and Regulations Section of the Bureau of Water Allocation was performed by Versar to identify groundwater wells that may be potentially affected by COCs at Site 283. The search was performed for a one-mile radius surrounding the central point of the M-18 Landfill Site (approximately 300 feet west of the center of Building 283). This well search was conducted as part of an RIR for the M-18 Landfill Site (submitted October 2003), and the results are included in this report based on the proximity of the M-18 Landfill site to Site 283.

The well records obtained during the well search are provided in **Appendix H** and are summarized in **Table 6-7**. The wells designated for domestic or irrigation uses are presented in **Figure 6-15**. There were no domestic or irrigation wells identified by records within 1,000 feet of the Site 283.

Due to the significant distance of the Site 283 from any sensitive receptors, the concern for sensitive receptors is minimal. The probability that any well in the vicinity of Site 283 is being used for consumptive purposes is low, thus minimizing health-based risks associated with ingestion. There were no sensitive receptors identified within 1,000 feet of Site 283.

6.3 Aquifer Classification

Upon review of the NJDEP GWQS (NJAC 7:9-6), January 7, 1993, Site 283 is found to be underlain by a Class III-A aquifer. The primary designated use for Class III-A groundwater is the release or transmittal of groundwater to adjacent classification areas and surface water, as relevant. Secondary designated uses in Class III-A include any reasonable uses. For an area to be classified as a Class III-A aquifer, the groundwater must meet the following characteristics:

- Class III-A groundwater includes portions of the saturated zones (that meet the criteria below) of the Woodbury Formation, Merchantville Formation, Marshalltown Formation, Navesink Formation, Hornerstown Formation, aquitard formations of the Potomac-Raritan-Magothy aquifer system and the Kirkwood aquifer system, portions of the glacial moraine and glacial lake deposits and other geologic units having the characteristics of an aquitard. Class III-A areas have the following characteristics (NJAC 7:9-6.5):

    - The average thickness of a Class III-A aquifer must be at least 50 feet.
    - Typical hydraulic conductivity of a Class III-A aquifer is approximately 0.1 feet/day or less.
    - The areal extent defined as Class III-A must be at least 100 acres.

The shallow aquifer at Fort Monmouth meets each of the three criteria listed above. These criteria are discussed below:

- As presented in **Figure 2-7**, Fort Monmouth is located within the outcrop area of the "Navesink-Hornerstown Confining Unit" (Martin, 1998), which also includes the Red Bank Sand, Tinton Sand, Vincentown Formation, Manasquan Formation, Shark River Formation, Piney Point Formation and the basal clay of the Kirkwood Formation (see **Section 2.4.2**). **Figure 2-7** illustrates that the thickness of the Hornerstown-Navesink Confining Unit in the vicinity of Fort Monmouth is approximately 125 feet.
- Published hydraulic conductivities (Martin, 1998) for the Navesink-Hornerstown Confining Unit (shown in **Table 6-5)** yield a geometric mean of 0.12 feet per day, which was the conductivity used in the MODFLOW Model (**Section 6.1.4**) and which is consistent with an aquitard.
- The area of Fort Monmouth is greater than 100 acres.

6.4 Contaminant Migration Summary

At Site 283, benzene, ethylbenzene, total xylenes and lead were identified as COCs in groundwater using the NJDEP GWQC for Class II-A aquifers. The Class II-A criteria were used for comparison with site-specific data obtained from the various sampling rounds because the GWQS (NJAC 7:9-6.7e) state that groundwater quality criteria to be used for Class III-A aquifers are the most stringent criteria associated with vertically or horizontally adjacent groundwater that is not Class III-A.

Groundwater modeling and a sensitive receptor survey were conducted to determine whether groundwater from Site 283 could impact surface water, off-site domestic wells and the subsurface groundwater aquifers. Groundwater modeling indicates the impact of COC migration in groundwater at Site 283 could impact groundwater and surface water quality north of Site 283. The results of the groundwater modeling and sensitive receptor survey are summarized below:

- Using published biodegradation rates for benzene, benzene concentrations are predicted to fall below the NJDEP criteria within approximately 20 years. Based on this result, it is possible that benzene could migrate in groundwater northward towards Parkers Creek.
- Although the MODFLOW simulation did not predict this migration, the presence of underground utility lines beneath the surface at Site 283 and the fill material associated with these utilities implies the possibility that underground utilities could be conduits for contaminant migration.
- The two other organic COCs in groundwater (ethylbenzene and total xylenes) have faster degradation rates than benzene, as well as higher sorption rates. In addition, the groundwater sampling results for benzene at Site 283 indicate that benzene concentrations are much higher in relation to the GWQC than these three other organic COCs. These factors indicate that benzene concentrations will remain above the NJDEP criteria longer than these two other organic COCs and that benzene will most likely migrate farther.

- Due to the low concentrations of the identified metal COC (lead) at Site 283, and high retardation of lead migration due to sorption, there is little potential for off-site migration of lead. The presence of lead in groundwater at Site 283 will therefore have little or no impact on nearby groundwater or surface water.
- The closest aquifer, the Wenonah-Mount Laurel Aquifer, is located approximately 125 feet bgs. The results of groundwater modeling indicate that this aquifer is too deep to be affected by the COCs near the ground surface at Site 283, and that the vertical exchange of groundwater between the aquifers (leakage) is minimal.
- The sensitive receptor survey indicates that there are three schools located less than one mile from Site 283 and that there are no domestic or irrigation wells within 1,000 feet of Site 283. There is no potential for groundwater contamination at Site 283 to impact any of the identified sensitive receptors.

Because benzene, ethylbenzene and total xylenes could migrate from Site 283 northward and potentially into Parkers Creek, remedial actions to address this possibility are appropriate. Recommended remedial actions are discussed below in **Section 8.0**, RAWP.

7.0 CONCLUSIONS AND RECOMMENDATIONS

Geologic publications show that Site 283 is located within an aquitard (the Navesink-Hornerstown Confining Unit). The low hydraulic conductivity of the aquitard and the thickness of the aquitard at the site conform to the requirements of a Class III-A aquifer, as specified in the NJDEP GWQS (NJAC 7:9-6, January 7, 1993).

The analytical results for the groundwater samples collected between September 1999 and February 2004 indicate that benzene, ethylbenzene, total xylenes and lead are potential COCs at Site 283. The Class II-A criteria were used for comparison with site-specific data obtained from the various sampling rounds because the GWQS (N.J.A.C. 7:9-6.7e) state that the GWQC to be used for Class III-A aquifers are the most stringent criteria associated with vertically or horizontally adjacent ground waters that are not Class III-A.

The Wenonah Mount Laurel aquifer, which is approximately 125 feet bgs, is too deep to be affected by the COCs near the ground surface. In addition, the sensitive receptor survey indicates that there are no schools or domestic or irrigation wells close enough to Site 283 to be adversely impacted by COC migration.

Due to low concentrations of lead in groundwater at Site 283 and the slow migration rates for lead in groundwater, there is little potential for significant lead impact by migration into Parkers Creek.

Based on biodegradation rates and the MODFLOW simulation, benzene, ethylbenzene and total xylenes could migrate from Site 283 northward towards Parkers Creek. The presence of underground utility lines beneath the surface at Site 283 and the fill material associated with these utilities implies the possibility that underground utilities could be conduits for contaminant migration.

The construction of three additional groundwater monitoring wells (283-MW4, 283-MW5 and 283-MW6) is suggested. The monitoring wells should be located downgradient (north) of monitoring wells 283-MW1, 283-MW2 and 283-MW3 at Site 283, as shown in **Figure 7-1**. The installation and quarterly monitoring of these additional monitoring wells will aid in more accurately determining if the present underground utilities are avenues for off-site transport of COCs and the extent of off-site migration of COCs at Site 283.

To evaluate surface water quality and ensure that groundwater seepage from Site 283 is not adversely impacting surface water, surface water samples should be collected and analyzed for COCs at locations in Parkers Creek, which is north of Site 283. NJDEP Surface Water Quality Standards (SWQS) for the four identified COCs should be used as comparison to surface water sampling results.

The monitored natural attenuation (MNA) program at Fort Monmouth includes quarterly groundwater monitoring and quarterly surface water sampling at strategic locations. Continued groundwater and surface water monitoring at Site 283 are recommended.

An ORC Advanced™ injection program is recommended to reduce the concentrations of benzene, ethylbenzene and total xylenes at Site 283. The ORC Advanced™ injection program will be implemented at Site 283 according to the RAWP included in **Section 8.0** of this RIR/RAWP.

8.0 REMEDIAL ACTION WORKPLAN

The following sections present the RAWP for the remediation of the identified organic COCs at Site 283: benzene, ethylbenzene and total xylenes. This RAWP was prepared in accordance with the applicable sections of NJDEP *Technical Requirements for Site Remediation* (February 2003), NJAC 7:26E, et seq. The remedial activities described in the RAWP will be performed by the DPW.

8.1 Description of Remedial Action Alternatives

Based on the findings of the previous RIR sections of this report, four general response actions were considered for implementation at Site 283: No Action, Limited Action and MNA, *In-Situ* Active Restoration and *Ex-Situ* Active Restoration. Numerous remedial technologies were identified for each general response action, and process options of each remedial technology were screened based on effectiveness, implementability and cost. The remedial technology process options derived from the consideration of the general response actions yielded the following remedial action alternatives for further consideration: No Action, Limited Action with MNA, Limited Action with Enhanced Bioremediation and MNA and a Mass Extraction Pump-and-Treat System with MNA.

Alternative #1: No Action

A No Action alternative is evaluated to establish a baseline for the comparison of other remedial alternatives. Under this alternative, no remedial action will take place and there are no associated costs.

Alternative #2: Limited Action with MNA

A Limited Action with MNA alternative includes long-term monitoring of groundwater and surface water. No active treatment will be implemented to remove the COCs from groundwater at the site under this alternative. Monitoring of groundwater and surface water for the natural attenuation of the COCs will verify that the COCs are naturally biodegrading and COC levels are continually decreasing over time. This remedial action alternative will minimize capital and Operation and Maintenance (O&M) costs while effectively allowing COC concentrations to naturally degrade below action levels.

Alternative #3: Limited Action with Enhanced Bioremediation and MNA

A Limited Action with Enhanced Bioremediation and MNA alternative includes direct-push injections of ORC Advanced™ and long-term monitoring of groundwater and surface water. The ORC Advanced™ will be injected into the "hot-spot" areas of the site, accelerating the rate of biodegradation of the COCs. Monitoring of groundwater and surface water for the natural attenuation of the COCs will verify that the COCs are naturally biodegrading and COC levels are continually decreasing over time. This remedial action alternative has low capital costs and virtually zero O&M costs while effectively enhancing and accelerating the degradation of COC concentrations to below action levels.

Alternative #4: Mass Extraction Pump-and-Treat System with MNA

A Mass Extraction Pump-and-Treat System with MNA alternative includes powered machinery that actively pumps contaminated groundwater to an above-ground remediation facility and long-term monitoring of groundwater and surface water. The Mass Extraction Pump-and-Treat System degrades contamination levels in the above-ground facility and often returns the treated water to a nearby surface water body. Monitoring of groundwater and surface water for the natural attenuation of the COCs will verify that the COCs are naturally biodegrading and COC levels are continually decreasing over time. This remedial action alternative typically requires extensive O&M costs, as well as high capital costs for equipment and site preparation.

8.2 Comparative Analysis of Remedial Action Alternatives

Each of the above alternatives was evaluated against a standard set of criteria, such as protection of human health and the environment, compliance with the NJDEP, short- and long-term effectiveness, permanence, reduction of toxicity, mobility or volume through treatment, implementability and cost.

Alternative #1: A No Action alternative takes no actions to eliminate, reduce or control exposure pathways, provides no short- or long-term effectiveness or permanence and does not comply with NJDEP criteria. This alternative is not appropriate for remediating COCs under current conditions at Site 283.

Alternative #2: Limited Action with MNA alternatives are becoming increasingly popular due to their non-existant capital costs and extremely low O&M costs and their effective treatment of low-concentration contaminant plumes. These remedial alternatives are easily implemented, not permanent and are accepted by the NJDEP. However, due to the relatively high concentrations of several COCs present at Site 283, this alternative would not significantly impact COC levels at the site.

Alternative #4: A Mass Extraction Pump-and-Treat System with MNA is one of the most widely used groundwater remediation technologies. This remedial alternative is a very aggressive treatment approach with long-term effectiveness and permanence; however, this alternative is also difficult to implement, has low short-term effectiveness, is high is cost and often experiences unforeseen difficulties relating to the sorption of COCs to soil particles. The molecular nature of groundwater contaminants allows them to sorb to soil particles, which prevents the COCs from being effectively pumped out of the ground for treatment. Greater capital costs combined with protracted O&M costs, plus the high incidence of unexpected treatment difficulties and marginal efficiency, often lead to total project costs that exceed the initial estimates by an order of magnitude. Due to the low residual COC concentrations at Site 1122, this approach is not of appropriate cost and remediation strength for success at the site.

Alternative #3: A Limited Action with Enhanced Bioremediation and MNA alternative has been selected for Site 283 based upon its appropriateness for remediation of the relatively high concentrations of several COCs present at the site in a time frame acceptable to the NJDEP. ORC Advanced™ and MNA are very low in cost, and the

COC concentrations at Site 283 do not require a permanent alternative. This alternative is equally effective in the short- and long-term, is easy to implement and can attain compliance with NJDEP criteria. Historical groundwater sampling results at Site 1122 indicate that natural attenuation is occurring at an acceptable rate, and the ORC Advanced™ injection program will accelerate this process. The ORC Advanced™ will be applied as specified by Regenesis (**Appendix I**). Based on recommendations by Regenesis, the ORC Advanced™ will be injected in a grid pattern in the vicinity of 283-MW2 over a 4,220 square foot area. The specifics of the ORC Advanced™ and MNA remedial action are discussed below.

8.3 Approach

The following sections provide details of the approach the DPW will use to perform this remedial action.

8.3.1 Equipment

The ORC Advanced™ injections will be performed using direct-push hydraulic equipment associated with a truck-mounted GeoProbe® rig to apply the ORC Advanced™/water slurry mixture throughout the specified depth intervals, generally over a region that may include both saturated and unsaturated zones where the COCs have been identified (e.g., slightly above the groundwater table to the maximum depth at which the COCs were detected). The ORC Advanced™ will be mixed with water to create a slurry mixture and will then be injected into the ground. Equipment required for the ORC Advanced™ injection program shall include, but is not limited to, the following items:

- GeoProbe® truck-mounted rig and associated injection equipment
- Mixing equipment
- Adapted union
- ORC Advanced™ material
- Water

8.3.2 Mobilization

Equipment and supplies will be transported to the site and staged appropriately near Site 283. Prior to mobilization to the site, the DPW will contact the New Jersey One Call system to have underground utilities in the vicinity of the site located and marked. Prior to mobilization, Fort Monmouth will have the underground electric utilities in the vicinity of Site 283 located and marked.

8.3.3 Injection Procedure

A full-scale remediation approach for Site 283 will consist of injecting ORC Advanced™ in a grid-based pattern to reduce COC levels in the 4,220 square foot treatment area, which is shown on **Figure 8-1**. The points of injection will be 8 feet on-center between rows and 8 feet on-center within rows, which translates to five rows of ten points and five rows of five points, placed as shown on **Figure 8-2**, for a total of 75 injection points. The ORC Advanced™ will be injected into the first 10 feet of saturated aquifer, and the ORC

Advanced™ dose rate will be 4 pounds (lbs) per vertical foot, which translates to 40 lbs per injection point.

The ORC Advanced™/water slurry mixture is typically 20% to 40% ORC Advanced™ solids by weight. An average ORC Advanced™ solids content is 30%, but this value may need to be adjusted in the field so that the required mass of ORC Advanced™ can be injected at each location. The volume (V) of water per injection location can be calculated from the following equation:

$$\text{V of water (gal/point)} = \frac{\text{ORC Advanced™ pounds/hole}}{(8.34 \text{ lbs/gal water})(\%\text{ ORC Advanced™ solids})} [1-(\%\text{ ORC Advanced™ solids})]$$

8.3.4 Equipment Decontamination

The GeoProbe® rig and other equipment used for the ORC Advanced™ application will be decontaminated prior to the removal from Site 283. Decontamination will be conducted at the injection site. The equipment will be sprayed with a pressure washer. The water used during decontamination will be collected in 55-gallon containers and staged temporarily for off-site disposal.

8.3.5 Remedial Action-Derived Waste Management

The waste derived from the remedial action will be placed in Department of Transportation (DOT) approved 55-gallon drums and staged temporarily for off-site disposal. The waste generated from these activities will be disposed of in accordance with the Resource Conservation Recovery Act (RCRA) guidelines. The anticipated wastes generated during the remedial action include:

- Decontamination water
- Level D Personal Protective Equipment (PPE), such as disposable gloves and/or tyvek suits

8.3.6 Soil and Sediment Erosion

As described above, the ORC Advanced™ application will be accomplished using a GeoProbe®. There is no planned disturbance of the soil at Site 283 as part of the proposed remedial action. Soil and sediment control measures will be implemented to minimize the transport of soil onto the installation roadways from vehicles entering and exiting the site.

8.3.7 Quarterly Sampling

The long-term monitoring program at Fort Monmouth includes quarterly groundwater monitoring and quarterly surface water sampling at strategic locations. Continued groundwater and surface water monitoring at Site 283 is recommended.

Quarterly groundwater sampling at Site 283 will include groundwater samples collected from monitoring wells 283-MW1, 283-MW2 and 283-MW3 and the newly constructed monitoring wells 283-MW4, 283-MW5 and 283-MW6. The groundwater samples collected from these monitoring wells will be analyzed by the FMETL for VOCs plus 15

TICs and lead. NJDEP GWQC for the four identified COCs should be used for comparison to groundwater sampling results.

Monitoring Well	Analyzed for	Future Sampling Status
283-MW1	VOCs, TAL Metals	Continue Quarterly Sampling
283-MW2	VOCs, TAL Metals	Continue Quarterly Sampling
283-MW3	VOCs, TAL Metals	Continue Quarterly Sampling
283-MW4	VOCs, TAL Metals	Begin Quarterly Sampling
283-MW5	VOCs, TAL Metals	Begin Quarterly Sampling
283-MW6	VOCs, TAL Metals	Begin Quarterly Sampling

Quarterly surface water sampling at Site 283 will include surface water samples collected from locations in Parkers Creek, which is north of Site 283. Surface water samples collected from these locations will be analyzed by the FMETL for VOCs plus 15 TICs and lead. NJDEP SWQS for the four identified COCs should be used for comparison to surface water sampling results.

Surface Water Site	Analyzed for	Future Sampling Status
SS-14	VOCs, TAL Metals	Begin Quarterly Sampling
SS-15	VOCs, TAL Metals	Begin Quarterly Sampling
SS-27	VOCs, TAL Metals	Begin Quarterly Sampling

8.3.8 Quality Assurance Project Plan (QAPP)

Field sampling activities will be conducted in accordance with the NJDEP Field Sampling Manual. The FMETL will conduct all analyses in accordance with the New Jersey Laboratory Certification Program. A separate QAPP will not be submitted for the planned ORC Advanced™ injection program implementation.

Quality control samples will be collected to assure that data developed during sampling are comparable to, or are of greater quality than, prior data collected at the site. Quality control samples for this project include trip blanks, field blanks and duplicate samples. One trip blank will be included with each sample shipment; one field blank will be taken each day that sampling is performed. Duplicate samples are to be collected at a rate of one duplicate sample for every 20 samples; therefore, one duplicate sample is required for every round of samples submitted to the FMETL for analysis. The FMETL will conduct internal auditing procedures according to their established Quality Assurance Manual.

All samples will be placed in laboratory-supplied bottles and placed on ice upon collection to assure samples are maintained below 4°C. Proper chain-of-custody procedures will be followed, tracking the samples from collection through analysis and reporting.

8.3.9 Remedial Action Progress Report (RAPR)

An RAPR will be prepared one year after the completion of the ORC Advanced™ injection program in accordance with NJDEP *Technical Requirements for Site Remediation* (February 2003), NJAC 7:26E-6.6. The RAPR will include a summary of the remedial actions performed during the reporting period, an analysis of the quarterly

groundwater and surface water sampling results collected during the reporting period, conclusions about the effectiveness of the ORC Advanced™ injection program, and the trends of the COCs and recommendations concerning further action at Site 283.

8.4 Project Organization

The Contracting Officer's Representative (COR) for this project is Mr. Kevin Dooney, who is responsible for all procurement and change orders. Mr. Doug Guenther can provide technical site guidance as requested by the contractor. Any variance to the NJDEP *Technical Requirements for Site Remediation* (February 2003), NJAC 7:26E, et seq. will be communicated to the NJDEP immediately. No variance to the NJDEP regulations will be permitted unless approved by the NJDEP Case Manager, Mr. Greg Zalaskus.

8.5 Site Specific Health and Safety Plan (SSHSP)

The SSHSP will be prepared, as required by NJDEP *Technical Requirements for Site Remediation* (February 2003), NJAC 7:26E, et seq., and adhered to as part of the remediation activities.

8.6 Required Permits

A Discharge to Groundwater Permit is required to perform the ORC Advanced™ application at Site 283 and can be obtained under the Permit-By-Rule provision in NJAC 7:14A-7.5, Subsection (b). Because Fort Monmouth is conducting remedial activities under NJDEP oversight, the DPW is eligible to receive a Discharge to Groundwater Permit through Permit-By-Rule. By submitting this RAWP, Fort Monmouth is requesting written approval for a Discharge to Groundwater Permit by Permit-By-Rule for the proposed ORC Advanced™ application and discharge to groundwater.

8.7 Effectiveness Analysis and Certification

The effectiveness of this remedial action will be assured through an evaluation of the post- ORC Advanced™ application groundwater sampling analytical results. This analysis will be performed as discussed in **Section 8.2.7** - Quarterly Sampling. If after one year the results indicate that COC concentrations remain either at levels comparable to pre- ORC Advanced™ application levels or in excess of their respective NJDEP GWQC, additional remedial actions will be considered.

8.8 Remedial Action Costs

The estimated costs for implementation of the remedial action to be performed at Site 283 are provided below:

Estimated Costs of Remedial Actions to be Performed at Site 283 (per year)	
TASK	**ESTIMATED COSTS**
1. Total Labor Cost	$ 11,400
2. Laboratory costs	$ 3,700
3. Material costs	$ 25,500
4. Data analysis and Progress Report	$ 8,700
TOTAL ESTIMATED COSTS	$ 49,300
TOTAL ESTIMATED COST TO CLOSURE	$ 153,000

8.9 Implementation Schedule

Upon written approval from the NJDEP, Fort Monmouth will solicit and award a contract for completion of the planned remedial actions addressed within this RAWP. Following contract award, the implementation schedule will be as follows:

- Procurement and delivery of equipment to the site – Two weeks
- Site mobilization and utility clearances – One week
- Performance of ORC Advanced™ injection program – One week
- Demobilization – One week
- Quarterly groundwater and surface water sampling, post- ORC Advanced™ injections – Two days per quarter for one year
- Submittal of an RAPR – One year following ORC Advanced™ injections

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TABLES

Table 2-1
Well Construction Summary
Site 283
Fort Monmouth, New Jersey

Well ID	NJDEP Permit Number	Northing	Easting	Elevation of Inner Casing Survey Mark	Elevation of Ground Surface	Hole Diameter	Total Depth of Well	Depth to Top of Screen	Screen Length	Screen Diameter	Screen Material	Date of Construction
Units	**--**	**ft**	**ft**	**ft (amsl)[1]**	**ft (amsl)[1]**	**in**	**ft (bgs)[2]**	**ft (bgs)[2]**	**ft**	**in**	**--**	**--**
283-MW1	29-40367	540539.91	619033.2	11.34	11.55	10	20.0	5.0	15.0	4.0	10 Slot PVC	3/28/2000
283-MW2	29-40887	540322.37	618946.24	13.52	14.00	10	20.0	5.0	15.0	4.0	20 Slot PVC	7/28/1999
283-MW3	29-41650	540508.03	618821.32	11.86	12.42	10	20.0	5.0	15.0	4.0	10 Slot PVC	3/28/2000

Notes:
[1]amsl = above mean sea level
[2]bgs = below ground surface
Where a difference in reported data exists between a monitoring well permit and the corresponding boring log, data from the permit was used.
Well locations were recorded using Trimble GPS equipment in August 2001.
Wells 283-MW1, 283-MW2, and 283-MW3 were installed by Lutz Environmental for the DPW.

Table 3-1
Groundwater Sample Collection Summary
Site 283
Fort Monmouth, New Jersey

Round	Sample ID	Monitoring Well ID	Date Collected	Date Analysis Started	Matrix	Sample Type	Analytical Parameters	Analysis Method
Quarterly Sampling Rounds								
#1	4798.01	283-MW2	09/20/99	09/21/99	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#2	5045.01	Trip Blank	12/27/99	01/03/00	aqueous	Blank	VOCs+15	624
	5045.02	Field Blank	12/27/99	01/03/00	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5045.03	Duplicate	12/27/99	N/A	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5046.01	283-MW2	12/27/99	12/29/99	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#3	5280.01	283-MW2	03/23/00	03/28/00	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5283.01	Trip Blank	03/23/00	03/31/00	aqueous	Blank	VOCs +15	Method 624
	5283.02	Field Blank	03/23/00	03/29/00	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5283.03	Duplicate	03/23/00	N/A	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#4	5505.01	283-MW2	06/28/00	07/04/00	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5505.02	283-MW1	06/28/00	07/04/00	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5505.03	283-MW3	06/28/00	07/04/00	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#5	5619.01	283-MW1	08/10/00	08/14/00	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5619.02	283-MW2	08/10/00	08/14/00	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5619.03	283-MW3	08/10/00	08/14/00	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5620.01	Trip Blank	08/10/00	08/17/00	aqueous	Blank	VOCs +15	Method 624
	5620.02	Field Blank	08/10/00	08/14/00	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5620.03	Duplicate	08/10/00	N/A	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
Low Flow #1	5681.01	Field Blank	08/31/00	09/18/00	aqueous	Blank	TAL metals	Methods 3112B and 3120B
	5681.02	283-MW3	08/31/00	09/18/00	aqueous	GW	TAL metals	Methods 3112B and 3120B
	5681.03	283-MW1	08/31/00	09/18/00	aqueous	GW	TAL metals	Methods 3112B and 3120B
	5681.04	283-MW2	08/31/00	09/18/00	aqueous	GW	TAL metals	Methods 3112B and 3120B
	5681.05	Duplicate	08/31/00	09/18/00	aqueous	Blank	TAL metals	Methods 3112B and 3120B
Low Flow #2	5788.01	Field Blank	10/13/00	10/17/00	aqueous	Blank	TAL metals	Methods 3112B and 3120B
	5788.02	Duplicate	10/13/00	10/17/00	aqueous	Blank	TAL metals	Methods 3112B and 3120B
	5788.03	283-MW1	10/13/00	10/17/00	aqueous	GW	TAL metals	Methods 3112B and 3120B
	5788.04	283-MW2	10/13/00	10/17/00	aqueous	GW	TAL metals	Methods 3112B and 3120B
	5788.05	283-MW3	10/13/00	10/17/00	aqueous	GW	TAL metals	Methods 3112B and 3120B
#6	5797.01	Trip Blank	10/17/00	10/20/00	aqueous	Blank	VOCs +15	Method 624
	5797.02	Field Blank	10/17/00	10/20/00	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5797.03	Duplicate	10/17/00	10/20/00	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5797.04	283-MW1	10/17/00	10/23/00	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5797.05	283-MW2	10/17/00	10/20/00	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	5797.06	283-MW3	10/17/00	10/23/00	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#7	28	Trip Blank	01/05/01	01/10/01	aqueous	Blank	VOCs +15	Method 624
	29	Field Blank	01/05/01	01/10/01	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	30	Duplicate	01/05/01	01/10/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	31	283-MW1	01/05/01	01/10/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	32	283-MW2	01/05/01	01/10/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	33	283-MW3	01/05/01	01/10/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#8	1602901	Trip Blank	04/04/01	04/10/01	aqueous	Blank	VOCs +15	Method 624
	1602902	Field Blank	04/04/01	04/10/01	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	1602903	Duplicate	04/04/01	04/10/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	1602904	283-MW1	04/04/01	04/10/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	1602905	283-MW2	04/04/01	04/10/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	1602906	283-MW3	04/04/01	04/10/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B

Notes:
GW : Groundwater
VOCs+15 : Target Compound List Volatile Organic Analysis plus 15 Tentatively Identified Compounds (TICs)
SVOCs+25: Semi-Volatile Organic Compounds plus 25 TICs
TAL metals : Target Analyte List metals
Low Flow 1 and Low Flow 2: Low Flow Sampling Method was used to collect sample
N/A: Not Available

Table 3-1
Groundwater Sample Collection Summary
Site 283
Fort Monmouth, New Jersey

Round	Sample ID	Monitoring Well ID	Date Collected	Date Analysis Started	Matrix	Sample Type	Analytical Parameters	Analysis Method
Quarterly Sampling Rounds								
#9	1628501	Trip Blank	07/24/01	07/25/01	aqueous	Blank	VOCs +15	Method 624
	1628502	Field Blank	07/24/01	07/25/01	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	1628503	Duplicate	07/24/01	07/25/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	1628504	283-MW1	07/24/01	07/25/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	1628505	283-MW2	07/24/01	07/25/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	1628506	283-MW3	07/24/01	07/25/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#10	1663701	Trip Blank	12/11/01	12/13/01	aqueous	Blank	VOCs +15	Method 624
	1663702	Field Blank	12/11/01	12/13/01	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	1663801	283-MW1	12/11/01	12/13/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	1663802	283-MW2	12/11/01	12/13/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	1663803	283-MW3	12/11/01	12/13/01	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#11	2014201	Trip Blank	03/08/02	03/19/02	aqueous	Blank	VOCs +15	Method 624
	2014202	Field Blank	03/08/02	03/19/02	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	2014501	283-MW1	03/08/02	03/19/02	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	2014502	283-MW2	03/08/02	03/19/02	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	2014503	283-MW3	03/08/02	03/19/02	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#12	2029201	Trip Blank	05/16/02	05/26/02	aqueous	Blank	VOCs +15	Method 624
	2029202	Field Blank	05/16/02	05/26/02	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	2029203	Duplicate	05/16/02	05/26/02	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	2029204	283-MW1	05/16/02	05/26/02	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	2029205	283-MW2	05/16/02	05/26/02	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	2029206	283-MW3	05/16/02	05/26/02	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#13	2064401	Trip Blank	09/10/02	09/20/02	aqueous	Blank	VOCs +15	Method 624
	2064402	Field Blank	09/10/02	09/20/02	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	2064701	283-MW1	09/10/02	09/20/02	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	2064702	283-MW2	09/10/02	09/20/02	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	2064703	283-MW3	09/10/02	09/20/02	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#14	2086101	Trip Blank	12/03/02	12/09/02	aqueous	Blank	VOCs +15	Method 624
	2086102	Field Blank	12/03/02	12/09/02	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	2086401	283-MW1	12/03/02	12/09/02	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	2086402	283-MW2	12/03/02	12/09/02	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	2086403	283-MW3	12/03/02	12/09/02	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#15	3008601	Trip Blank	02/27/03	03/13/03	aqueous	Blank	VOCs +15	Method 624
	3008602	Field Blank	02/27/03	03/13/03	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3008603	Duplicate	02/27/03	03/13/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3008604	283-MW1	02/27/03	03/13/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3008605	283-MW2	02/27/03	03/13/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3008606	283-MW3	02/27/03	03/13/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#16	3023401	Trip Blank	05/19/03	05/29/03	aqueous	Blank	VOCs +15	Method 624
	3023402	Field Blank	05/19/03	05/29/03	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3023601	283-MW1	05/19/03	05/29/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3023602	283-MW2	05/19/03	05/29/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3023603	283-MW3	05/19/03	05/29/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#17	3046601	Trip Blank	08/04/03	08/13/03	aqueous	Blank	VOCs +15	Method 624
	3046602	Field Blank	08/04/03	08/13/03	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3046901	283-MW1	08/04/03	08/13/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3046902	283-MW2	08/04/03	08/13/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3046903	283-MW3	08/04/03	08/13/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B

Notes:
GW : Groundwater
VOCs+15 : Target Compound List Volatile Organic Analysis plus 15 Tentatively Identified Compounds (TICs)
SVOCs+25: Semi-Volatile Organic Compounds plus 25 TICs
TAL metals : Target Analyte List metals
Low Flow 1 and Low Flow 2: Low Flow Sampling Method was used to collect sample
N/A: Not Available

Table 3-1
Groundwater Sample Collection Summary
Site 283
Fort Monmouth, New Jersey

Round	Sample ID	Monitoring Well ID	Date Collected	Date Analysis Started	Matrix	Sample Type	Analytical Parameters	Analysis Method
Quarterly Sampling Rounds								
#18	3073101	Trip Blank	11/13/03	11/20/03	aqueous	Blank	VOCs +15	Method 624
	3073102	Field Blank	11/13/03	11/20/03	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3073103	Duplicate	11/13/03	11/20/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3073104	283-MW1	11/13/03	11/20/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3073105	283-MW2	11/13/03	11/20/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	3073106	283-MW3	11/13/03	11/20/03	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
#19	4010201	Trip Blank	02/05/04	02/13/04	aqueous	Blank	VOCs +15	Method 624
	4010202	Field Blank	02/05/04	02/13/04	aqueous	Blank	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	4010203	Duplicate	02/05/04	02/13/04	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	4010204	283-MW1	02/05/04	02/13/04	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	4010205	283-MW2	02/05/04	02/13/04	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B
	4010206	283-MW3	02/05/04	02/13/04	aqueous	GW	VOCs+15; SVOCs+25; Pesticides; PCBs; TAL metals	Method 624; Method 625; Method 608; Methods 3112B and 3120B

Notes:
GW : Groundwater
VOCs+15 : Target Compound List Volatile Organic Analysis plus 15 Tentatively Identified Compounds (TICs)
SVOCs+25: Semi-Volatile Organic Compounds plus 25 TICs
TAL metals : Target Analyte List metals
Low Flow 1 and Low Flow 2: Low Flow Sampling Method was used to collect sample
N/A: Not Available

Table 3-2
Groundwater Elevation Summary
Site 283
Fort Monmouth, New Jersey

Round Number:		#1			#2			#3			#4		
Well ID	Elev. of Inner Casing Survey Mark	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.
283-MW1	11.34	NS	NS	NS	NS	NS	NS	NS	NS	NS	06/28/00	6.31	5.03
283-MW2	13.52	09/20/99	7.20	6.32	12/27/99	6.81	6.71	03/23/00	6.38	7.14	06/28/00	7.83	5.69
283-MW3	11.86	NS	NS	NS	NS	NS	NS	NS	NS	NS	06/28/00	7.12	4.74

Notes:
1) Elev.: Elevation in feet
above mean sea level.
2) Depth to water: depth in feet
from the inner casing survey mark.
3) NS: Not Sampled
4) For low-flow sampling rounds
(Aug. 31, 2000 and Oct 13, 2000)
depth to water shown is for previous day.

Table 3-2
Groundwater Elevation Summary
Site 283
Fort Monmouth, New Jersey

		Round Number:	#5			Low Flow #1			Low Flow 2			#6		
Well ID	Elev. of Inner Casing Survey Mark	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.
283-MW1	11.34	08/10/00	5.54	5.80	08/31/00	5.73	5.61	10/13/00	5.60	5.74	10/17/00	6.07	5.27
283-MW2	13.52	08/10/00	6.28	7.24	08/31/00	6.80	6.72	10/13/00	6.90	6.62	10/17/00	7.09	6.43
283-MW3	11.86	08/10/00	6.41	5.45	08/31/00	6.70	5.16	10/13/00	6.75	5.11	10/17/00	6.88	4.98

Notes:
1) Elev.: Elevation in feet
above mean sea level.
2) Depth to water: depth in feet
from the inner casing survey mark.
3) NS: Not Sampled
4) For low-flow sampling rounds
(Aug. 31, 2000 and Oct 13, 2000)
depth to water shown is for previous day.

Table 3-2
Groundwater Elevation Summary
Site 283
Fort Monmouth, New Jersey

Round Number:		#7			#8			#9			#10		
Well ID	Elev. of Inner Casing Survey Mark	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.
283-MW1	11.34	01/05/01	6.11	5.23	04/04/01	4.62	6.72	07/24/01	6.25	5.09	12/11/01	7.15	4.19
283-MW2	13.52	01/05/01	7.32	6.20	04/04/01	4.81	8.71	07/24/01	6.75	6.77	12/11/01	8.54	4.98
283-MW3	11.86	01/05/01	6.94	4.92	04/04/01	5.75	6.11	07/24/01	7.00	4.86	12/11/01	7.67	4.19

Notes:
1) Elev.: Elevation in feet
above mean sea level.
2) Depth to water: depth in feet
from the inner casing survey mark.
3) NS: Not Sampled
4) For low-flow sampling rounds
(Aug. 31, 2000 and Oct 13, 2000)
depth to water shown is for previous day.

Table 3-2
Groundwater Elevation Summary
Site 283
Fort Monmouth, New Jersey

Round Number:		#11			#12			#13			#14		
Well ID	Elev. of Inner Casing Survey Mark	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.
283-MW1	11.34	03/08/02	6.43	4.91	05/16/02	6.14	5.2	09/10/02	5.91	5.43	12/03/02	5.37	5.97
283-MW2	13.52	03/08/02	7.47	6.05	05/16/02	6.90	6.62	09/10/02	5.93	7.59	12/03/02	5.28	8.24
283-MW3	11.86	03/08/02	7.10	4.76	05/16/02	6.90	4.96	09/10/02	6.51	5.35	12/03/02	6.31	5.55

Notes:
1) Elev.: Elevation in feet
above mean sea level.
2) Depth to water: depth in feet
from the inner casing survey mark.
3) NS: Not Sampled
4) For low-flow sampling rounds
(Aug. 31, 2000 and Oct 13, 2000)
depth to water shown is for previous day.

Table 3-2
Groundwater Elevation Summary
Site 283
Fort Monmouth, New Jersey

	Round Number:	#15			#16			#17			#18			#19		
Well ID	Elev. of Inner Casing Survey Mark	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.	Date	Depth to Water	Ground-water Elev.
283-MW1	11.34	02/27/03	5.12	6.22	05/19/03	6.02	5.32	08/04/03	5.74	5.6	11/13/03	5.72	5.62	02/05/04	5.50	5.84
283-MW2	13.52	02/27/03	4.70	8.82	05/19/03	6.46	7.06	08/04/03	6.11	7.41	11/13/03	6.03	7.49	02/05/04	5.60	7.92
283-MW3	11.86	02/27/03	5.94	5.92	05/19/03	6.77	5.09	08/04/03	6.56	5.3	11/13/03	6.45	5.41	02/05/04	6.60	5.26

Notes:
1) Elev.: Elevation in feet
above mean sea level.
2) Depth to water: depth in feet
from the inner casing survey mark.
3) NS: Not Sampled
4) For low-flow sampling rounds
(Aug. 31, 2000 and Oct 13, 2000)
depth to water shown is for previous day.

Table 4-1
Data for Geologic Cross Section A-A'
Site 283
Fort Monmouth, New Jersey

Well ID	Units	283-MW3	283-MW2
Elevation of Top of Casing	ft (amsl)	11.86	13.52
Elevation of Ground Surface	ft (amsl)	12.42	14
Elevation of Top of Screen	ft (amsl)	7.42	9
Elevation of Groundwater (1/5/01)	ft (amsl)	4.92	6.2
Elevation of Top of Unit 2	ft (amsl)	NA	0
Elevation of Top of Unit 3	ft (amsl)	NA	NA
Elevation of Top of Unit 4	ft (amsl)	11.92	NA
Elevation of Top of Unit 5	ft (amsl)	11.42	13.5
Elevation of Top of Unit 6	ft (amsl)	8.42	NA
Elevation of Top of Unit 7	ft (amsl)	NA	NA
Elevation of Top of Unit 8	ft (amsl)	-1.58	9
Elevation of Bottom of Well	ft (amsl)	-7.58	-6
Distance from Point A on Cross-Section	ft	0	222

Explanation of Units (see Minard, 1969):

Surface Materials:

*Unit 1 = asphalt

Unit 2 = topsoil

Unit 3 = fill -- cinders, slag, coal fragments (NA)

Unit 4 = brown coarse-medium-fine sand, some medium-fine gravel (fill?)

Tinton Sand:

Unit 5 = brown medium-fine sand, little silt

Unit 6 = brown-green/brown medium-fine sand and silty clay

Unit 7 = brown-orange/brown green silty clay (NA)

Lower Red Bank Formation (Sandy Hook):

Unit 8 = green silty clay, some black fine sand

Notes:

*Shown in geologic cross section A-A" but not in table above

All measurements in feet.

amsl: above mean sea level

NA: Not Applicable

Unit numbering matches Geologic Cross Section A-A".

Table 4-2
Data for Geologic Cross Section A-A''
Site 283
Fort Monmouth, New Jersey

Well ID	Units	283-MW3	283-MW1
Elevation of Top of Casing	ft (amsl)	11.86	11.34
Elevation of Ground Surface	ft (amsl)	12.42	11.55
Elevation of Top of Screen	ft (amsl)	7.42	6.55
Elevation of Groundwater (1/5/01)	ft (amsl)	4.92	5.23
Elevation of Top of Unit 2	ft (amsl)	NA	0
Elevation of Top of Unit 3	ft (amsl)	NA	11.05
Elevation of Top of Unit 4	ft (amsl)	11.92	NA
Elevation of Top of Unit 5	ft (amsl)	11.42	NA
Elevation of Top of Unit 6	ft (amsl)	8.42	8.55
Elevation of Top of Unit 7	ft (amsl)	NA	6.55
Elevation of Top of Unit 8	ft (amsl)	-1.58	-0.45
Elevation of Bottom of Well	ft (amsl)	-7.58	-13.45
Distance from Point A on Cross-Section	ft	0	216

Explanation of Units (see Minard, 1969):

Surface Materials:

Unit 1 (not in table) = asphalt
Unit 2 = topsoil
Unit 3 = fill -- cinders, slag, coal fragments
Unit 4 = brown coarse-medium-fine sand, some medium-fine gravel (fill?)

Tinton Sand:

Unit 5 = brown medium-fine sand, little silt
Unit 6 = brown-green/brown medium-fine sand and silty clay
Unit 7 = brown-orange/brown green silty clay

Lower Red Bank Formation (Sandy Hook):

Unit 8 = green silty clay, some black fine sand

Notes:

*Shown in geologic cross section A-A' but not in table above
All measurements in feet.
amsl: above mean sea level
NA: Not Applicable
Unit numbering matches Geologic Cross Section A-A'.

Table 4-3
Slug Testing Results Summary
Site 283
Fort Monmouth, New Jersey

Well ID	Date	Depth to Static Water Level	DTW at t=0	b	DTW Adjustment	Hydraulic Conductivity (feet/day)
283-MW1	8/14/2001	6.55	8.871	16.129	3.871	4.06
283-MW2	8/14/2001	7.94	9.528	10.472	0.295	2.41
283-MW3	8/14/2001	7.20	9.807	10.193	9.801	4.38
Geometric Mean of Hydraulic Conductivity (feet/day):						3.5

Notes:
DTW = Depth To Water
Depth to Static Water Level was estimated by subtracting 0.3 ft. from the measured DTW at the end of each test.
b = height of water in well at the beginning of the test.
DTW Adjustment = factor by which raw data was adjusted so final hermit data point equals final measured DTW.

Table 5-1
Groundwater Sampling Results
Site 283
Fort Monmouth, New Jersey

Well ID			283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1
Lab Sample ID	**NJDEP**	**Site Specific**	5505.02	5619.01	5681.03[2]	5788.03[2]	5797.04	31	1602904	1628504	1663801	2014501	2029204	2064701	2086401	3008604	3023601	3046901	3073104	4010204
Sample Date	**Criteria**	**MBC[1]**	06/28/00	08/10/00	08/31/00	10/13/00	10/17/00	01/05/01	04/04/01	07/24/01	12/11/01	03/08/02	05/16/02	09/10/02	12/03/02	02/27/03	05/19/03	08/04/03	11/13/03	02/05/04
		Round	#4	#5	Low Flow #1	Low Flow #2	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19
Volatiles																				
Acetone	**700**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	**6**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	**30**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	**1**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	**1000**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	**700**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes[3]	**1000**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total TICs - VOCs	**NLE**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	130	ND	ND	ND	ND	30
Semi-Volatiles																				
2,4-Dimethylphenol	**100**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methylphenol	**NLE**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	**30**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	1.26	ND	ND	ND	ND	ND	ND
Naphthalene[3]	**300**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene[3]	**100**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	**5000**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	**10**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzylphthalate	**100**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	**4000**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total TICs - SVOCs	**100**	**N/A**	40	6	NS	NS	48	5	ND	ND	5	17	5	59	27	99	12	20	11	4
Pesticides/PCBs			ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals																				
Aluminum	**200**	**121000**	**2070**	**1930**	**1930**	**1920**	**2120**	**2460**	**2350**	**3150**	**3600**	**3520**	**3330**	**3350**	**3190**	**3130**	**3140**	**2960**	**4010**	**4710**
Antimony	**20**	**N/A**	ND	3.92	ND	ND	3.97	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**83.6**	ND	ND
Arsenic	**8**	**N/A**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**27.7**	3.16	ND	ND	ND	ND	ND	ND
Barium	**2000**	**699**	71.1	64.1	68.8	73.1	80.7	78.2	78.7	102	92.7	96	94.4	110	108	87.9	95.6	96	118	121
Beryllium	**20**	**N/A**	0.682	0.562	0.757	0.618	0.709	0.627	0.6	0.99	1.04	1.05	0.782	1.11	0.905	0.699	0.815	0.9	1.19	1.01
Cadmium	**4**	**N/A**	ND	ND	ND	ND	ND	ND	ND	1.67	ND	ND	ND	ND	0.887	0.836	ND	0.719	0.436	ND
Calcium	**NLE**	**45400**	5040	5390	5710	5800	6220	7180	6240	8190	7100	8380	8570	8600	8790	8590	9370	9170	11200	13300
Chromium	**100**	**N/A**	9.79	4.2	ND	3.13	1.1	0.88	1	3.98	19.1	4.99	3.03	3.31	1.39	1.62	1.77	ND	2.73	ND
Cobalt	**NLE**	**N/A**	3.28	3.08	3.76	3.53	3.2	4.03	3.9	4.36	4.41	4.84	4.19	4.93	4.45	4.65	4.48	4.36	5.48	6.39
Copper	**1000**	**65.6**	16.9	ND	ND	66.5	ND	ND	17	6.44	39.8	9.42	4.35	8.24	22.1	7.22	3.24	3.45	3.76	5.33
Iron	**300**	**431000**	**1450**	**739**	214	165	**306**	**868**	**410**	**575**	**4490**	**897**	**577**	**692**	281	ND	275	194	**515**	ND
Lead	**10**	**N/A**	ND	2.38	1.5	**20.1**	1.85	ND	3	3.03	7.83	1.36	ND	ND	ND	ND	ND	ND	ND	ND
Magnesium	**NLE**	**62700**	11800	11400	12300	12200	13200	15300	15200	16500	13700	18600	17600	17700	17500	17900	18400	16900	20100	22400
Manganese	**50**	**331**	22.2	23.8	16.6	29	21.8	26	34.7	**55.2**	29.3	36.1	33.9	33.1	43.2	40.6	36.3	33	42.9	**58.2**
Mercury	**2**	**N/A**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.11	ND	ND	ND	ND	ND	ND	ND
Nickel	**100**	**187**	10.4	5.91	5.06	13.3	5.56	4.89	12	20.4	12.5	11.9	10.9	11.9	13.4	11.2	11.1	10.4	13.9	13.5
Potassium	**NLE**	**137000**	5220	5370	5880	5210	5590	5310	4350	6020	6980	5900	5580	11000	6870	4810	5690	6670	7080	6360
Selenium	**50**	**N/A**	ND	ND	ND	ND	ND	ND	ND	7.93	ND	10.4	13.7	8.98	10.6	ND	3.78	ND	ND	ND
Silver	**20**	**N/A**	ND	ND	ND	ND	ND	ND	2	ND	ND	ND	ND	ND	4.44	ND	ND	ND	ND	ND
Sodium	**50000**	**21500**	35600	25400	39500	37300	42700	46600	41300	49100	38400	50000	**51500**	**54400**	**50800**	49000	**54300**	**51400**	**60900**	**80100**
Thallium	**10**	**N/A**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	**NLE**	**N/A**	2.74	1.41	ND	1.38	ND	ND	ND	1.62	7.61	1.36	0.943	0.967	ND	ND	0.537	0.362	0.717	ND
Zinc	**5000**	**233**	53	73.5	78.8	234	67	46.6	100	92.2	110	87.1	72.2	86.8	123	76.7	66.5	79.1	83.9	99.5

Notes

All concentrations in micrograms per liter (ug/L), equivalent to parts per billion (ppb)
Exceedences of NJDEP GWQS are shaded and **bold**
ND: Analyte not detected in sample
N/A: Not Applicable NS: Not Sampled
NLE: No NJDEP GWQC exists for this analyte
*Sampling results that exceeded calibration limits were not run again with dilution due to a laboratory error.

[1]Fort Monmouth Site-specific Groundwater Maximum Background Concentrations (MBCs), background (native) metals only (Weston SI Report Dated 1995)

[2]Low Flow Sampling Method used to collect sample

[3]Interim Criteria used as NJDEP criteria

Table 5-1
Groundwater Sampling Results
Site 283
Fort Monmouth, New Jersey

Well ID			283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2
Lab Sample ID	**NJDEP**	**Site Specific**	4798.01	5046.01	5280.01	5505.01	5619.02	5681.04[2]	5788.04[2]	5797.05	32	1602905	1628505	1663802	2014502	2029205	2064702	2086402	3008605	3023602	3046902	3073105	4010205
Sample Date	**Criteria**	**MBC[1]**	09/20/99	12/27/1999*	03/23/00	06/28/00	08/10/00	08/31/00	10/13/00	10/17/00	01/05/01	04/04/01	07/24/01	12/11/01	03/08/02	05/16/02	09/10/02	12/03/02	02/27/03	05/19/03	08/04/03	11/13/03	02/05/04
		Round	#1	#2	#3	#4	#5	Low Flow #1	Low Flow #2	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19
Volatiles																							
Acetone	**700**	**N/A**	ND	ND	ND	7.16	15.55	NS	NS	ND	23.44	ND	ND	ND	ND	ND	ND	ND	5.23	ND	ND	ND	2.78
Chloroform	**6**	**N/A**	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.46	ND	ND	2.59	ND
Chloromethane	**30**	**N/A**	15.51	ND	ND	ND	ND	NS	NS	ND	ND	18.56	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	**1**	**N/A**	**536.85**	**720.56**	**827.72**	**908.16**	**152**	NS	NS	**670.35**	**1009.73**	**264**	**502.2**	**1055.06**	**710.22**	**395.51**	**223.8**	**119.4**	**123.79**	**112.54**	**239.49**	**290.54**	**156.83**
Toluene	**1000**	**N/A**	598.45	413.22	511.78	663.58	381.19	NS	NS	303.92	320.72	235.04	241.61	24.78	172.69	99.1	94.08	39.32	122.91	27.19	108.66	175.5	47.53
Ethylbenzene	**700**	**N/A**	**797.4**	422.5	**725.71**	**1129.23**	**717.5**	NS	NS	**810.07**	**1160.45**	502.14	604.67	**711.17**	**925.08**	659.8	476.21	349.99	560.9	215.6	485.84	**899.91**	672.01
Total Xylenes[3]	**1000**	**N/A**	**3831.36**	**2125.86**	**4295.69**	**5960.7**	**4009.44**	NS	NS	**3829.91**	**5143.75**	**3221.45**	**2797.88**	**1524.1**	**3744.16**	**2192.84**	**1910.78**	970.36	**3067.89**	**2499.45**	**1985.34**	**2648.84**	**1427.1**
Total TICs - VOCs	**NLE**	**N/A**	8400	3669	4102	3851	44	NS	NS	13500	377	331	323	327	8250	298	338	5720	4270	4932	232	5280	1890
Semi-Volatiles																							
2,4-Dimethylphenol	**100**	**N/A**	3.88	3.57	3.9	ND	1.48	NS	NS	ND	ND	ND	ND	ND	ND	1.75	ND	ND	7.37	ND	4.34	1.8	4.88
4-Methylphenol	**NLE**	**N/A**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.72
bis(2-Ethylhexyl)phthalate	**30**	**N/A**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.09	ND	ND	ND	ND	ND	ND
Naphthalene[3]	**300**	**N/A**	119.16	183.38	82.44	174.92	101.97	NS	NS	152.89	223.45	65.12	150.61	89.93	80.67	101.9	135.69	76.68	21.97	51.41	80.88	108.81	62.19
2-Methylnaphthalene[3]	**100**	**N/A**	25.25	26.28	7.43	24.57	25.13	NS	NS	22.89	26.93	6.1	18.69	13.36	13.24	16.78	30.03	11.88	ND	6.73	9.03	20.23	10.16
Diethylphthalate	**5000**	**N/A**	ND	ND	ND	ND	0.17	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.01
Nitrobenzene	**10**	**N/A**	ND	ND	ND	ND	1.17	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzylphthalate	**100**	**N/A**	ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	9.83	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	**4000**	**N/A**	ND	ND	5.11	ND	ND	NS	NS	ND	ND	8.32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total TICs - SVOCs	**100**	**N/A**	**3225**	**2698**	**2892**	**4041**	**1758**	NS	NS	**3685**	**4912**	**2070**	**3061**	**2419**	**1717**	**2777**	**2979**	**1695**	**2410**	**1555**	**2379**	**2569**	**1987**
Pesticides/PCBs			ND	ND	ND	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals																							
Aluminum	**200**	**121000**	**309**	123	**241**	81.4	**812**	**411**	**247**	**917**	**360**	**2200**	**1780**	**1470**	**249**	**996**	**267**	157	**235**	**2690**	**984**	**762**	**3760**
Antimony	**20**	**N/A**	ND	ND	ND	ND	4.14	ND	ND	4.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	**8**	**N/A**	4.74	ND	ND	ND	3.4	6.6	5.36	2.38	3.72	3	6.78	3.09	ND	**24.2**	7.95	6.04	2.59	6.64	4.95	**10.7**	**10.1**
Barium	**2000**	**699**	39.9	40.3	38.5	45.9	21.7	27.2	25.3	38.9	34.6	30.5	43.1	47.6	43.5	34	24.4	23.2	54.8	39	34.5	37.6	48.4
Beryllium	**20**	**N/A**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.136	0.157	ND
Cadmium	**4**	**N/A**	1.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.744	ND	ND	ND	ND	0.779	ND	ND	ND	ND	ND
Calcium	**NLE**	**45400**	3500	7350	3590	2240	1010	1120	950	1650	1770	ND	1540	3870	3900	2590	1670	1950	1720	1810	1240	1200	1980
Chromium	**100**	**N/A**	5.05	ND	1.51	1.38	3.31	ND	0.874	8.6	2.6	12.7	13.6	21.5	3.24	11.4	2.58	0.701	3.15	33.3	11.3	8.95	46.3
Cobalt	**NLE**	**N/A**	0.908	1.43	ND	0.718	ND	ND	ND	0.556	0.717	ND	ND	1.5	ND	0.623	ND	ND	ND	1.41	ND	ND	2.32
Copper	**1000**	**65.6**	41.2	ND	ND	41.1	ND	ND	14.1	ND	80.5	19	8.26	79.3	11.5	8.35	2.36	4.13	7.25	7.46	3.22	4.92	30.4
Iron	**300**	**431000**	**2330**	**2060**	**2010**	**2130**	**2060**	**1780**	**1330**	**3340**	**3220**	**4360**	**4050**	**7120**	**3220**	**4040**	**2490**	**1720**	**1230**	**8350**	**4420**	**3830**	**10100**
Lead	**10**	**N/A**	**22**	6.92	**15.3**	**11.5**	**31.9**	**33.1**	**25.7**	**14.5**	**25.3**	**23**	**12.3**	**11.8**	9.02	7.47	9.58	5.84	**17.1**	**11.8**	9.71	**13.3**	**21.5**
Magnesium	**NLE**	**62700**	799	1990	1320	1230	532	604	744	1300	1150	1020	842	2320	1950	1480	9.32	764	917	2020	1210	1140	2360
Manganese	**50**	**331**	14.5	44	11.9	8.31	5.97	ND	2.67	4.68	6.47	8.1	36	15	14.3	11.2	6.62	29.8	6.39	8.97	5.08	6.2	11
Mercury	**2**	**N/A**	ND	0.3	0.2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.11	ND	ND	ND	ND	ND	ND	ND
Nickel	**100**	**187**	4.11	3.62	6.43	6.01	ND	ND	1.4	ND	2.85	5	12.2	8.52	4.99	3.7	2.12	1.56	3.06	5.59	2.76	2.91	6.53
Potassium	**NLE**	**137000**	1930	2530	1820	1730	1170	1180	1100	2130	1960	1420	2110	3370	2240	1960	2260	2770	1120	3310	2140	1770	4360
Selenium	**50**	**N/A**	6.49	4.73	7.29	4.36	8.4	5.7	4.09	6.69	6.22	5	30	ND	13.4	15.7	11.1	6.81	6.98	6.97	ND	9.53	ND
Silver	**20**	**N/A**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.87	ND	1.24	ND	ND	ND	0.636	ND
Sodium	**50000**	**21500**	12100	18600	10600	15100	10100	16100	16300	17900	17300	14100	16100	17800	16700	16500	15500	17000	13300	16700	13600	13500	16100
Thallium	**10**	**N/A**	8.76	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	**NLE**	**N/A**	1.73	ND	1.68	1.17	2.84	ND	1.89	3.13	ND	6.4	6.21	7.77	0.773	4.21	1.32	0.858	0.654	12.2	4.38	3.29	17.3
Zinc	**5000**	**233**	21.9	29.4	43.1	18.1	43.9	84.8	51.5	28.4	147	37	36.6	87	23.9	57.1	21.6	10.1	18.8	15.2	15.8	17.4	60.5

Notes

All concentrations in micrograms per liter (ug/L), equivalent to parts per billion (ppb)

Exceedences of NJDEP GWQS are shaded and **bold**

ND: Analyte not detected in sample

N/A: Not Applicable NS: Not Sampled

NLE: No NJDEP GWQC exists for this analyte

*Sampling results that exceeded calibration limits were not run again with dilution due to a laboratory error.

[1]Fort Monmouth Site-specific Groundwater Maximum Background Concentrations (MBCs), background (native) metals only (Weston SI Report Dated 1995)

[2]Low Flow Sampling Method used to collect sample

[3]Interim Criteria used as NJDEP criteria

Table 5-1
Groundwater Sampling Results
Site 283
Fort Monmouth, New Jersey

Well ID			283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3
Lab Sample ID	**NJDEP**	**Site Specific**	5505.03	5619.03	5681.02[2]	5788.05[2]	5797.06	33	1602906	1628506	1663803	2014503	2029206	2064703	2086403	3008606	3023603	3046903	3073106	4010206
Sample Date	**Criteria**	**MBC[1]**	06/28/00	08/10/00	08/31/00	10/13/00	10/17/00	01/05/01	04/04/01	07/24/01	12/11/01	03/08/02	05/16/02	09/10/02	12/03/02	02/27/03	05/19/03	08/04/03	11/13/03	02/05/04
		Round	#4	#5	Low Flow #1	Low Flow #2	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	#17	#18	#19
Volatiles																				
Acetone	**700**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	**6**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	**30**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	**1**	**N/A**	**9.25**	**11.76**	NS	NS	**9.86**	**5.3**	**10.06**	**10.2**	**8.53**	**8.38**	**6.21**	ND	**3.45**	**8.24**	**1.47**	ND	ND	**3.21**
Toluene	**1000**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	**700**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes[3]	**1000**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.14	15.94	ND	ND	ND
Total TICs - VOCs	**NLE**	**N/A**	ND	ND	NS	NS	ND	ND	ND	238	ND	ND	71	ND	10	123	9	ND	ND	21
Semi-Volatiles																				
2,4-Dimethylphenol	**100**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methylphenol	**NLE**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	**30**	**N/A**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.33	ND	ND	ND	ND	ND	ND
Naphthalene[3]	**300**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene[3]	**100**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethylphthalate	**5000**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	**10**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butylbenzylphthalate	**100**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	**4000**	**N/A**	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total TICs - SVOCs	**100**	**N/A**	ND	45	NS	NS	48	ND	ND	ND	6	10	6	55	20	67	12	17	ND	5
Pesticides/PCBs			ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals																				
Aluminum	**200**	**121000**	**3920**	**302**	**298**	149	**365**	**1680**	**880**	**289**	**1030**	**503**	**246**	**393**	48.3	64	**336**	109	**234**	**340**
Antimony	**20**	**N/A**	ND	ND	ND	ND	3.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	**8**	**N/A**	ND	3.56	ND	ND	2.32	6.4	5	3.3	7.27	3.25	**29.9**	6.61	4.18	2.74	7.68	3.1	**8.1**	ND
Barium	**2000**	**699**	99.5	64.8	59.2	66.5	66.6	284	534	178	193	197	150	135	20.7	76.7	336	173	131	282
Beryllium	**20**	**N/A**	0.566	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0682	0.128	ND
Cadmium	**4**	**N/A**	ND	ND	ND	ND	ND	ND	**5.1**	1.48	0.748	ND	0.597	ND	0.564	ND	0.899	0.66	0.463	ND
Calcium	**NLE**	**45400**	11700	10400	10600	10700	10400	12400	8800	10000	11100	10400	10800	11400	8150	10700	12300	11600	12300	14300
Chromium	**100**	**N/A**	50.7	2.22	ND	0.662	1.56	18	4.5	2.31	14	4.81	2.29	1.5	ND	0.911	3.55	ND	1.93	ND
Cobalt	**NLE**	**N/A**	2.38	1.03	1.09	0.9	0.753	0.963	ND	ND	1.63	1.23	1.02	0.919	0.658	0.831	ND	ND	0.542	ND
Copper	**1000**	**65.6**	ND	ND	ND	24.6	ND	105	ND	5.78	ND	ND	14.1	13.1	53.6	3.33	ND	ND	ND	ND
Iron	**300**	**431000**	**21000**	**7090**	**6740**	**6640**	**7030**	**38500**	**40500**	**11200**	**23400**	**19100**	**13000**	**10700**	**1230**	**6360**	**26500**	**12300**	**10300**	**17600**
Lead	**10**	**N/A**	ND	ND	ND	ND	2.17	**21.1**	2	2.6	ND	ND	ND	ND	9.11	ND	1.16	ND	ND	ND
Magnesium	**NLE**	**62700**	4080	1940	2020	2040	2110	2860	2310	1450	2540	2190	1950	2230	1560	2030	2390	2200	2360	2750
Manganese	**50**	**331**	36.9	30.8	24.2	31.5	27.5	34.3	31.5	**63.4**	35.5	33.9	33.3	35.7	48.2	33.5	40.8	34.4	38.4	46
Mercury	**2**	**N/A**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	**100**	**187**	9.39	2.93	ND	3.87	1.96	8.53	6	14.9	5.8	5.3	10.2	5.55	3.96	4.68	5.78	5.13	5.4	6
Potassium	**NLE**	**137000**	12200	ND	7540	7300	7610	10000	7800	6880	8310	7650	7000	8150	6070	7530	8670	7900	7920	8650
Selenium	**50**	**N/A**	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.75	7.31	5.54	5.69	ND	ND	ND	ND	ND
Silver	**20**	**N/A**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.47	ND	ND	ND	ND	ND
Sodium	**50000**	**21500**	7350	5730	7800	8140	8870	7960	7600	7840	6950	7490	8200	8430	7530	7950	9050	7600	7330	14300
Thallium	**10**	**N/A**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	**NLE**	**N/A**	18.2	1.17	ND	ND	ND	5.04	3	0.945	5	1.38	ND	ND	ND	ND	1.37	0.497	0.524	ND
Zinc	**5000**	**233**	28.7	33	20.3	21.8	26	216	7	34.7	17.8	12.1	36.1	50.8	10.9	14.4	47.4	10.4	14.1	ND

Notes

All concentrations in micrograms per liter (ug/L), equivalent to parts per billion (ppb)
Exceedences of NJDEP GWQS are shaded and **bold**
ND: Analyte not detected in sample
N/A: Not Applicable NS: Not Sampled
NLE: No NJDEP GWQC exists for this analyte

*Sampling results that exceeded calibration limits were not run again with dilution due to a laboratory error.

[1]Fort Monmouth Site-specific Groundwater Maximum Background Concentrations (MBCs), background (native) metals only (Weston SI Report Dated 1995)

[2]Low Flow Sampling Method used to collect sample

[3]Interim Criteria used as NJDEP criteria

Table 5-2
Groundwater Sampling Results for Contaminants of Concern
Site 283
Fort Monmouth, New Jersey

Well ID		283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1	283-MW1
Lab Sample ID	**NJDEP**	5505.02	5619.01	5681.03[2]	5788.03[2]	5797.04	31	1602904	1628504	1663801	2014501	2029204	2064701	2086401
Sample Date	**Criteria**	06/28/00	08/10/00	08/31/00	10/13/00	10/17/00	01/05/01	04/04/01	07/24/01	12/11/01	03/08/02	05/16/02	09/10/02	12/03/02
Round No.		#4	#5	Low Flow #1	Low Flow #2	#6	#7	#8	#9	#10	#11	#12	#13	#14
Benzene	**1**	0.115	0.115	NS	NS	0.115	0.115	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene[3]	**700**	0.325	0.325	NS	NS	0.325	0.325	ND	ND	ND	ND	ND	ND	ND
Xylenes[3][4]	**1000**	0.88	0.88	NS	NS	0.88	0.88	ND	ND	ND	ND	ND	ND	ND
Lead	**10**	1	2.38	1.5	**20.1**	1.85	1	3	3.03	7.83	1.36	ND	ND	ND

Well ID		283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2
Lab Sample ID	**NJDEP**	4798.01	5046.01	5280.01	5505.01	5619.02	5681.04[2]	5788.04[2]	5797.05	32	1602905	1628505	1663802	2014502
Sample Date	**Criteria**	09/20/99	12/27/99	03/23/00	06/28/00	08/10/00	08/31/00	10/13/00	10/17/00	01/05/01	04/04/01	07/24/01	12/11/01	03/08/02
Round No.		#1	#2	#3	#4	#5	Low Flow #1	Low Flow #2	#6	#7	#8	#9	#10	#11
Benzene	**1**	**536.85**	**720.56**	**827.72**	**908.16**	**152**	NS	NS	**670.35**	**1009.73**	**264**	**502.2**	**1055.06**	**710.22**
Ethylbenzene[3]	**700**	**797.4**	422.5	**725.71**	**1129.23**	**717.5**	NS	NS	**810.07**	**1160.45**	502.14	604.67	**711.17**	**925.08**
Xylenes[3][4]	**1000**	**3831.36**	**2125.86**	**4295.69**	**5960.7**	**4009.44**	NS	NS	**3829.91**	**5143.75**	**3221.45**	**2797.88**	**1524.1**	**3744.16**
Lead	**10**	**22**	6.92	**15.3**	**11.5**	**31.9**	**33.1**	**25.7**	**14.5**	**25.3**	**23**	**12.3**	**11.8**	9.02

Well ID		283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3	283-MW3
Lab Sample ID	**NJDEP**	5505.03	5619.03	5681.02[2]	5788.05[2]	5797.06	33	1602906	1628506	1663803	2014503	2029206	2064703	2086403
Sample Date	**Criteria**	06/28/00	08/10/00	08/31/00	10/13/00	10/17/00	01/05/01	04/04/01	07/24/01	12/11/01	3/8/2002	05/16/02	09/10/02	12/03/02
Round No.		#4	#5	Low Flow #1	Low Flow #2	#6	#7	#8	#9	#10	#11	#12	#13	#14
Benzene	**1**	**9.25**	**11.76**	NS	NS	**9.86**	**5.3**	**10.06**	**10.2**	**8.53**	**8.38**	**6.21**	ND	**3.45**
Ethylbenzene[3]	**700**	0.325	0.325	NS	NS	0.325	0.325	ND	ND	ND	ND	ND	ND	ND
Total Xylenes[3]	**1000**	0.88	0.88	NS	NS	0.88	0.88	ND	ND	ND	ND	ND	ND	ND
Lead	**10**	1	1	1	1	2.17	**21.1**	2	2.6	ND	ND	ND	ND	9.11

Notes

All concentrations in micrograms per liter (ug/L), equivalent to parts per billion (ppb)
Exceedences of NJDEP GWQS are shaded and **bold**
ND: Analyte not detected in sample
N/A: Not Applicable
NS: Not Sampled
[1]Low Flow Sampling Method used to collect sample
[2]Interim Criteria used as NJDEP criteria

Table 5-2
Groundwater Sampling Results for Contaminants of Concern
Site 283
Fort Monmouth, New Jersey

Well ID		283-MW1	283-MW1	283-MW1	283-MW1	283-MW1
Lab Sample ID	**NJDEP**	3008604	3023601	3046901	3073104	4010204
Sample Date	**Criteria**	02/27/03	05/19/03	08/04/03	11/13/03	02/05/04
Round No.		#15	#16	#17	#18	#19
Benzene	**1**	ND	ND	ND	ND	ND
Ethylbenzene[3]	**700**	ND	ND	ND	ND	ND
Xylenes[3][4]	**1000**	ND	ND	ND	ND	ND
Lead	**10**	ND	ND	ND	ND	ND

Well ID		283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2	283-MW2
Lab Sample ID	**NJDEP**	2029205	2064702	2086402	3008605	3023602	3046902	3073105	4010205
Sample Date	**Criteria**	05/16/02	09/10/02	12/03/02	02/27/03	05/19/03	08/04/03	11/13/03	02/05/04
Round No.		#12	#13	#14	#15	#16	#17	#18	#19
Benzene	**1**	**395.51**	**223.8**	**119.4**	**123.79**	**112.54**	**239.49**	**290.54**	**156.83**
Ethylbenzene[3]	**700**	659.8	476.21	349.99	560.9	215.6	485.84	**899.91**	672.01
Xylenes[3][4]	**1000**	**2192.84**	**1910.78**	970.36	**3067.89**	**2499.45**	**1985.34**	**2648.84**	**1427.1**
Lead	**10**	7.47	9.58	5.84	**17.1**	**11.8**	9.71	**13.3**	**21.5**

Well ID		283-MW3	283-MW3	283-MW3	283-MW3	283-MW3
Lab Sample ID	**NJDEP**	3008606	3023603	3046903	3073106	4010206
Sample Date	**Criteria**	02/27/03	05/19/03	08/04/03	11/13/03	02/05/04
Round No.		#15	#16	#17	#18	#19
Benzene	**1**	**8.24**	**1.47**	ND	ND	**3.21**
Ethylbenzene[3]	**700**	ND	ND	ND	ND	ND
Total Xylenes[3]	**1000**	3.14	15.94	ND	ND	ND
Lead	**10**	ND	1.16	ND	ND	ND

Notes

All concentrations in micrograms per liter (ug/L), equivalent to parts per billion (ppb)
Exceedences of NJDEP GWQS are shaded and **bold**
ND: Analyte not detected in sample
N/A: Not Applicable
NS: Not Sampled
[1]Low Flow Sampling Method used to collect sample
[2]Interim Criteria used as NJDEP criteria

Table 5-3
Determination of Contaminants of Concern
Site 283
Fort Monmouth, New Jersey

Analyte	NJDEP Cleanup Criteria[1]	Site Specific Groundwater MBC[2]	Maximum Result	No. of NJDEP Criteria Exceedences	No. of Site Maximum Background Exceedences	Comments
Volatiles						
Acetone	700	N/A	15.55	0	N/A	No exceedence of NJDEP criteria
Chloroform	6	N/A	17.56	1	N/A	**Not a Contaminant of Concern: only one exceedence of NJDEP criteria**
Chloromethane	30	N/A	15.51	0	N/A	No exceedence of NJDEP criteria
Benzene	1	N/A	1009.73	11	N/A	**Contaminant of Concern at monitoring wells 283-MW2 and 283-MW3.**
Toluene	1000	N/A	663.58	0	N/A	No exceedence of NJDEP criteria
Ethylbenzene	700	N/A	1160.45	6	N/A	**Contaminant of Concern at monitoring well 283-MW2.**
Xylenes[3]	1000	N/A	5960.7	7	N/A	**Contaminant of Concern at monitoring well 283-MW2.**
Semi-Volatiles						
2,4-Dimethylphenol	100	N/A	3.9	0	N/A	No exceedence of NJDEP criteria
4-Methylphenol	NLE	N/A	2.72	N/A	N/A	No NJDEP Groundwater Criteria
bis(2-Ethylhexyl)phthalate	30	N/A	1.33	0	N/A	No exceedence of NJDEP criteria
Naphthalene[3]	300	N/A	223.45	6	N/A	No exceedence of NJDEP criteria
2-Methylnaphthalene[3]	100	N/A	26.93	0	N/A	No exceedence of NJDEP criteria
Diethylphthalate	5000	N/A	1.01	0	N/A	No exceedence of NJDEP criteria
Nitrobenzene	10	N/A	1.17	0	N/A	No exceedence of NJDEP criteria
Phenol	4000	N/A	5.11	0	N/A	No exceedence of NJDEP criteria
Pesticides/PCBs: None Detected						
Metals						
Aluminum	200	121000	3920	18	0	**Not a Contaminant of Concern: did not exceed Site Specific Groundwater MBC.**
Antimony	20	N/A	83.6	1	N/A	**Not a Contaminant of Concern: was not detected in low-flow sampling rounds.**
Arsenic	8	N/A	29.9	6	N/A	**Not a Contaminant of Concern: was not detected in low-flow sampling rounds.**
Barium	2000	699	534	0	0	No exceedence of NJDEP criteria
Beryllium	20	N/A	1.19	0	N/A	No exceedence of NJDEP criteria

Table 5-3
Determination of Contaminants of Concern
Site 283
Fort Monmouth, New Jersey

Analyte	NJDEP Cleanup Criteria[1]	Site Specific Groundwater MBC[2]	Maximum Result	No. of NJDEP Criteria Exceedences	No. of Site Maximum Background Exceedences	Comments
Cadmium	**4**	**N/A**	**5.1**	**1**	**N/A**	**Not a Contaminant of Concern: was not detected in low-flow sampling rounds.**
Calcium	**NLE**	**45400**	14,300	N/A	0	No NJDEP Groundwater Criteria
Chromium	**100**	**N/A**	50.7	0	N/A	No exceedence of NJDEP criteria
Cobalt	**NLE**	**N/A**	6.39	N/A	N/A	No NJDEP Groundwater Criteria
Copper	**1000**	**65.6**	105	0	3	No exceedence of NJDEP criteria
Iron	**300**	**431000**	**40,500**	**19**	**0**	**Not a Contaminant of Concern: did not exceed Site Specific Groundwater MBC.**
Lead	**10**	**N/A**	**33.1**	**10**	**N/A**	**Contaminant of Concern at monitoring wells 283-MW2 and 283-MW3. At well 283-MW1, lead exceeded the NJDEP Criteria only on 10/13/00 (2nd Low Flow round).**
Magnesium	**NLE**	**62700**	22,400	N/A	0	No exceedence of NJDEP criteria
Manganese	**50**	**331**	**58.2**	**1**	**0**	**Not a Contaminant of Concern: did not exceed Site Specific Groundwater MBC.**
Mercury	**2**	**N/A**	0.3	0	N/A	No exceedence of NJDEP criteria
Nickel	**100**	**187**	20.4	0	0	No exceedence of NJDEP criteria
Potassium	**NLE**	**137000**	12,200	N/A	0	No NJDEP Groundwater Criteria
Selenium	**50**	**N/A**	30	0	N/A	No exceedence of NJDEP criteria
Silver	**20**	**N/A**	2	0	N/A	No exceedence of NJDEP criteria
Sodium	**50000**	**21500**	**80,100**	**7**	**18**	**Not a Contaminant of Concern: infrequent exceedences in a limited area.**
Thallium	**10**	**N/A**	8.76	0	N/A	No exceedence of NJDEP criteria
Vanadium	**NLE**	**N/A**	18.2	N/A	N/A	No NJDEP Groundwater Criteria
Zinc	**5000**	**233**	234	0	1	No exceedence of NJDEP criteria

Notes:

All concentrations in micrograms per liter (ug/L), equivalent to parts per billion (ppb).

NJDEP GWQC: New Jersey Department of Environmental Protection Groundwater Quality Criteria.

N/A = Not Applicable

Exceeds NJDEP GWQC =

ND: Analyte not detected in sample

NLE: No limit established for this analyte

[1]Higher of Practical Quantitation Limits (PQLs) and Groundwater Quality Criteria (GWQC) per NJAC 7:9-6

[2]Fort Monmouth Site-specific Groundwater Maximum Background Concentrations (MBCs), background (native) metals only (Weston SI Report Dated 1995)

[3]Interim Criteria used as NJDEP criteria

Table 5-4
Aquifer pH and Dissolved Oxygen
Site 283
Fort Monmouth, New Jersey

283-MW1			283-MW2			283-MW3		
Sample Date	pH	DO (mg/L)	Sample Date	pH	DO (mg/L)	Sample Date	pH	DO (mg/L)
			09/20/99	7.66	5.37			
			12/27/99	6.6	5.27			
			03/23/00	6.84	5.07			
06/28/00	6.9	5.3	06/28/00	6.85	4.17	06/28/00	6.97	5.17
08/10/00	3.7	4.07	08/10/00	5.25	4.11	08/10/00	5.75	4.23
08/31/00	3.48	0.01 ?	08/31/00	4.81	0.13 ?	08/31/00	5.4	0.09 ?
10/13/00	3.33	0.53 ?	10/13/00	4.78	1.3 ?	10/13/00	5.22	1.12 ?
10/17/00	6.23	4.33	10/17/00	6.44	3.71	10/17/00	6.87	4.11
01/05/01	6.38	4.86	01/05/01	6.49	4.02	01/05/01	6.81	4.21
04/04/01	3.49	5.37	04/04/01	5.1	5.41	04/04/01	5.57	5.27
07/24/01	3.73	0.03	07/24/01	5.1	0.49	07/24/01	5.73	0.49
12/11/01	3.53	0.64	12/11/01	5.61	0.44	12/11/01	5.59	0.64
03/08/02	4.09	0.98	03/08/02	5.81	0.97	03/08/02	5.61	1.07
05/16/02	6.4	4.59	05/16/02	6.5	3.9	05/16/02	6.86	4.38
09/10/02	6.54	3.76	09/10/02	6.56	4.03	09/10/02	6.9	3.59
12/03/02	3.49	0.07	12/03/02	4.75	3.15	12/03/02	5.17	1.96
02/27/03	4.71	2.98	02/27/03	4.74	2.18	02/27/03	5.2	2.37
05/19/03	4.5	2.16	05/19/03	4.69	1.11	05/19/03	5.26	2.58
08/04/03	5.3	2.66	08/04/03	4.81	2.06	08/04/03	5.36	2.17
11/13/03	5.49	2.58	11/13/03	4.99	2.16	11/13/03	5.4	2.27
02/05/04	5.48	2.37	02/05/04	5.21	2.23	02/05/04	5.51	2.15
Min:	3.33	0.03	Min:	4.69	0.44	Min:	5.17	0.49
Max:	6.90	5.37	Max:	7.66	5.41	Max:	6.97	5.27
Average:	4.82	2.92	Average:	5.69	3.15	Average:	5.84	2.92

Notes:
1.) DO: Dissolved Oxygen
2.) NA: Not Available / Not Applicable
3.) ?: Questionable Data (not used in calculations)

Table 6-1
Degradation Rates in Groundwater for Contaminants of Concern
Site 283
Fort Monmouth, New Jersey

Contaminant of Concern	Degradation Half life ("high") for anaerobic decay (days)	Degradation Half-life ("low") for aerobic decay (days)	Degradation Rate Constant (k) for anaerobic decay (1/day)	Degradation Rate Constant (k) for aerobic decay (1/day)	Source/Comments
Benzene	**730**	10	**9.5E-04**	6.93E-02	Howard (1991)
Ethylbenzene	228	6	3.0E-03	1.16E-01	Howard (1991)
Total Xylenes	365	14	1.9E-03	4.95E-02	Howard (1991)
Lead	-		-		Does not degrade

Notes:
Values shown are for biodegradation in groundwater.
Decay Rates are shown in scientific notation (9.5E-04 = 0.00095).
"high": Scientific judgement based on anaerobic decay rate in unacclimated groundwater.
"low": Scientific judgement based on aerobic decay rate in unacclimated groundwater.
Bold: Degradation rate used in groundwater modeling for Site 283.
Source: Howard, P.H., et. al., 1991, *Handbook of Environmental Degradation Rates* . Lewis Publishers.

Table 6-2
Sorption Coefficients for Contaminants of Concern
Site 283
Fort Monmouth, New Jersey

Contaminant of Concern	Organic Carbon/Water Partition Coefficient (K_{oc}) (L/kg)	Sorption Coefficient* (K_d) (L/kg)	Source/Comments
Benzene	61.7	0.1851	USEPA (1996)
Ethylbenzene	204	0.612	USEPA (1996)
Total Xylenes:	--	--	--
m-xylene	196	0.588	USEPA (1996)
o-xylene	241	0.723	USEPA (1996)
p-xylene	311	0.933	USEPA (1996)
Lead	N/A	890	PADEP (2000)

Notes:
*Sorption coefficients of organic compounds are based on fraction of organic carbon (f_{oc}) of 0.003.
N/A: Not applicable.

Table 6-3
Benzene Biodegradation Calculation for Well 283-MW2
Site 283
Fort Monmouth, New Jersey

Duration of Benzene Degradation Based on Published Biodegradation Rate		
Input		
Parameters	**Units**	**Constituent: Benzene**
Δt	**days**	**365**
$T_{1/2}$	**days**	**730**
k [(1)]	**$days^{-1}$**	**0.00095**
Initial Concentration, C_0 [(2)]	**µg/L**	**838.48**
November 26, 2000		
Calculation and Results		
Time (days)	**Date**	**Predicted Concentrations, C (ug/L)**
0	November 26, 2000	838.48
365	November 26, 2001	592.89
730	November 26, 2002	419.24
1095	November 26, 2003	296.45
1460	November 25, 2004	209.62
1825	November 25, 2005	148.22
2190	November 25, 2006	104.81
2555	November 25, 2007	74.11
2920	November 24, 2008	52.41
3285	November 24, 2009	37.06
3650	November 24, 2010	26.20
4015	November 24, 2011	18.53
4380	November 23, 2012	13.10
4745	November 23, 2013	9.26
5110	November 23, 2014	6.55
5475	November 23, 2015	4.63
5840	November 22, 2016	3.28
6205	November 22, 2017	2.32
6570	November 22, 2018	1.64
6935	November 22, 2019	1.16
7300	November 21, 2020	0.82
Time until NJDEP criteria is reached:		
7,300	**November 21, 2020**	**0.82**
New Jersey Criteria	**µg/L**	**1**

Notes:
NJ Critera = Interim Groundwater Quality Criteria
Constituent Predicted Concentration: $C_p(t) = C_p(t-1) * e^{-k\Delta t}$
Time to reach NJ Criteria = TNJC
Reaction Rate Constant = $k = -\ln(0.5)/t_{1/2}$

Length of Impacted Area Based on Available Published Biodegradation Rates		
Input Data		
Hydraulic Conductivity[(3)] (K)	**ft/day**	**3.5**
Hydraulic Gradient[(4)] (i):	**ft/ft**	**0.0074**
Effective Porosity[(5)] (n_e):	**---**	**0.4**
Bulk Density of Formation[(5)] (ρ_b)	**kg/L**	**1.65**
n-Octanol/Carbon Partition[(6)] (K_{oc}):	**L/kg**	**61.7**
Fraction of Organic Carbon[(7)] (f_{oc})	**---**	**0.003**
Sorption Coefficient (K_d)	**L/kg**	**0.1851**
Calculation and Results		
Seepage Velocity (ft/day)	vs = K*i/ne =	0.065
Retardation Factor	Rd = 1 + (Kd * ρ_b / ne) =	1.76
Pollutant Transport Rate (ft/day)	vpt = vs/Rd =	0.037
or (ft/year)		13.40
TNJC (days)	**Determined above**	**7,300**
TNJC (years)		**20**
Length (ft)	**vpt * TNJC =**	**270**

Notes:
(1) Half-Life for anaerobic biodegradation in groundwater, upper limit: Howard, P.H. et. al. 1991.
(2) Initial concentration (Co) is the average of the two most recent concentrations that were detected at well 283-MW2 (10/17/00 and 01/05/01)
(3) Hydraulic conductivity of surficial fill, K = 3.5 ft/day (Geometeric mean of slug tests performed by Versar on August 14, 2001)
(4) Hydraulic gradient (i) derived from ground water elevation contours (January 5, 2001)
(5) Effective porosity, n = 0.4, and bulk density, ρ_b = 1.5 g/mL (consistent with the type of soil - clayey sands, at the Site).
(6) K_{oc} data reference: USEPA Soil Screeening Guidance 1996.
(7) f_{oc} = 0.003 (the geometric mean of the minimum and maximum range of f_{oc}). *USEPA 1996* .

Table 6-4
Benzene Biodegradation Calculation for Well 283-MW3
Site 283
Fort Monmouth, New Jersey

Duration of Benzene Degradation Based on Published Biodegradation Rate		
Input		
Parameters	**Units**	**Constituent: Benzene**
Δt	**days**	**180**
$T_{1/2}$	**days**	**730**
k (1)	**$days^{-1}$**	**0.00095**
Initial Concentration, C_0 (2)	**µg/L**	**7.58**
November 26, 2000		
Calculation and Results		
Time (days)	**Date**	**Predicted Concentrations, C (ug/L)**
0	November 26, 2000	7.58
180	May 25, 2001	6.39
360	November 21, 2001	5.39
540	May 20, 2002	4.54
720	November 16, 2002	3.83
900	May 15, 2003	3.23
1080	November 11, 2003	2.72
1260	May 9, 2004	2.29
1440	November 5, 2004	1.93
1620	May 4, 2005	1.63
1800	October 31, 2005	1.37
1980	April 29, 2006	1.16
2160	October 26, 2006	0.97
Time until NJDEP criteria is reached:		
2,160	**October 26, 2006**	**0.97**
New Jersey Criteria	**µg/L**	**1**

Notes:
NJ Critera = Interim Groundwater Quality Criteria
Constituent Predicted Concentration: $C_p(t) = C_p(t-1) * e^{-k\Delta t}$
Time to reach NJ Criteria = TNJC
Reaction Rate Constant = $k = -\ln(0.5)/t_{1/2}$

Length of Impacted Area Based on Available Published Biodegradation Rates		
Input Data		
Hydraulic Conductivity (3) (K)	**ft/day**	**3.5**
Hydraulic Gradient (4) (i):	**ft/ft**	**0.037**
Effective Porosity (5) (n_e):	**---**	**0.4**
Bulk Density of Formation (5) (ρ_b)	**kg/L**	**1.59**
n-Octanol/Carbon Partition (6) (K_{oc}):	**L/kg**	**62**
Fraction of Organic Carbon (7) (f_{oc})	**---**	**0.003**
Sorption Coefficient (K_d)	**L/kg**	**0.186**
Calculation and Results		
Seepage Velocity (ft/day)	vs = K*i/ne =	0.324
Retardation Factor	Rd = 1 + (Kd * ρ_b / ne) =	1.74
Pollutant Transport Rate (ft/day)	vpt = vs/Rd =	0.186
or (ft/year)		67.94
TNJC (days)	**Determined above**	**2,160**
TNJC (years)		**5.9**
Length (ft)	**vpt * TNJC =**	**400**

Notes:
(1) Half-Life for anaerobic biodegradation in groundwater, upper limit: Howard, P.H. et. al. 1991.
(2) Initial concentration (Co) is the average of the two most recent concentrations that were detected at well 283-MW2 (10/17/00 and 01/05/01)
(3) Hydraulic conductivity of surficial fill, K = 3.5 ft/day (Geometeric mean of slug tests performed by Versar on August 14, 2001)
(4) Hydraulic gradient (i) derived from ground water elevation contours (January 5, 2001)
(5) Effective porosity, n = 0.4, and bulk density, ρ_b = 1.5 g/mL (consistent with the type of soil - clayey sands, at the Site).
(6) K_{oc} data reference: USEPA Soil Screeening Guidance 1996.
(7) f_{oc} = 0.003 (the geometric mean of the minimum and maximum range of f_{oc}). *USEPA 1996* .

Table 6-5
MODFLOW Input Parameters
Site 283
Fort Monmouth, New Jersey

Software used for Modelling
Waterloo Hydrogeologic *Visual Modflow Version 2.8.2*
Golden Software, Inc. *Surfer for WindowsVersion 7.04*
Papadopulos & Associates, Inc. *MT3D 99*

Grid			
Model Area:	Min	Max	Range
X (Easting, NJ Nad 83):	617600	620000	2400
Y (Northing, NJ Nad 83):	539600	541400	1800
Number of Columns:	137		
Number of Rows:	113		
Default Grid Size:	20' x 20'		
Grid Size in vicinity of Building 283:	10' x 10'		

Units used in model	
Length	feet
Time	day
Hydraulic Conductivity	Feet per day (ft/day)
Recharge	Inches per year (in./year)
Concentration	Micrograms per Liter (ug/L), equivalent to Parts Per Billion (ppb)
Mass	kg
Volume	ft^3

Ground Surface
The ground surface elevations were obtained from the Fort Monmouth Nad83 topographic survey.
The river was assigned to elevation of zero (0) ft.
The ground surface used in the model was interpolated from elevation points using *Golden Software Surfer* .

Table 6-5
MODFLOW Input Parameters
Site 283
Fort Monmouth, New Jersey

Layer properties			
Number of Layers:	5		
Layer Number	Formation	Thickness	Porosity (ne)*
Layer 1	Fill	10 ft** (0.5 ft at stream)	0.40
Layer 2	Navesink-Hornerstown Confining Unit	15 ft	0.40
Layer 3	Navesink-Hornerstown Confining Unit	110 ft	0.40
Layer 4	Wenonah-Mount Laurel Aquifer	75 ft	0.40
Layer 5	Marshalltown-Wenonah Confining Unit	10 ft	0.40
**Porosity estimated from Dominico and Schwarts (1998), Table 2.1.*			
***Thickness of fill was estimated based on boring logs for Site 283 and underground utilities.*			

Recharge	
Majority of Area:	13.28 in. / year
Selected Area:	0.00 in./year in paved area at Site 283 and surrounding areas.
Recharge applied to:	Highest Active Cells
Source:	Jablonski, 1968, Ground-Water Resources of Monmouth County, New Jersey, USGS Special Report No. 23. *The recharge used for the model was taken to be the sum of the groundwater base flow and water utilization.*

River (Boundary Condition)	
Location:	Parkers Creek was assigned as a "river" in the area shown on the Fort Monmouth Base Map near the 283 site.
Stage Elevation:	0 ft
Elevation of River Bottom:	-1 ft
Conductance:	1600 ft^2/day

Table 6-5
MODFLOW Input Parameters
Site 283
Fort Monmouth, New Jersey

Hydraulic Conductivity (K)		
The geometric means were used for the layers specified below:		
Fill:	*From Slug tests conducted August 14, 2001.*	
(Layer 1)	Well	K
	283-MW1	4.06
	283-MW2	2.41
	283-MW3	4.38
Geometric Mean:		**3.5**
Navesink-Hornerstown		*From Martin (1998)*
Confining Unit:		2
(Layers 2 and 3)		5.00E-04
		1.30E-01
		9
		3.00E-03
		2.00E-02
		8.00E-02
		6.70E-01
		4
		5.60E-02
Geometric Mean:		**0.12**

Hydraulic Conductivity (K) (Continued)		
Wenonah Formation:		*From Martin (1998)*
(Layer 4)		17
		13
		19
		13
		19
Geometric Mean:		**15.964987**
Marshaltown Wenonah		*From Martin (1998)*
Confining Unit:		2.60E-04
(Layer 5)		1.30E-01
		4.90E-04
		5.70E-06
		2.40E-05
		1.50E-05
Geometric Mean:		**0.00018**
Source:	Martin, Mary, 1998, Groundwater Flow in the New Jersey Coastal Plain, USGS Professional Paper 1404-H.	

Table 6-5
MODFLOW Input Parameters
Site 283
Fort Monmouth, New Jersey

Contaminant Transport Inputs

Dispersivity: Longitudinal: 13.8 ft Lattitudinal = 0.1 * Longitudinal = 1.38 ft.

Source for dispersivity: USEPA Office of Research and Development, Feb. 2001,
http://www.epa.gov/athens/learn2model/part-two/onsite/longdisp.htm

Dispersivity (ax) determined from the following equation (Lp = plume length in feet):

$$\alpha_x = 0.83[\log_{10}(L_p)]^{2.414}$$

Dispersivity calculated based on a plume length of 300 feet.

Bulk Density (pb): 46.7 kg/ft^3 = 1.65 kg/L

Sorption type: Linear Isotherm

Sorption Constants Used in Model (Kd):

Source	COC	Kd (L/kg)	Kd (L/ug)	Kd (ft^3/kg)	**Calculated Rd=1+(Kd*pb/ne)**
(1)	Benzene	0.1851	1.851E-10	6.54E-03	**1.76**
(2)	Lead	890	0.00000089	3.14E+01	**3,700**

Notes:

Kd for benzene was found from the relationship: Kd = foc * Koc.

From EPA (1996): Koc = 61.7 L/Kg = 2.18 ft^3/Kg; foc = 0.003.

Benzene was also modelled separately using biodegradation only (See Tables 6-1 and 6-2).

Sources:

(1)United States Environmental Protection Agency (USEPA). 1996.
Soil Screening Guidance: Technical Background Document.
Office of Solid Waste and Emergency Response. Washington, D.C. EPA/540/R-95/128.
(2) Pennsylvania Department of Environmental Protection (PADEP)
Manual Appendix A Table 5B, http://www.dep.state.pa.us/dep/subject/eqb/2000/jun20/Table5b.pdf

Table 6-5
MODFLOW Input Parameters
Site 283
Fort Monmouth, New Jersey

Contaminant Transport Inputs (Continued):

Inititial Concentrations used in MODFLOW:

Contaminant of Concern	NJDEP Criteria[(1)]	Maximum Result	283-MW1 Initial Concentration	283-MW2 Initial Concentration	283-MW3 Initial Concentration
BENZENE	1	1009.7	0.115	838.480	7.580
LEAD	10	33.1	4.638	20.691	4.545

Notes:

[(1)]Higher of Practical Quantitation Limits (PQLs) and Groundwater Quality Criteria (GWQC) per N.J.A.C. 7:9-6.

All concentrations in micrograms per liter (ug/L), equivalent to parts per billion (ppb).

One-half the Method Detection Limit (MDL) was used for results of "Non-Detect" (ND).

See Table 5-3 for MDLs used in this calculation.

Bold with Shading: exceeds the NJDEP Criteria.

Initial concentrations for benzene were derived from average of two most recent concentrations (10/17/00 and 01/05/01).

Initial concentrations for lead were derived from average of groundwater sample results between 09/20/99 and 01/05/99.

Initial concentration maps were derived in *Golden Software Surfer* using the "minimal curvature" method.

The initial concentration map was applied to the Layers 1 and 2 (see above for description of layers).

Biodegradation:

Contaminant of Concern	Biodegradation Half-life (days)	Biodegradation Constant (1/day)
BENZENE	730	0.00095
LEAD	N/A	N/A

Notes: N/A: not applicable.

Biodegradation rate applied to both sorbed and nonsorbed species.

Source: Howard, P.H. et. al. 1991, Environmental Degradation Rates, Lewis Publishers.

Half-life used is the upper limit for biodegradation of benzene in groundwater (anaerobic)

Table 6-6
MODFLOW Results
Site 283
Fort Monmouth, New Jersey

Contaminant of Concern	NJDEP Criteria (ug/L)[(1)]	Well used for Calculation	**Estimated Time for Compliance (Years)**
Benzene	1	283-MW2	**18**
		283-MW3	**9**
Lead	10	283-MW2[(2)]	**210**

Notes:

[(1)]Higher of Practical Quantitation Limits (PQLs) and Groundwater Quality Criteria (GWQC) per N.J.A.C. 7:9-6

[(2)]Calculation based on extrapolating concentration versus time graph (Figure 6-14)

Table 6-7
Well Search Summary
Site 283
Fort Monmouth, New Jersey

Permit No.	Use*	Permit Date	Depth (ft)	Lattitude	Longitude
2900871	D	7/21/1953	140	401853	740346
2901016	D	12/24/1953	150	401839	740240
2901308	D	12/3/1954	46	401826	740319
2901458	D	5/20/1955	150	401853	740346
2901788	D	11/30/1955	60	401920	740253
2902505	D	10/10/1957	100	401908	740226
2902774	D	9/22/1958	124	401933	740226
2902919	I	5/11/1959	110	401906	740253
2903369	D	8/8/1960	100	401933	740213
2904271	D	2/13/1964	60	401933	740213
2904782	D	8/5/1965	50	401839	740240
2905052	D	5/2/1988	60	401933	740240
2905454	D	10/9/1967	60	401920	740346
2905609	D	10/7/1968	50	401906	740306
2905673	D	1/22/1969	100	401838	740226
2906861	D	1/29/1973	40	401933	740319
2907110	D	7/24/1973	40	401920	740306
2907451	D	4/9/1974	50	401933	740319
2908438	D	8/3/1976	60	401853	740200
2908510	D	6/7/1972	50	401839	740200
2908785	D	4/28/1977	120	401853	740346
2908810	D	5/12/1977	50	401839	740146
2911063	M	3/31/1981	25	401906	740213
2911064	M	3/31/1981	25	401905	740213
2911065	M	3/31/1981	25	401906	740213
2911066	M	3/31/1981	25	401906	740213
2911067	M	3/31/1981	25	101906	740213
2911068	M	3/31/1981	25	401906	740213
2911771	H	12/22/1981	100	401920	740253
2911772	H	12/22/1981	100	401906	740240
2912553	M	1/21/1983	25	401646	740152
2912554	M	1/21/1983	25	401846	740152
2912555	M	1/21/1983	25	401646	740152
2912785	M	6/2/1983	10	401939	740219
2912786	M	6/2/1983	10	101939	740219
2912787	M	6/2/1983	10	401939	740219
2912788	M	6/2/1983	10	401939	740219
2912789	M	6/2/1983	10	401939	740219
2912790	M	6/2/1983	10	401939	740219
2912792	M	6/2/1983	10	401939	740219
2912793	M	6/2/1983	10	401939	740219
2912794	M	6/2/1983	10	401939	740219
2912795	M	6/2/1983	10	401939	740219
2912796	M	6/2/1983	10	401939	740219
2912798	M	6/2/1983	10	401939	740219
2913696	M	8/5/1984	10	401939	740219
2913697	M	8/5/1984	10	401939	740219
2913698	M	8/5/1984	25	401939	740219
2914168	G	9/15/1984	200	401832	740339
2914244	D	6/30/1900	120	401819	740219
2914593	M	NA	17	401846	740352
2914594	M	NA	17	401846	740352
2914595	M	NA	17	401846	740352
2914596	M	N/A	17	401846	740352
2914980	R	5/5/1985	200	401912	740246
2915008	G	5/5/1985	200	101806	740248
2916628	M	6/11/1986	12	401939	740232
2916629	M	6/11/1986	12	401939	740232
2916630	M	6/11/1986	12	401939	740232
2917404	D	1/26/1900	100	401806	740246
2917657	B	12/4/1986	20	401939	740246
2917918	B	2/9/1987	20	401926	740246
2917919	B	2/9/1987	20	401926	740246

Permit No.	Use*	Permit Date	Depth (ft)	Lattitude	Longitude
2919007	B	7/21/1987	20	401906	740346
2919669	M	12/4/1987	20	401933	740240
2919670	M	12/4/1987	20	401933	740240
2919671	M	12/4/1987	20	401933	740240
2919672	M	12/4/1987	20	401933	740240
2919673	M	12/4/1987	20	401933	740240
2920626	M	5/13/1988	12	401826	740333
2920627	M	5/13/1988	12	401828	740333
2920628	M	5/13/1988	12	401826	740333
2921172	G	9/1/1988	200	401853	740306
2922571	G	4/14/1989	60	401920	740253
2923076	Y	6/29/1989	250	401839	740346
2923608	D	10/18/1989	200	401933	740226
2923677	M	11/3/1989	30	401908	740226
2923678	M	11/3/1989	30	401906	740226
2923679	M	11/3/1989	30	401906	740225
2923680	M	11/3/1989	30	401906	740226
2923690	D	11/2/1989	89	401813	740253
2923732	M	11/17/1989	15	401946	740226
2923733	M	11/17/1989	15	401946	740226
2923734	M	11/17/1989	15	401946	740226
2923735	M	11/17/1989	15	401946	740226
2923808	M	11/29/1989	30	401933	740253
2923809	M	11/29/1989	30	401933	740253
2923810	M	11/29/1989	30	401933	740253
2923811	M	11/29/1989	30	401933	740253
2923955	M	N/A	15	401933	740333
2923956	M	N.A	15	401933	740333
2924138	M	1/11/1990	40	401933	740240
2924139	M	1/11/1990	40	401933	740240
2924140	M	1/11/1990	40	401933	740240
2924141	M	1/11/1990	40	401933	740240
2924639	M	NA	30	401906	740226
2924640	M	NA	30	401906	740226
2924953	M	1/25/1900	10	401853	740200
2924954	M	1/25/1900	10	401853	740200
2924955	M	1/25/1900	10	401853	740200
2924956	M	1/25/1900	10	401853	740200
2925357	M	9-188	20	401639	740213
2926116	M	1/22/1900	25	401839	740346
2926147	G	1/6/1900	300	401933	740319
2926684	M	5/21/1900	15	401946	740240
2926704	D	1/1/1900	230	401920	740253
2926706	M	2/11/1900	15	401920	740333
2926707	M	2/11/1900	15	401920	740333
2926925	M	9/24/1991	20	401906	740200
2926926	M	9/24/1991	20	401906	740200
2926927	M	9/24/1991	20	401906	740200
2926928	M	9/24/1991	20	401906	740200
2926930	M	9/24/1991	20	401906	740200
2926931	M	9/24/1991	20	401906	740200
2926939	M	9/25/1991	20	401920	740200
2926940	M	9/25/1991	20	401906	740200
2926942	M	9/25/1991	20	401906	740200
2927072	M	10/24/1991	25	401933	740240
2927073	M	10/24/1991	25	401933	740240
2927755	G	3/31/1992	200	401920	740333
2927770	E	4/2/1992	16	401626	740333
2927771	E	4/2/1992	18	401826	740333
2927772	E	4/2/1992	16	401826	740333
2927773	E	4/2/1992	18	401826	740333
2928031	E	5/14/1992	20	401906	740200
2928144	E	8/4/1992	20	401933	740240

Table 6-7
Well Search Summary
Site 283
Fort Monmouth, New Jersey

Permit No.	Use*	Permit Date	Depth (ft)	Lattitude	Longitude
2928236	M	6/18/1992	20	401826	740333
2928907	M	10/13/1992	20	401906	740200
2928929	M	9/24/1991	20	401906	740200
2928938	M	9/25/1991	20	401920	740200
2928941	M	9/25/1991	20	401906	740200
2928992	M	10/27/1992	20	401920	740200
2928993	M	10/27/1992	20	401920	740200
2928994	M	10/27/1992	20	401920	740200
2928995	M	10/27/1992	20	401920	740200
2929158	M	12/8/1992	20	401839	740333
2929159	M	12/8/1992	20	401839	740333
2929208	M	12/31/1992	20	401946	740240
2929627	M	5/4/1993	15	401839	740319
2929628	M	5/4/1993	15	401839	740319
2929629	M	5/4/1993	15	401839	740319
2929739	M	6/3/1993	20	401920	740146
2929740	M	6/3/1993	20	401920	740146
2929741	M	8/3/1993	20	401920	740146
2930139	M	8/24/1993	25	401933	740333
2930282	M	9/28/1993	20	401946	740240
2930283	E	9/28/1993	25	401946	740240
2930284	E	9/28/1993	25	401946	740240
2930388	G	11/1/1993	20	401839	740253
2930781	G	2/16/1994	100	401933	740253
2930957	M	4/5/1994	15	401906	740200
2930961	M	4/5/1994	15	401653	740240
2930962	M	4/5/1994	15	401906	740200
2930962	M	4/5/1994	15	401906	740200
2930964	M	4/5/1994	15	401906	740200
2930965	M	4/5/1994	15	401906	740306
2930966	M	4/5/1994	15	401906	740253
2930973	M	4/5/1994	15	401905	740240
2930974	M	4/5/1994	15	401906	740240
2930975	M	4/5/1994	15	401920	740240
2930976	M	4/5/1994	15	401920	740240
2930979	M	4/5/1994	15	401906	740253
2930980	M	4/5/1994	15	401906	740240
2930983	M	4/5/1994	15	401906	740200
2930987	M	4/5/1994	15	401906	740253
2930988	M	4/5/1994	15	401906	740253
2931158	M	5/4/1994	25	401853	740200
2931159	M	5/4/1994	25	401653	740200
2931401	M	6/2/1994	20	401946	740226
2931772	M	8/3/1994	15	401906	740240
2931773	M	8/3/1994	15	401906	740240
2931774	M	6/3/1994	15	401906	740240
2931775	M	8/3/1994	15	401906	740240
2931776	M	8/3/1994	15	401920	740319
2931777	M	8/3/1994	15	401920	740319
2931778	M	8/3/1994	15	401920	740319
2931779	M	8/3/1994	15	401920	740319
2931780	M	8/3/1994	15	401906	740253
2931781	M	8/3/1994	15	101906	740253
2931782	M	8/3/1994	15	401906	740253
2931783	M	8/3/1994	15	401920	740319
2931784	M	8/3/1994	15	401906	740319
2931785	M	8/3/1994	15	401906	740306
2931787	M	8/3/1994	15	401920	740333
2931788	M	8/3/1994	15	401920	740333
2931792	M	8/3/1994	15	401946	740240
2932115	M	9/14/1994	15	401906	740346
2932189	B	10/4/1994	30	401906	740306
2932190	B	10/4/1994	30	401906	740306
2932191	B	10/4/1994	30	401906	740306

Permit No.	Use*	Permit Date	Depth (ft)	Lattitude	Longitude
2932192	B	10/4/1994	30	401906	740306
2932560	M	11/29/1994	25	401906	740253
2932561	M	11/29/1994	25	401906	740253
2932562	M	11/29/1994	25	401906	740253
2932564	M	11/29/1994	25	401839	740319
2932566	M	11/29/1994	25	401906	740253
2932566	M	11/29/1994	25	401839	740319
2932567	M	11/29/1994	25	401906	740253
2932568	M	11/29/1994	25	401839	740319
2932569	M	11/29/1994	25	401906	740306
2932570	M	11/29/1994	25	401906	740306
2932571	M	11/29/1994	25	401906	740306
2932572	M	11/29/1994	25	401906	740306
2932573	M	11/29/1994	25	401906	740306
2932574	M	11/29/1994	25	401906	740306
2932575	M	11/29/1994	25	401906	740306
2932576	M	11/29/1994	25	401853	740226
2932577	M	11/29/1994	25	401653	740226
2932578	M	11/29/1994	25	401853	740226
2932579	M	11/29/1994	25	401653	740226
2932580	M	11/29/1994	25	401853	740226
2932581	M	11/29/1994	25	401853	740226
2932582	M	11/29/1994	25	401853	740226
2932583	M	11/29/1994	25	401906	740253
2932583	M	11/29/1994	25	401653	740226
2932585	M	11/29/1994	25	401906	740253
2932585	M	11/29/1994	25	401839	740319
2932587	M	11/29/1994	25	401639	740319
2932588	M	11/29/1994	25	401906	740306
2932588	M	11/29/1994	25	401839	740319
2932589	M	11/29/1994	25	401839	740319
2932743	B	1/20/1995	50	401906	740253
2932925	M	3/13/1995	25	401933	740333
2933063	M	4/5/1995	17	401946	740226
2933064	M	4/5/1995	17	401946	740226
2933065	M	4/5/1995	17	401946	740226
2933754	M	7/19/1995	20	401906	740200
2933755	M	7/19/1995	20	401906	740200
2933770	M	7/19/1995	20	401853	740253
2933771	M	7/19/1995	20	401853	740253
2933772	M	7/19/1995	20	401653	740253
2933773	M	7/19/1995	20	401853	740253
2933789	M	7/19/1995	20	401853	740253
2933989	M	8/18/1995	20	401920	740240
2934248	M	9/28/1995	25	401825	740319
2934249	M	9/28/1995	25	401626	740319
2934250	M	9/28/1995	25	401825	740319
2934251	M	9/28/1995	25	401626	740319
2934252	M	9/28/1995	25	401826	740319
2934565	M	11/22/1995	40	401933	740333
2934566	M	11/17/1995	20	401946	740306
2934582	M	11/22/1995	40	401933	740333
2934583	M	11/22/1995	10	401933	740333
2934586	M	11/22/1995	40	401933	740333
2934702	B	12/15/1995	40	401920	740146
2934857	B	2/8/1996	50	401920	740146
2935127	E	4/2/1996	45	401813	740319
2935128	E	4/2/1996	45	401813	740319
2935129	E	4/2/1996	45	401813	740319
2935130	E	4/2/1996	45	401813	740319
2935312	M	5/1/1996	50	401853	740319
2935313	M	5/1/1996	50	401853	740319
2935314	M	5/1/1996	50	401653	740319
2935314	M	5/1/1996	50	401653	740319

Table 6-7
Well Search Summary
Site 283
Fort Monmouth, New Jersey

Permit No.	Use*	Permit Date	Depth (ft)	Lattitude	Longitude
2935585	M	8/19/1996	20	401826	740319
2935585	M	6/19/1996	20	401826	740319
2935931	E	8/29/1996	35	401813	740306
2935931	E	8/29/1996	35	401813	740306
2937524	M	6/26/1997	15	401839	740333
2937524	M	8/28/1997	15	401839	740333
2937602	E	9/11/1997	35	401813	740306
2937602	E	9/11/1997	35	401813	740306
2937603	E	9/11/1997	35	401813	740306
2937603	E	9/11/1997	35	401813	740306
2937604	E	9/11/1997	35	401813	740306
2937604	E	9/11/1997	35	401813	740306
2937605	E	9/11/1997	35	401813	740306
2937605	E	9/11/1997	35	401813	740306
2937606	E	9/11/1997	35	401813	740306
2937606	E	9/11/1997	35	401813	740306
2937737	V	10/8/1997	25	401853	740319
2937737	V	10/8/1997	35	401853	740319
2937738	V	10/8/1997	25	401853	740319
2937739	V	10/8/1997	25	401853	740319
2937740	V	10/8/1997	25	401853	740319
2937878	G	11/14/1997	35	401853	740200
2938172	M	2/11/1998	30	401826	740226
2938350	G	3/20/1998	100	401933	740305
2939416	M	9/24/1998	20	401946	740306
2939550	H	10/21/1998	300	401826	740225
2939820	M	1/6/1999	20	401946	740226
2939821	M	1/6/1999	20	401946	740226
2939822	M	1/6/1999	20	401946	740226
2939826	M	1/7/1999	20	401839	740319
2912797	M	6/2/1983	10	401939	740219
2934584	M	11/22/1995	40	401933	740333

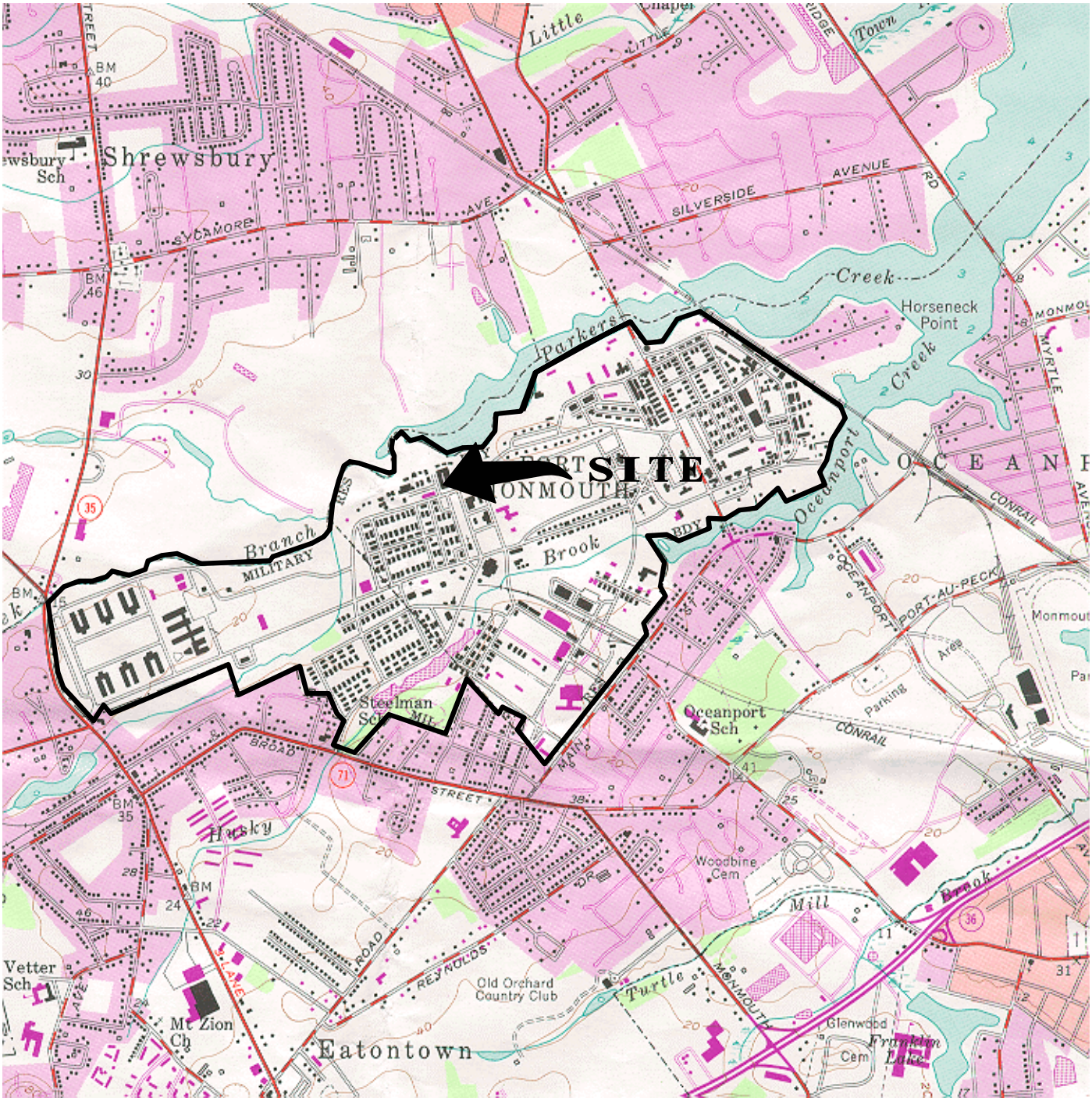
***Well Use Codes**
A - Unknown/Well Record Use Only
B - Boring
C - Commercial
D - Domestic (Potable)
E - Recovery/Decontamination Pollution Control/Leachate with Pump Capacity
F - Fire
G - Irrigation
H - Heat Pump/Geothermal (Return Well)
I - Industrial
J - Injection
K - Inclinometer
L - Livestock
M - Monitoring Well (Observation)
N - Public Non Community
O - Oil/Gas Exploration
P - Public Supply
Q - Recharge
R - Replacement (Replacement Codes: 1 - Domestic; 2 - Public Community, 5 - Irrigation)
S - Closed Loop
T - Test
U - Non Public (Supply)
V - Gas Vent
W - Dewatering
X - Agricultural/Horticultural/IrrigationWells
Y - Cathodic Protection
Z - Piezometer

Notes:
Source: State of New Jersey Department of Environmental Protection - Well Permitting and Regulations Section of the Bureau of Water
Search date: 16 February 2001.

Well search was performed for a 1-mile radius surrounding the center point of the M18 landfill, U.S. Army Garrison Fort Monmouth, Fort Monmouth, New Jersey. The M18 Landfill is approximately 350 feet from Site 283.

M18 Location: latitude = North 40^{o} 18' 58", longitude = West 74^{o} 02' 48".
NA: Data Not Available

FIGURES



LONG BRANCH, N. J.

40073-C8-TF-024

1954

PHOTOREVISED 1981

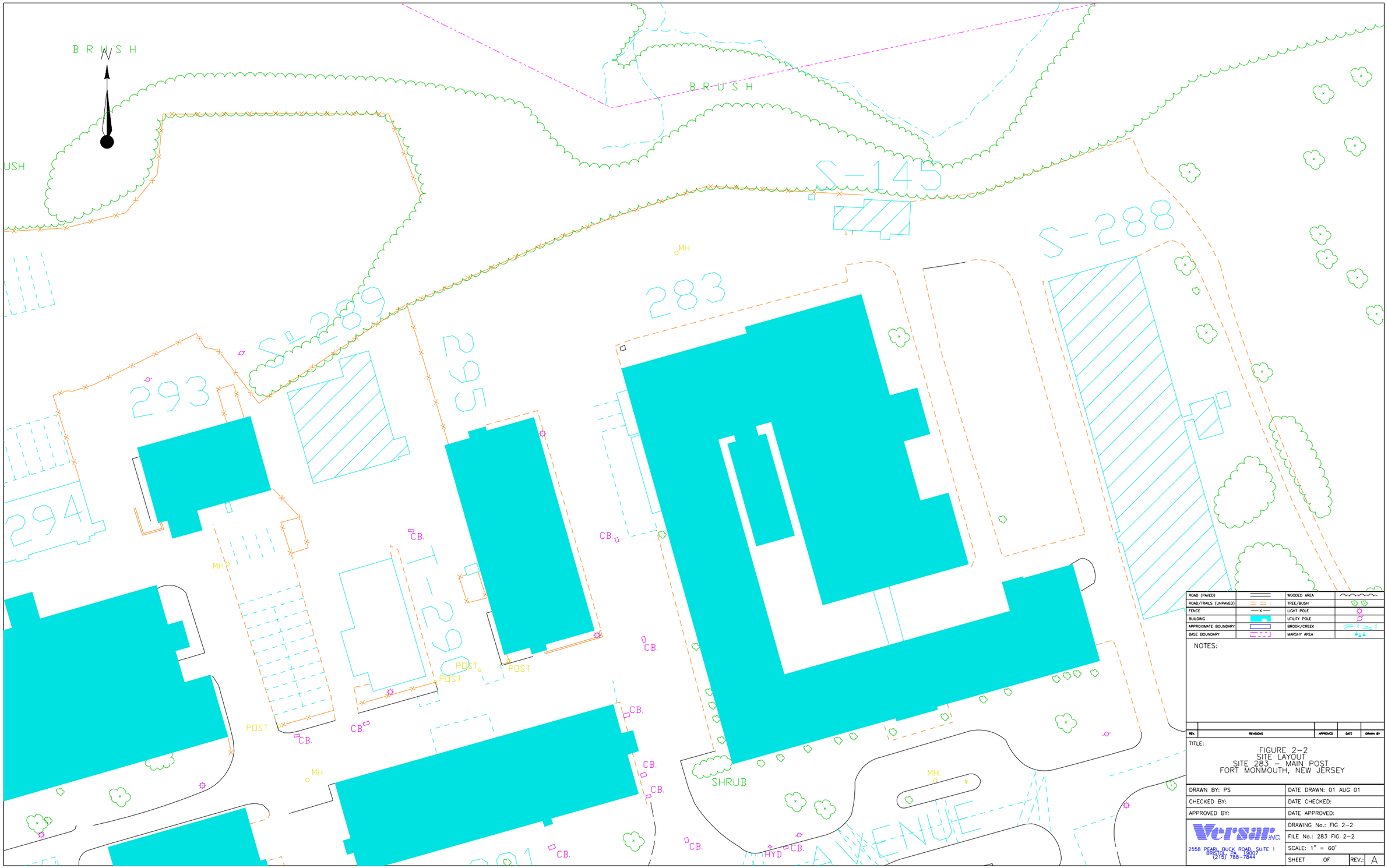
DMA 6164 I SE-SERIES V822

QUADRANGLE LOCATION

Mapped, edited and published by the Geological Survey

Figure 2-1
Site Location Map
Site 283
Fort Monmouth, New Jersey

Versar INC.
201 Gibraltar Road, Suite 100
Horsham, PA 19044
(215) 957-0955



ROAD (PAVED)		WOODED AREA	
ROAD/TRAILS (UNPAVED)		TREE/BUSH	
FENCE	—x—	LIGHT POLE	
BUILDING		UTILITY POLE	
APPROXIMATE BOUNDARY		BROOK/CREEK	
BASE BOUNDARY		MARSHY AREA	

NOTES:

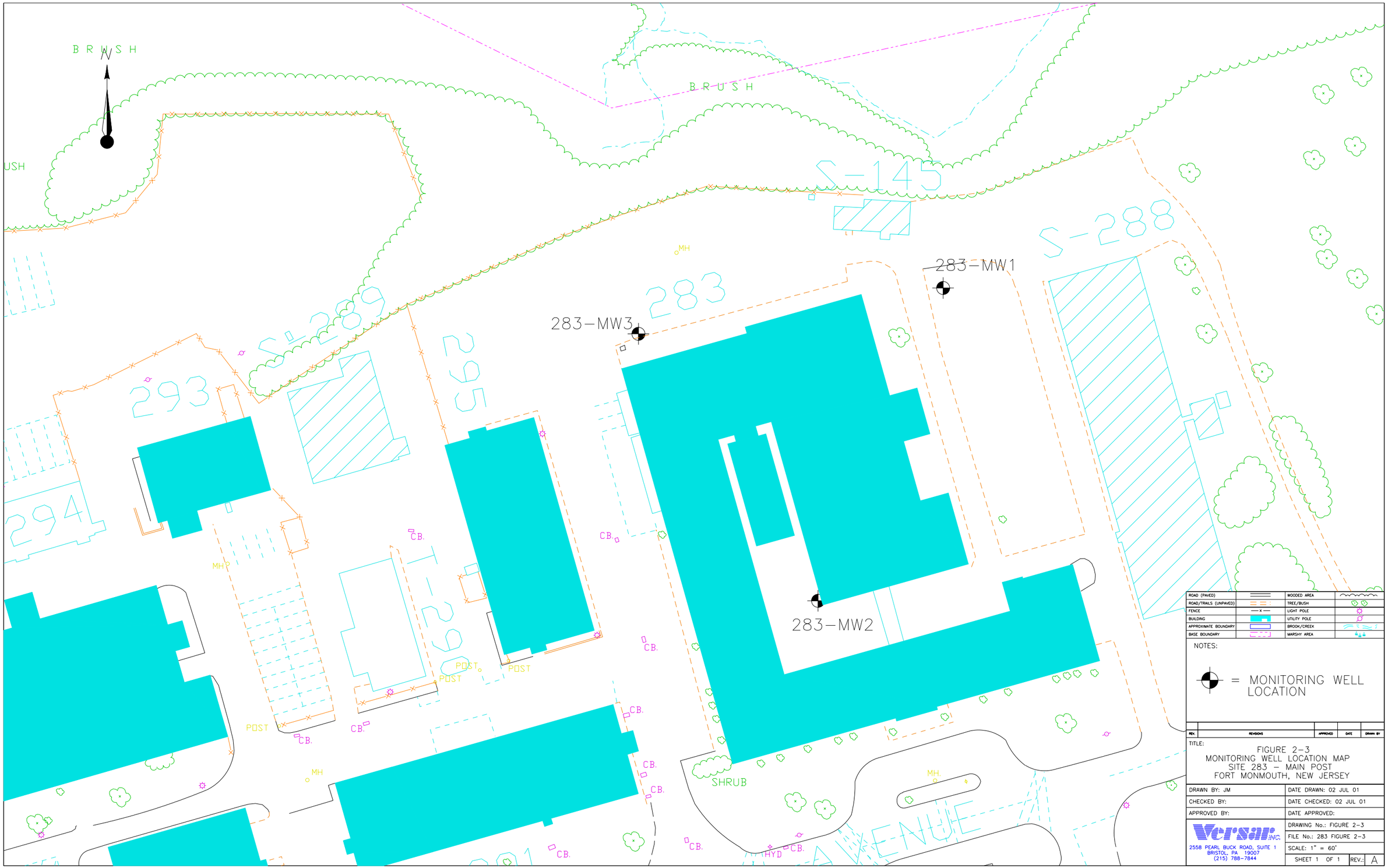
REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 2-2
SITE LAYOUT
SITE 283 - MAIN POST
FORT MONMOUTH, NEW JERSEY

DRAWN BY: PS	DATE DRAWN: 01 AUG 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIG 2-2
	FILE No.: 283 FIG 2-2
	SCALE: 1" = 60'
	SHEET OF REV.: A

Versar INC.
2558 PEARL BUCK ROAD SUITE 1
BRISTOL, PA. 19007
(215) 788-7844



ROAD (PAVED)		WOODED AREA	
ROAD/TRAILS (UNPAVED)		TREE/BUSH	
FENCE	—x—	LIGHT POLE	
BUILDING		UTILITY POLE	
APPROXIMATE BOUNDARY		BROOK/CREEK	
BASE BOUNDARY		MARSHY AREA	

NOTES:

⊕ = MONITORING WELL LOCATION

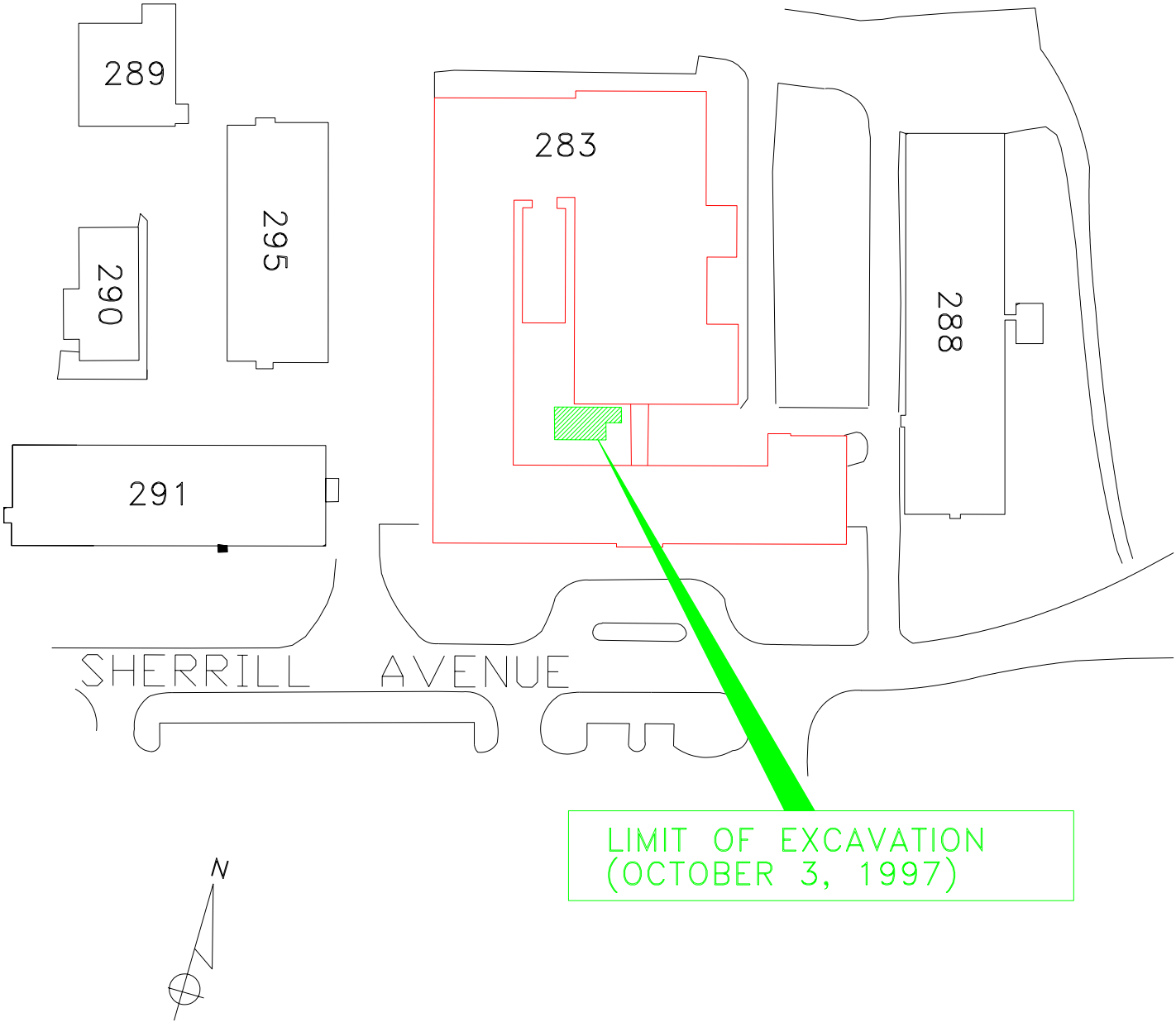
REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 2-3
MONITORING WELL LOCATION MAP
SITE 283 - MAIN POST
FORT MONMOUTH, NEW JERSEY

DRAWN BY: JM	DATE DRAWN: 02 JUL 01
CHECKED BY:	DATE CHECKED: 02 JUL 01
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIGURE 2-3
	FILE No.: 283 FIGURE 2-3
	SCALE: 1" = 60'
	SHEET 1 OF 1 REV.: A

Versar INC.
2558 PEARL BUCK ROAD, SUITE 1
BRISTOL, PA 19007
(215) 788-7844



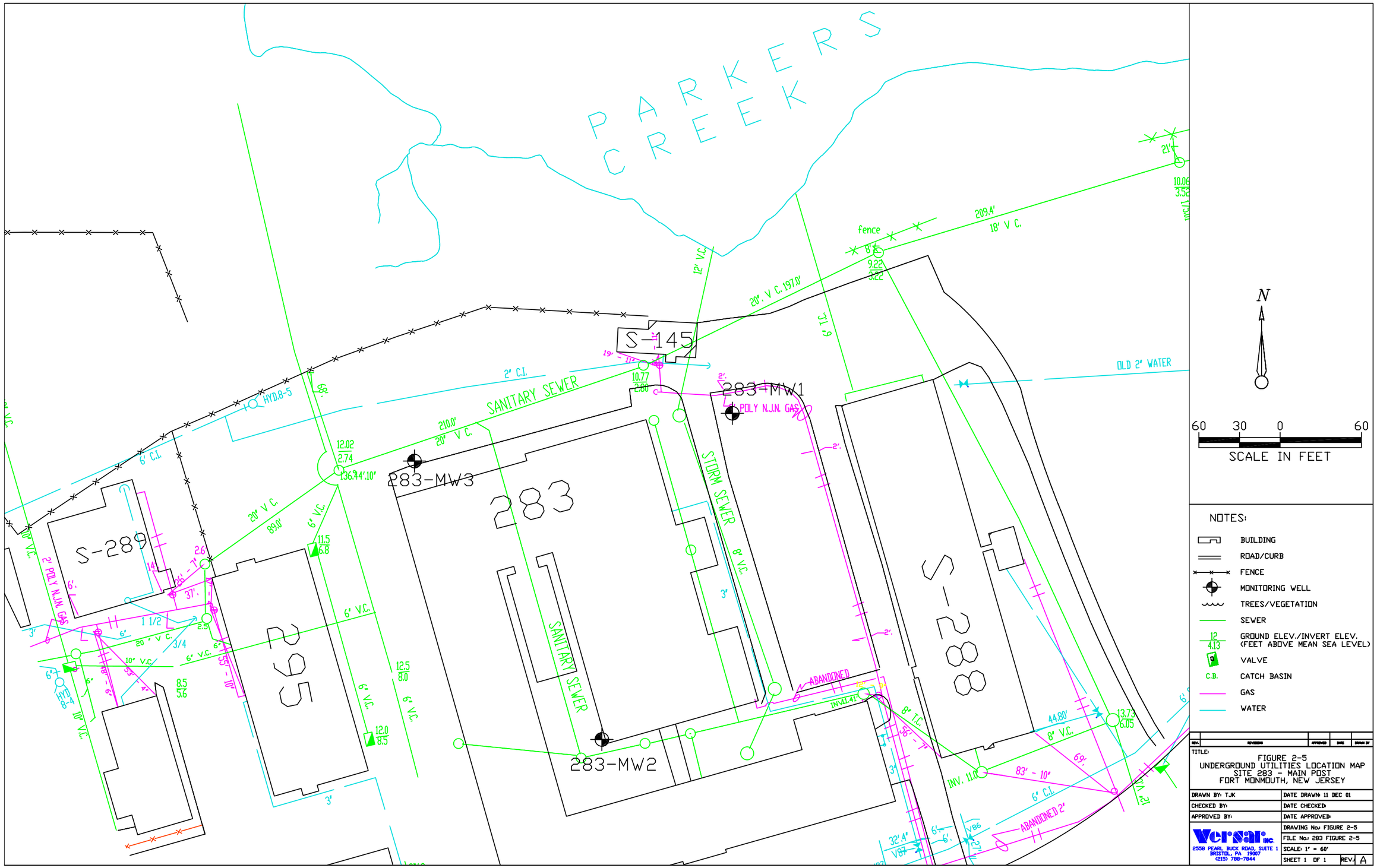
SOURCE: UNITED STATES ARMY – FORT MONMOUTH, NEW JERSEY, UNDERGROUND STORAGE TANK CLUSURE AND SITE INVESTIGATION REPORT BUILDING 283C, OCTOBER 2000

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:
FIGURE 2–4
SOIL EXCAVATION AREA DURING
UST CLOSURE
SITE 283 – MAIN POST
FORT MONMOUTH, NEW JERSEY

DRAWN BY: TJK	DATE DRAWN: 06 AUG 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: 283 FIG 2–4
	FILE No.: 283 FIG 2–4
	SCALE: 1" = 100'
	SHEET 1 OF 1 — REV.: A

Versar INC.
2558 PEARL BUCK ROAD, SUITE 1
BRISTOL, PA 19007
(215) 788–7844



NOTES:

- BUILDING
- ROAD/CURB
- FENCE
- MONITORING WELL
- TREES/VEGETATION
- SEWER
- 12 / 4.13 — GROUND ELEV./INVERT ELEV. (FEET ABOVE MEAN SEA LEVEL)
- VALVE
- C.B. — CATCH BASIN
- GAS
- WATER

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:
FIGURE 2-5
UNDERGROUND UTILITIES LOCATION MAP
SITE 283 - MAIN POST
FORT MONMOUTH, NEW JERSEY

DRAWN BY: TJK	DATE DRAWN: 11 DEC 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIGURE 2-5
	FILE No.: 283 FIGURE 2-5
	SCALE: 1" = 60'
	SHEET 1 OF 1 REV.: A

Versar, Inc.
2550 PEARL BUCK ROAD, SUITE 1
BRISTOL, PA 19007
(215) 788-7844

Geologic Map of New Jersey

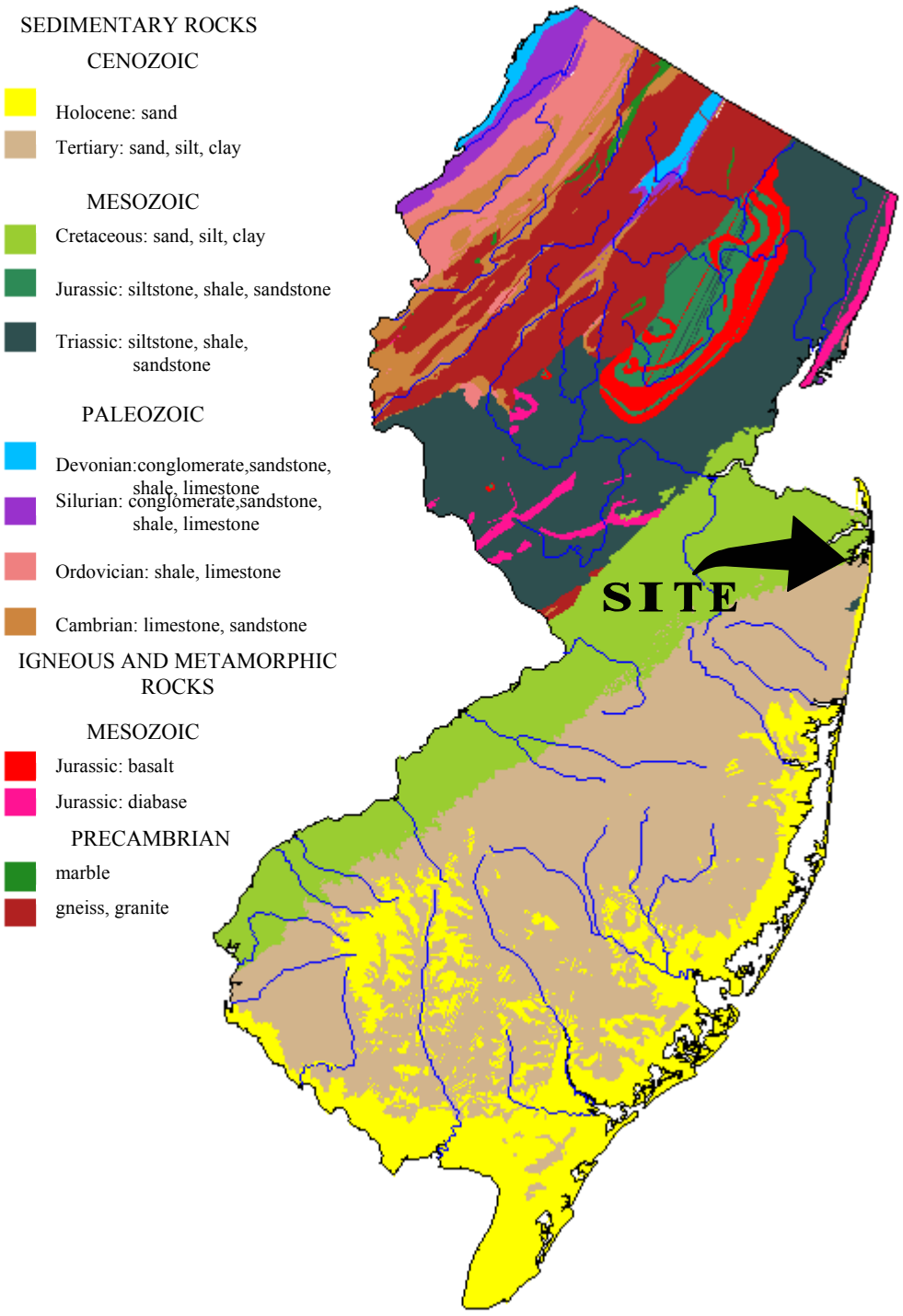
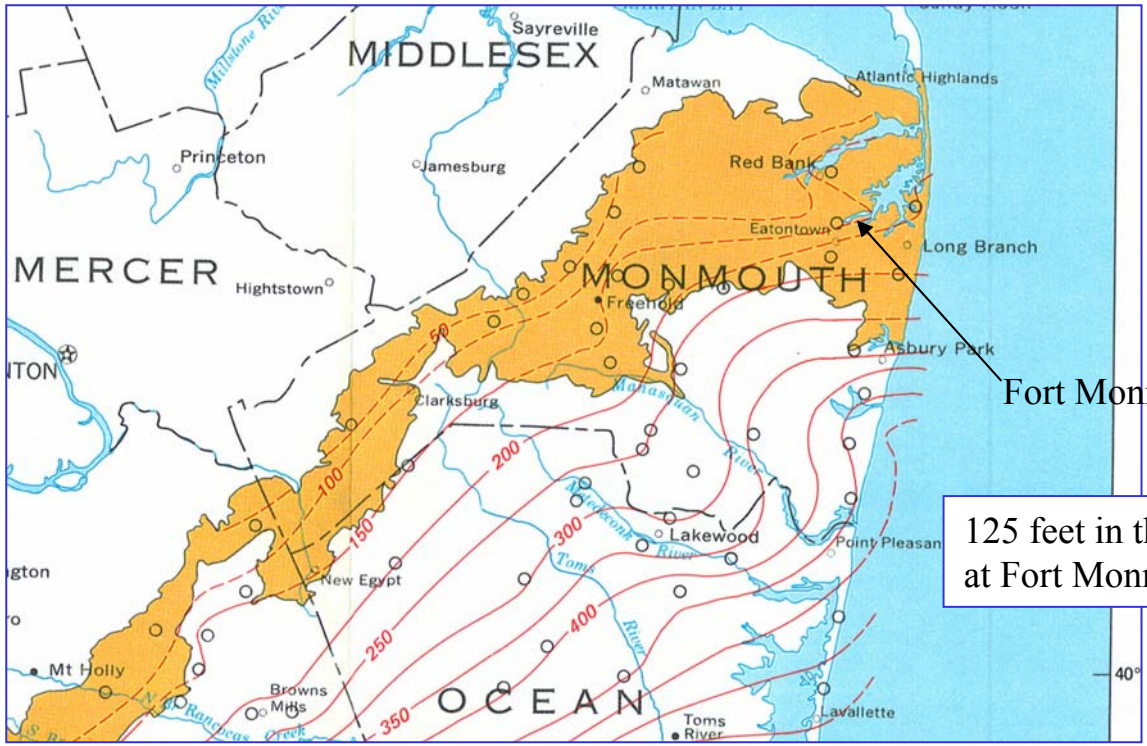


FIGURE 2-6
Geologic Map of New Jersey
Site 283 – Main Post
Fort Monmouth, New Jersey

Source: New Jersey Geologic Survey, 1994, *Geologic Map of New Jersey*.

Versar INC.
2558 Pearl Buck Road, Suite 1
Bristol, Pennsylvania, 19007
(215)-788-7844



125 feet in thickness at Fort Monmouth

EXPLANATION

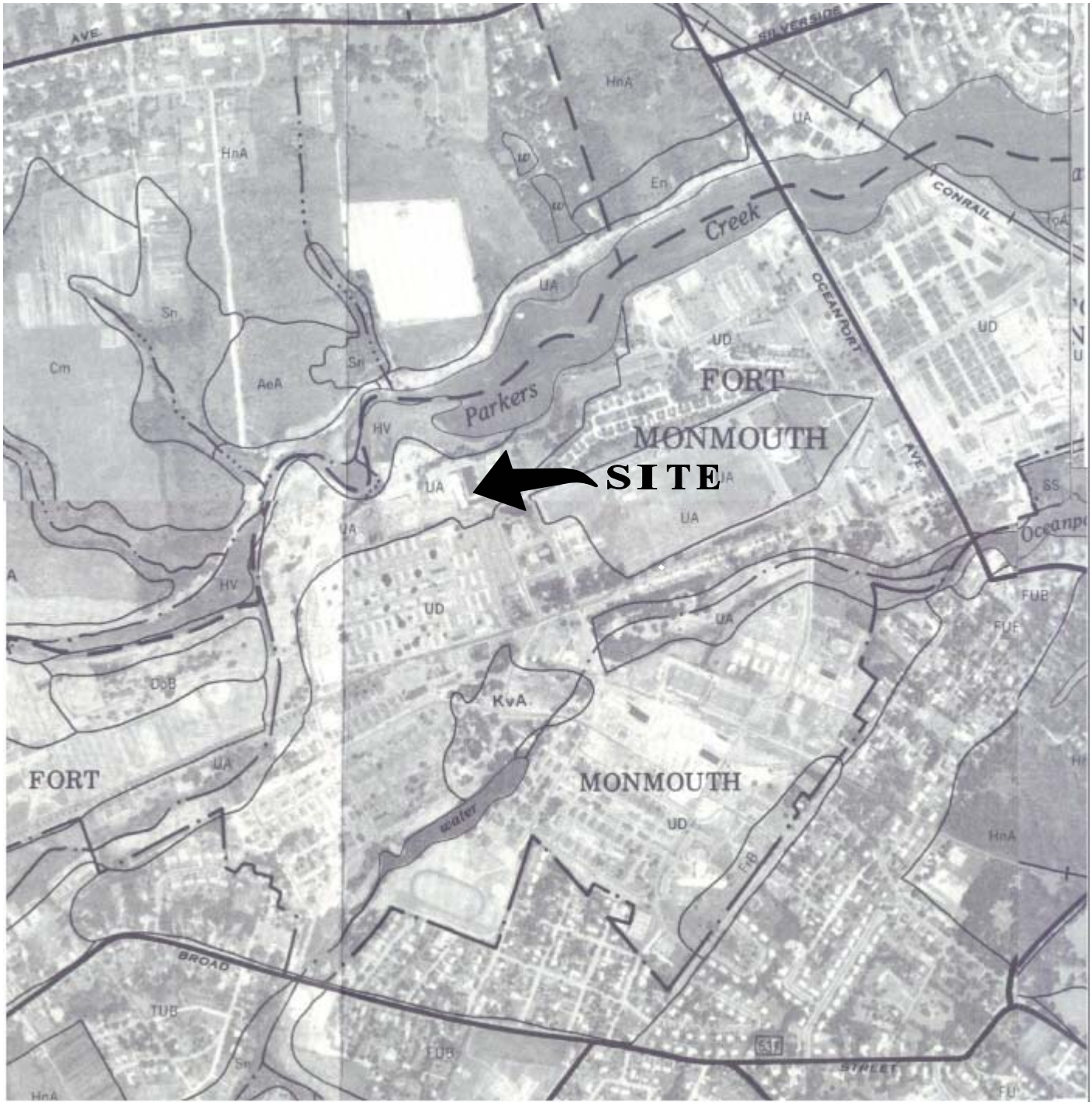
- Outcrop area of the Navesink Formation, Red Bank Sand, Tinton Sand, Hornerstown Sand, Vincentown Formation, and Manasquan Formation
- 600 — Line of equal thickness of the composite confining bed. Dashed where approximately located. Interval 50 feet
- Well location

Source: Zapecza, O. 1989. *Hydrogeologic Framework of the New Jersey Coastal Plain.* USGS Professional Paper 1404-B. U.S. Government Printing Office, Washington, DC.

FIGURE 2-7

Outcrop and Thickness of Composite Confining Unit
Site 283 – Main Post
Fort Monmouth, New Jersey

Versar INC.
2558 Pearl Buck Road, Suite 1
Bristol, PA 19007
(215) 788-7844



US Department of Agriculture
Soil Conservation Service
Soil Survey of Monmouth County, NJ
April 1989

Figure 2-8
Soil Map of Monmouth County
Site 283
Fort Monmouth, New Jersey

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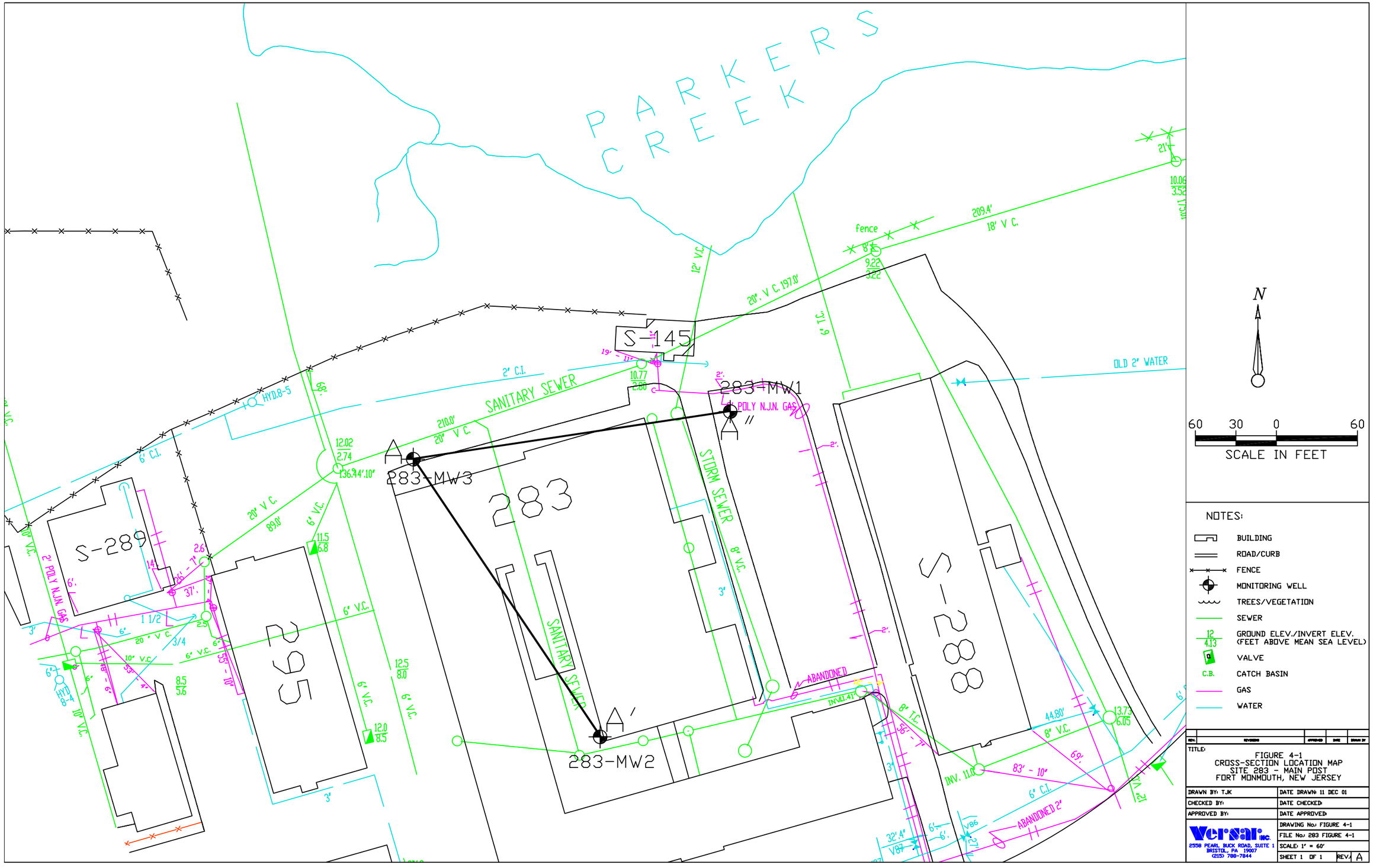

NOTES:

- BUILDING
- ROAD/CURB
- FENCE
- MONITORING WELL
- TREES/VEGETATION
- SEWER
- 12 / 4.13 — GROUND ELEV./INVERT ELEV. (FEET ABOVE MEAN SEA LEVEL)
- VALVE
- C.B. — CATCH BASIN
- GAS
- WATER

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 4-1
CROSS-SECTION LOCATION MAP
SITE 283 - MAIN POST
FORT MONMOUTH, NEW JERSEY

DRAWN BY: TJK	DATE DRAWN: 11 DEC 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIGURE 4-1
	FILE No.: 283 FIGURE 4-1
	SCALE: 1" = 60'
	SHEET 1 OF 1 REV.: A

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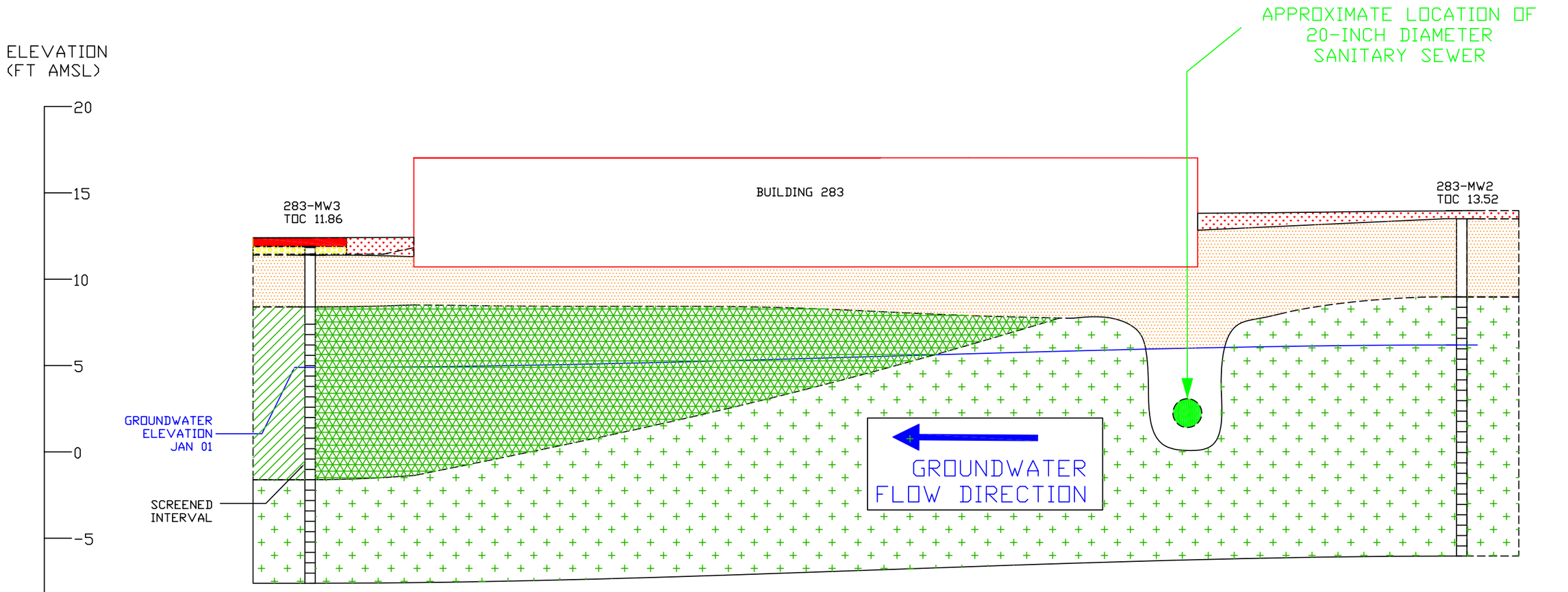

UNIT	SYMBOL	DESCRIPTION
(1)		ASPHALT
(2)		TOPSOIL
(3)		CINDERS, SLAP, COAL FRAGMENTS - FILL
(4)		BROWN COARSE MEDIUM FINE SAND SOME MEDIUM FINE GRAVEL
(5)		BROWN MEDIUM FINE SAND LITTLE SILT (FILL?)
(6)		BROWN-GREEN/BROWN MEDIUM FINE SAND AND SILTY CLAY
(7)		BROWN ORANGE/BROWN GREEN SILTY CLAY
(8)		GREEN SILTY CLAY, SOME BLACK FINE SAND

NOTES:

1) GEOLOGIC CROSS SECTION LINE A-A' IS SHOWN ON FIGURE 4-1.

2) VERTICAL SCALE: 1" = 6'.
HORIZONTAL SCALE: 1" = 20'.
VERTICAL EXAGGERATION = 3.33.

3) ELEV. = ELEVATION (FEET AMSL).

4) EACH OF THE WELLS HAS A DIAMETER OF 4 INCHES, WHICH IS ENLARGED ON THIS DRAWING FOR PRESENTATION.

5) BOUNDARIES ARE DASHED WHERE INFERRED.

6) THE SIZE OF THE UNDERGROUND UTILITY PIPES IS PORTRAYED IN THE VERTICAL SCALE (1"=6')

REV.	REVISIONS	APPROVED	DRAWN BY

TITLE:
FIGURE 4-2
GEOLOGIC CROSS SECTION A-A'
SITE 283 - MAIN POST
FORT MONMOUTH, NEW JERSEY

DRAWN BY: PS/TJK	DATE DRAWN: 10 AUG 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIGURE 4-2
	FILE No.: 283 FIG 4-2
	SCALE: 1" = 20' (VERT:1"=3')
	SHEET 1 OF 1 REV.: A

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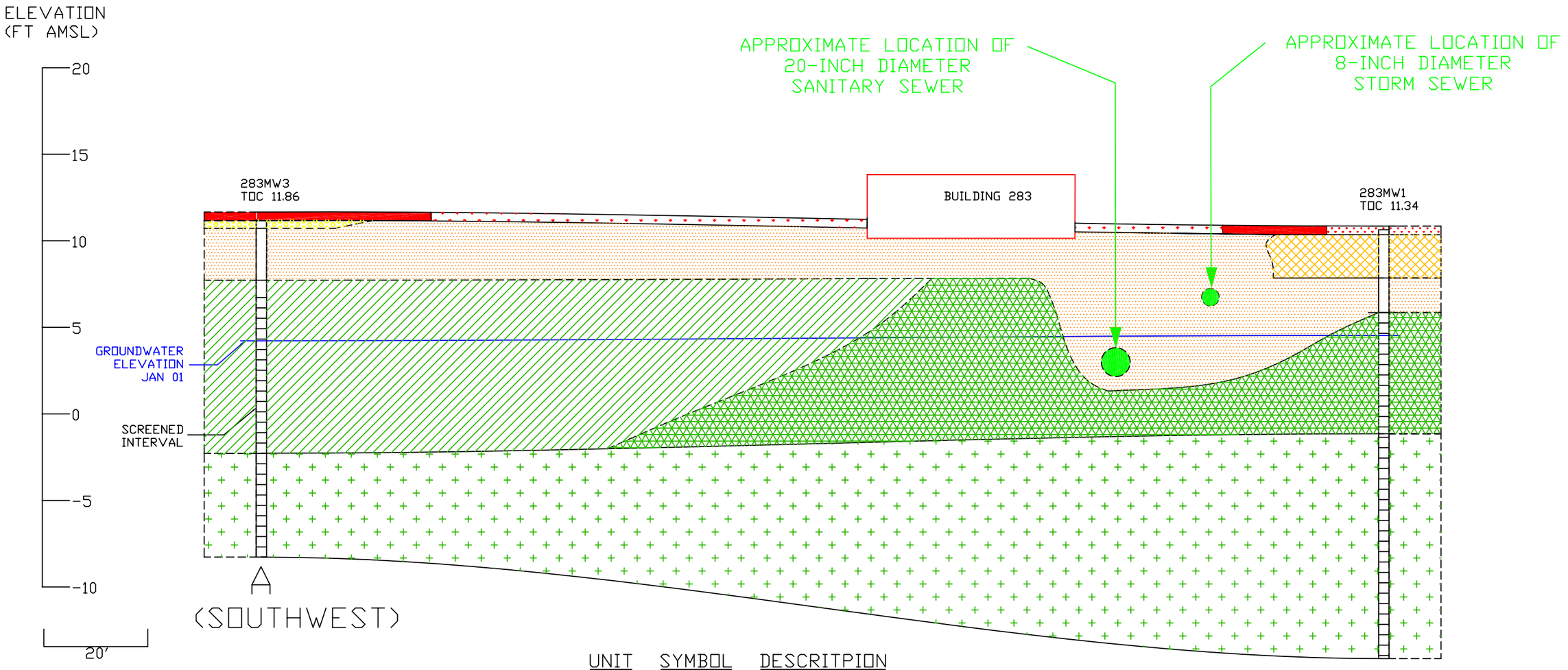

UNIT	SYMBOL	DESCRIPTION
(1)		ASPHALT
(2)		TOPSOIL
(3)		CINDERS, SLAP, COAL FRAGMENTS - FILL
(4)		BROWN COARSE MEDIUM FINE SAND SOME MEDIUM FINE GRAVEL
(5)		BROWN MEDIUM FINE SAND LITTLE SILT (FILL?)
(6)		BROWN-GREEN/BROWN MEDIUM FINE SAND AND SILTY CLAY
(7)		BROWN ORANGE/BROWN GREEN SILTY CLAY
(8)		GREEN SILTY CLAY, SOME BLACK FINE SAND

NOTES:

1) GEOLOGIC CROSS SECTION LINE A-A' IS SHOWN ON FIGURE 4-1.

2) VERTICAL SCALE: 1" = 6'.
HORIZONTAL SCALE: 1" = 20'.
VERTICAL EXAGGERATION = 3.33.

3) ELEV. = ELEVATION (FEET AMSL).

4) EACH OF THE WELLS HAS A DIAMETER OF 4 INCHES, WHICH IS ENLARGED ON THIS DRAWING FOR PRESENTATION.

5) BOUNDARIES ARE DASHED WHERE INFERRED.

6) THE SIZE OF THE UNDERGROUND UTILITY PIPES IS PORTRAYED IN THE VERTICAL SCALE (1"=6')

REV.	REVISIONS	APPROVED	DRAWN BY

TITLE:

FIGURE 4-3
GEOLOGIC CROSS SECTION A-A''
SITE 283- MAIN POST
FORT MONMOUTH, NEW JERSEY

DRAWN BY: PS/TJK	DATE DRAWN: 10 AUG 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIGURE 4-3
	FILE No.: 283 FIG. 4-3
	SCALE: 1" = 20' (VERT:1"=3')
	SHEET 1 OF 1 REV.: A

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PARKERS CREEK

PARKERS CREEK

HEAD WALL

296-MW4
MP18-MW24
MP18-MW25
0296-MW5
296-MW6
296-MW7
296-MW8
290-MW2
290-MW1
296-MW2
296-MW1
283-MW1
283-MW3
283-MW2

S-145
S-289
S-288
T-294
T-290
293
292
291
296
283
255

SHERRILL AVENUE

N

100 50 0 100
SCALE IN FEET

NOTES:

- BUILDING
- ROAD/CURB
- RAILROAD
- BROOK/CREEK
- MARSHY AREA
- WOODED AREA
- FENCE
- SITE 283 MONITORING WELL
- M18 LANDFILL SITE MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
- APPROXIMATE GROUNDWATER FLOW DIRECTION

ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:
FIGURE 4-4a
GROUNDWATER COUNTOUR MAP (28 JUN 00)
SITE 283
FORT MONMOUTH, NEW JERSEY

DRAWN BY: TJK	DATE DRAWN: 31 AUG 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIGURE 4-4a
	FILE No.: 283 FIGURE 4-4a
	SCALE: 1" = 100'
	SHEET 1 OF 1 REV.: A

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PARKERS CREEK

PARKERS CREEK

HEAD WALL

296-MW4

MP18-MW24

MP18-MW25

0296-MW3

296-MW6

296-MW7

296-MW8

290-MW2

290-MW1

296-MW2

296-MW1

283-MW3

283-MW1

283-MW2

S-145

S-289

S-288

T-294

T-290

293

292

291

296

283

295

3

3.5

SHERRILL AVENUE

N

100 50 0 100

SCALE IN FEET

NOTES:

- BUILDING
- ROAD/CURB
- RAILROAD
- BROOK/CREEK
- MARSHY AREA
- WOODED AREA
- FENCE
- SITE 283 MONITORING WELL
- M18 LANDFILL SITE MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
- APPROXIMATE GROUNDWATER FLOW DIRECTION

ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 4-4b
GROUNDWATER COUNTOUR MAP (10 AUG 00)
SITE 283
FORT MONMOUTH, NEW JERSEY

DRAWN BY: TJK	DATE DRAWN: 31 AUG 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIGURE 4-4b
	FILE No.: 283 FIGURE 4-4b
	SCALE: 1" = 100'
	SHEET 1 OF 1 REV.: A

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PARKERS CREEK

PARKERS CREEK

HEAD WALL

296-MW4

MP18-MW24

MP18-MW25

0296-MW3

296-MW6

296-MW7

296-MW8

290-MW2

290-MW1

296-MW2

296-MW1

283-MW1

283-MW3

283-MW2

S-145

S-289

T-294

293

T-290

S-69

283

S-288

292

291

296

SHERRILL AVENUE

N

100 50 0 100

SCALE IN FEET

NOTES:

- BUILDING
- ROAD/CURB
- RAILROAD
- BROOK/CREEK
- MARSHY AREA
- WOODED AREA
- FENCE
- SITE 283 MONITORING WELL
- M18 LANDFILL SITE MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
- APPROXIMATE GROUNDWATER FLOW DIRECTION

ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 4-4c
GROUNDWATER COUNTOUR MAP (17 OCT 00)
SITE 283
FORT MONMOUTH, NEW JERSEY

DRAWN BY: TJK	DATE DRAWN: 31 AUG 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIGURE 4-4c
	FILE No.: 283 FIGURE 4-4c
	SCALE: 1" = 100'
	SHEET 1 OF 1 REV.: A

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PARKERS CREEK

PARKERS CREEK

HEAD WALL

MP18-MW24

MP18-MW25

296-MW4

0296-MW3

296-MW6

296-MW7

296-MW8

290-MW2

290-MW1

296-MW2

296-MW1

283-MW1

283-MW3

283-MW2

S-145

S-289

S-288

T-294

T-290

293

292

291

296

256

283

SHERRILL AVENUE

N

100 50 0 100

SCALE IN FEET

NOTES:

- BUILDING
- ROAD/CURB
- RAILROAD
- BROOK/CREEK
- MARSHY AREA
- WOODED AREA
- FENCE
- SITE 283 MONITORING WELL
- M18 LANDFILL SITE MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
- APPROXIMATE GROUNDWATER FLOW DIRECTION

ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 4-4d
GROUNDWATER COUNTOUR MAP (5 JAN 01)
SITE 283
FORT MONMOUTH, NEW JERSEY

DRAWN BY: TJK	DATE DRAWN: 31 AUG 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIGURE 4-4d
	FILE No.: 283 FIGURE 4-4d
	SCALE: 1" = 100'
	SHEET 1 OF 1 REV.: A

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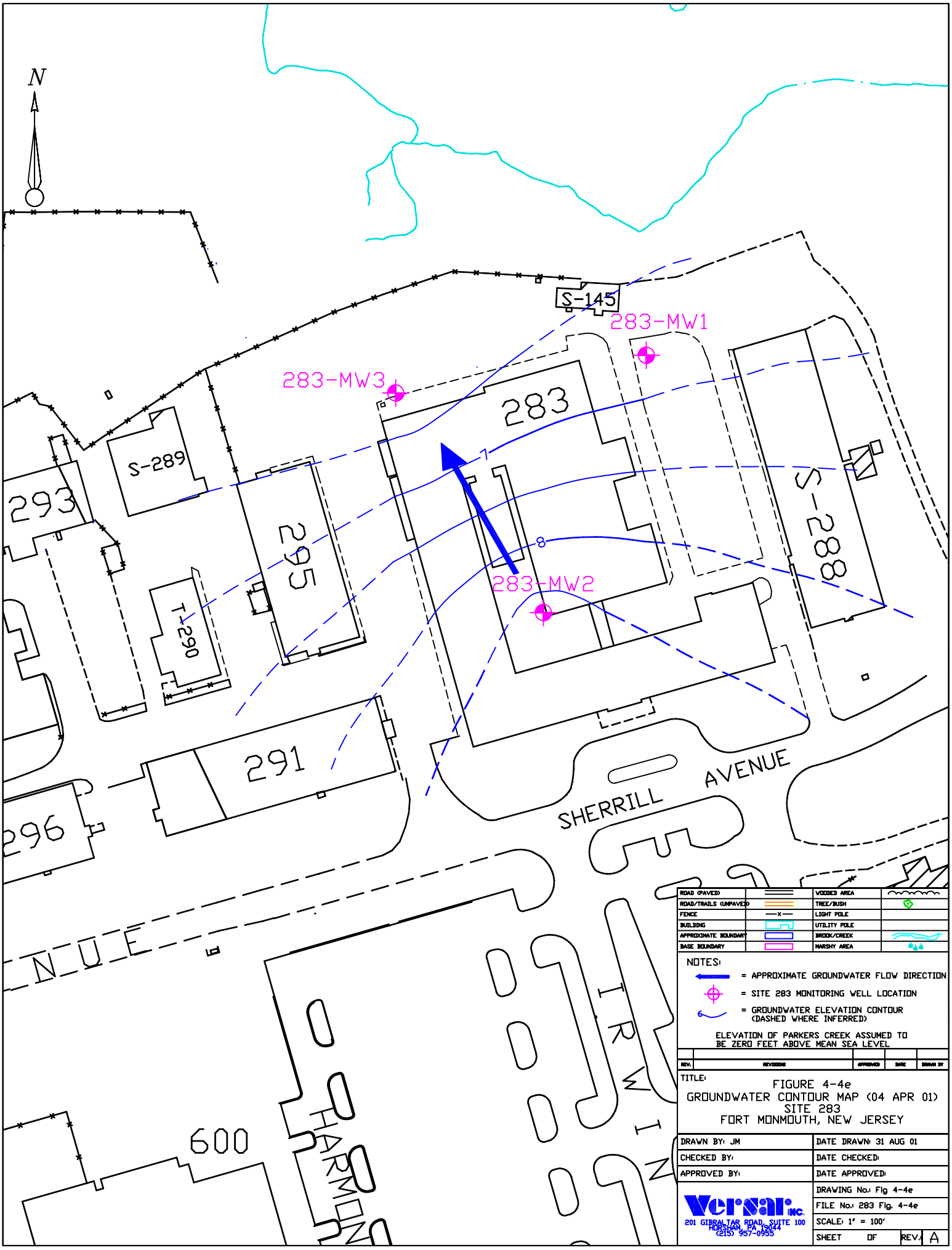
N
S-145
283-MW1
283-MW3
283
S-289
293
S-288
S-290
283-MW2
291
SHERRILL AVENUE
296
600
ROAD (PAVED)
ROAD/TRAILS (UNPAVED)
FENCE
BUILDING
APPROXIMATE BOUNDARY
BASE BOUNDARY
WOODED AREA
TREE/BUSH
LIGHT POLE
UTILITY POLE
BROOK/CREEK
MARSHY AREA
NOTES:
= APPROXIMATE GROUNDWATER FLOW DIRECTION
= SITE 283 MONITORING WELL LOCATION
= GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL
REV. REVISIONS APPROVED DATE DRAWN BY
TITLE:
FIGURE 4-4e
GROUNDWATER CONTOUR MAP (04 APR 01)
SITE 283
FORT MONMOUTH, NEW JERSEY
DRAWN BY: JM
DATE DRAWN: 31 AUG 01
CHECKED BY:
DATE CHECKED:
APPROVED BY:
DATE APPROVED:
DRAWING No.: Fig 4-4e
FILE No.: 283 Fig. 4-4e
SCALE: 1" = 100'
SHEET OF REV.: A
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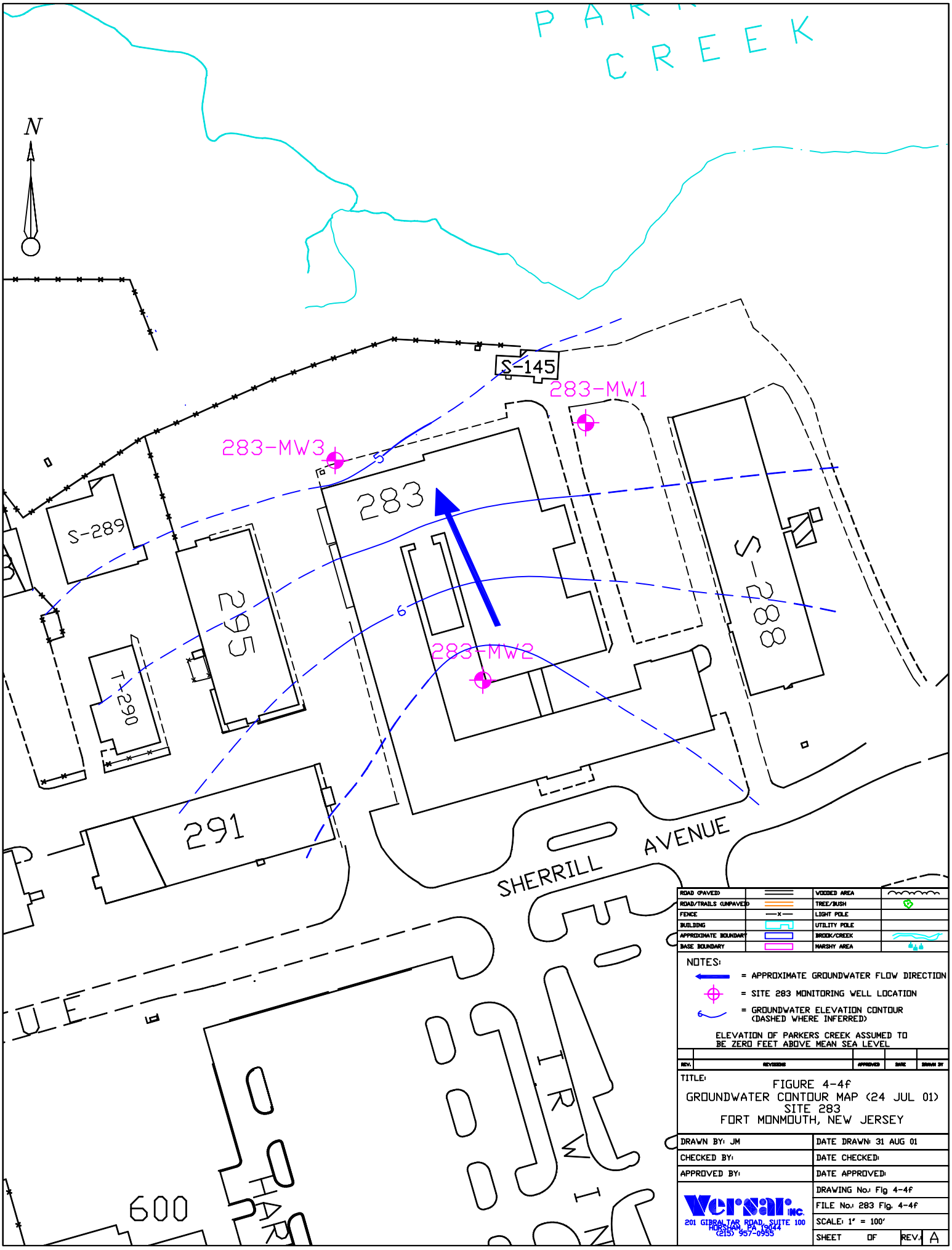

ROAD (PAVED)		WOODED AREA	
ROAD/TRAILS (UNPAVED)		TREE/BUSH	
FENCE	—x—	LIGHT POLE	
BUILDING		UTILITY POLE	
APPROXIMATE BOUNDARY		BROOK/CREEK	
BASE BOUNDARY		MARSHY AREA	

NOTES:

= APPROXIMATE GROUNDWATER FLOW DIRECTION

= SITE 283 MONITORING WELL LOCATION

= GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)

ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 4-4f
GROUNDWATER CONTOUR MAP (24 JUL 01)
SITE 283
FORT MONMOUTH, NEW JERSEY

DRAWN BY: JM	DATE DRAWN: 31 AUG 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: Fig 4-4f
	FILE No.: 283 Fig. 4-4f
	SCALE: 1" = 100'
	SHEET OF REV.: A

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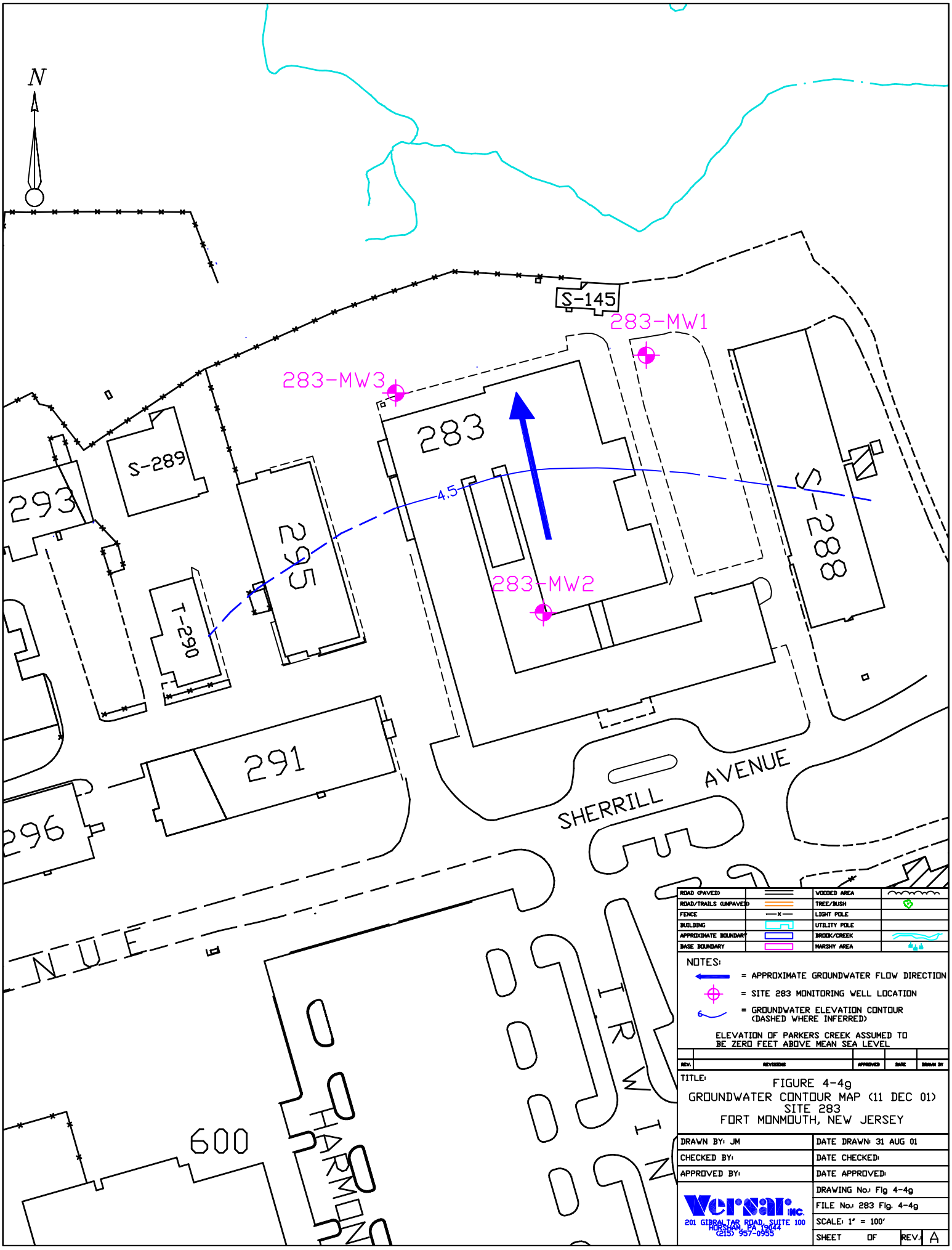

ROAD (PAVED)		WOODED AREA	
ROAD/TRAILS (UNPAVED)		TREE/BUSH	
FENCE	—x—	LIGHT POLE	
BUILDING		UTILITY POLE	
APPROXIMATE BOUNDARY		BROOK/CREEK	
BASE BOUNDARY		MARSHY AREA	

NOTES:

= APPROXIMATE GROUNDWATER FLOW DIRECTION

= SITE 283 MONITORING WELL LOCATION

= GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)

ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 4-4g
GROUNDWATER CONTOUR MAP (11 DEC 01)
SITE 283
FORT MONMOUTH, NEW JERSEY

DRAWN BY: JM	DATE DRAWN: 31 AUG 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: Fig 4-4g
	FILE No.: 283 Fig. 4-4g
	SCALE: 1" = 100'
	SHEET OF REV.: A

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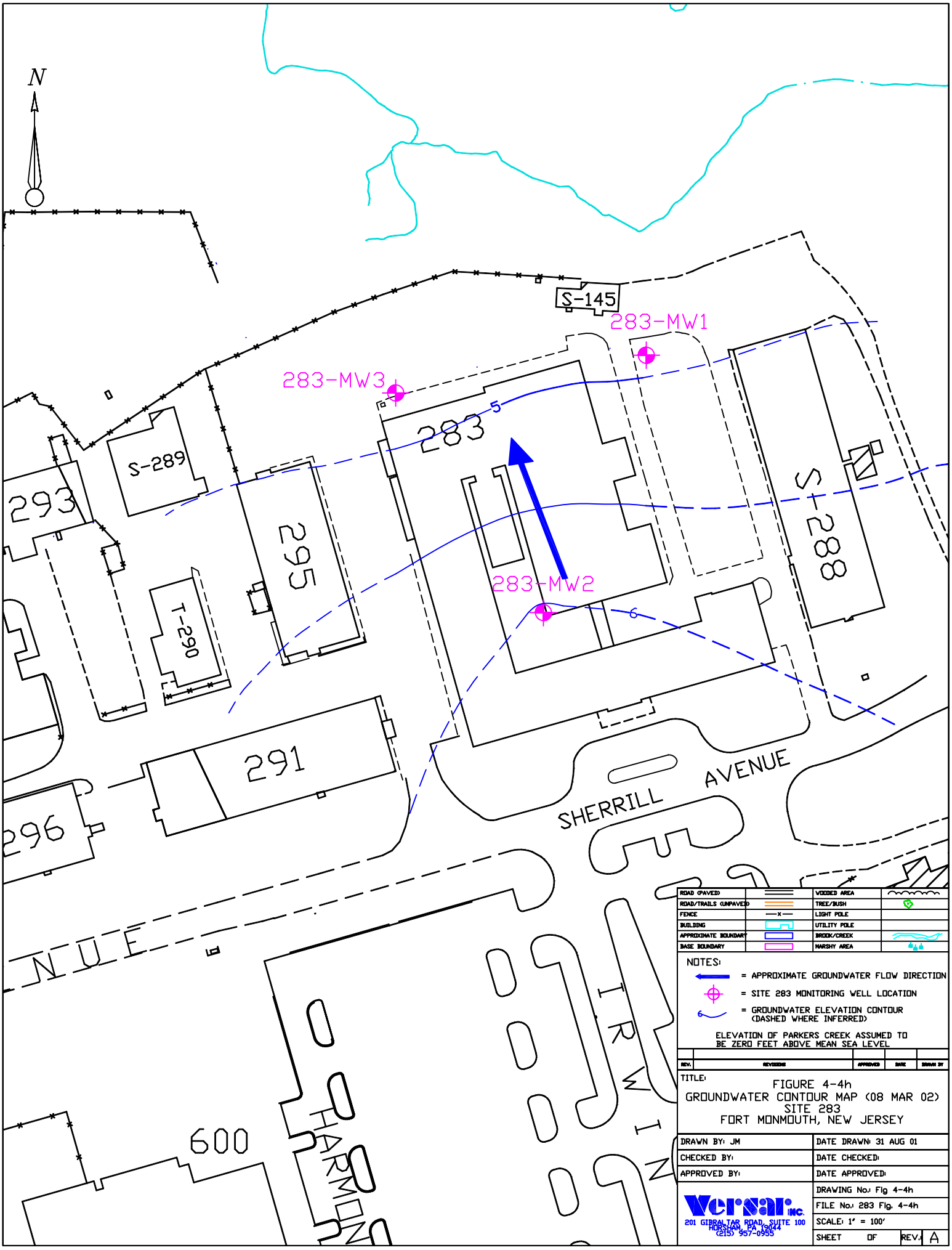

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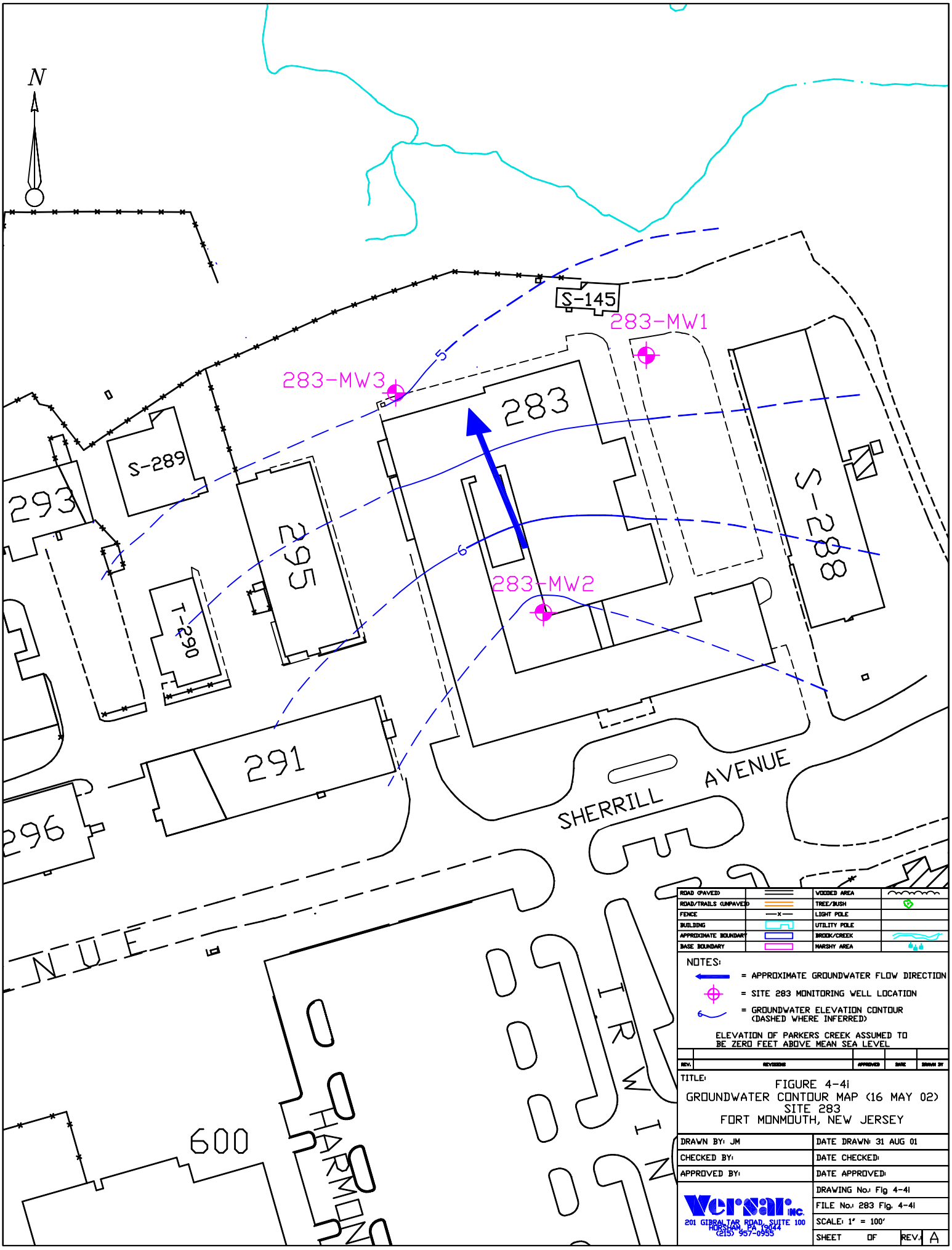
N
S-145
283-MW1
283-MW3
283
S-289
293
295
T-290
283-MW2
S-288
291
296
SHERRILL AVENUE
600
ROAD (PAVED)
ROAD/TRAILS (UNPAVED)
FENCE
BUILDING
APPROXIMATE BOUNDARY
BASE BOUNDARY
WOODED AREA
TREE/BUSH
LIGHT POLE
UTILITY POLE
BROOK/CREEK
MARSHY AREA
NOTES:
= APPROXIMATE GROUNDWATER FLOW DIRECTION
= SITE 283 MONITORING WELL LOCATION
= GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL
REV.
REVISIONS
APPROVED
DATE
DRAWN BY
TITLE:
FIGURE 4-4I
GROUNDWATER CONTOUR MAP (16 MAY 02)
SITE 283
FORT MONMOUTH, NEW JERSEY
DRAWN BY: JM
DATE DRAWN: 31 AUG 01
CHECKED BY:
DATE CHECKED:
APPROVED BY:
DATE APPROVED:
DRAWING No.: Fig 4-4I
FILE No.: 283 Fig. 4-4I
SCALE: 1" = 100'
SHEET OF
REV.: A
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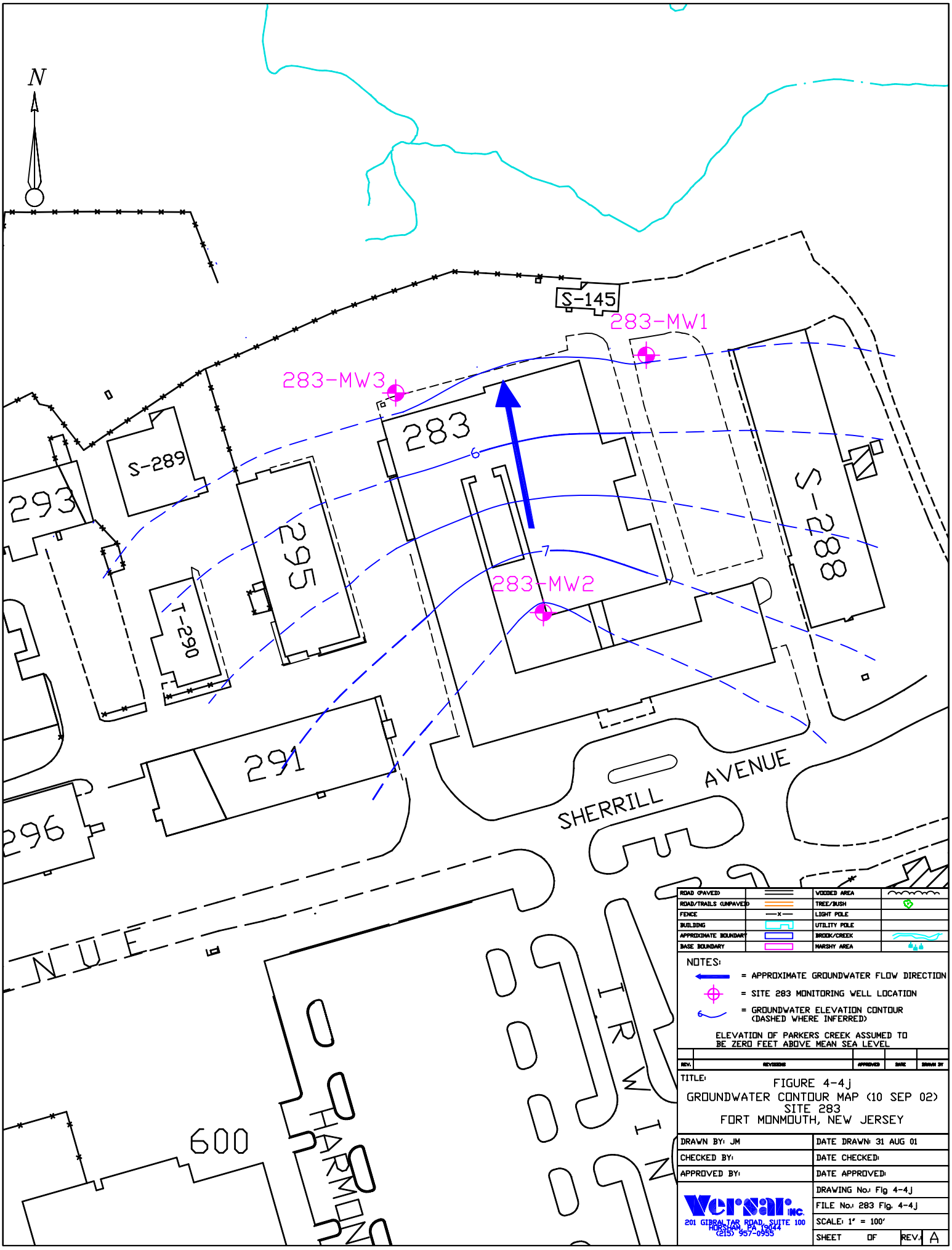

ROAD (PAVED)		WOODED AREA	
ROAD/TRAILS (UNPAVED)		TREE/BUSH	
FENCE	—x—	LIGHT POLE	
BUILDING		UTILITY POLE	
APPROXIMATE BOUNDARY		BROOK/CREEK	
BASE BOUNDARY		MARSHY AREA	

NOTES:

= APPROXIMATE GROUNDWATER FLOW DIRECTION

= SITE 283 MONITORING WELL LOCATION

= GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)

ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 4-4j
GROUNDWATER CONTOUR MAP (10 SEP 02)
SITE 283
FORT MONMOUTH, NEW JERSEY

DRAWN BY: JM	DATE DRAWN: 31 AUG 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: Fig 4-4j
	FILE No.: 283 Fig. 4-4j
	SCALE: 1" = 100'
	SHEET OF REV.: A

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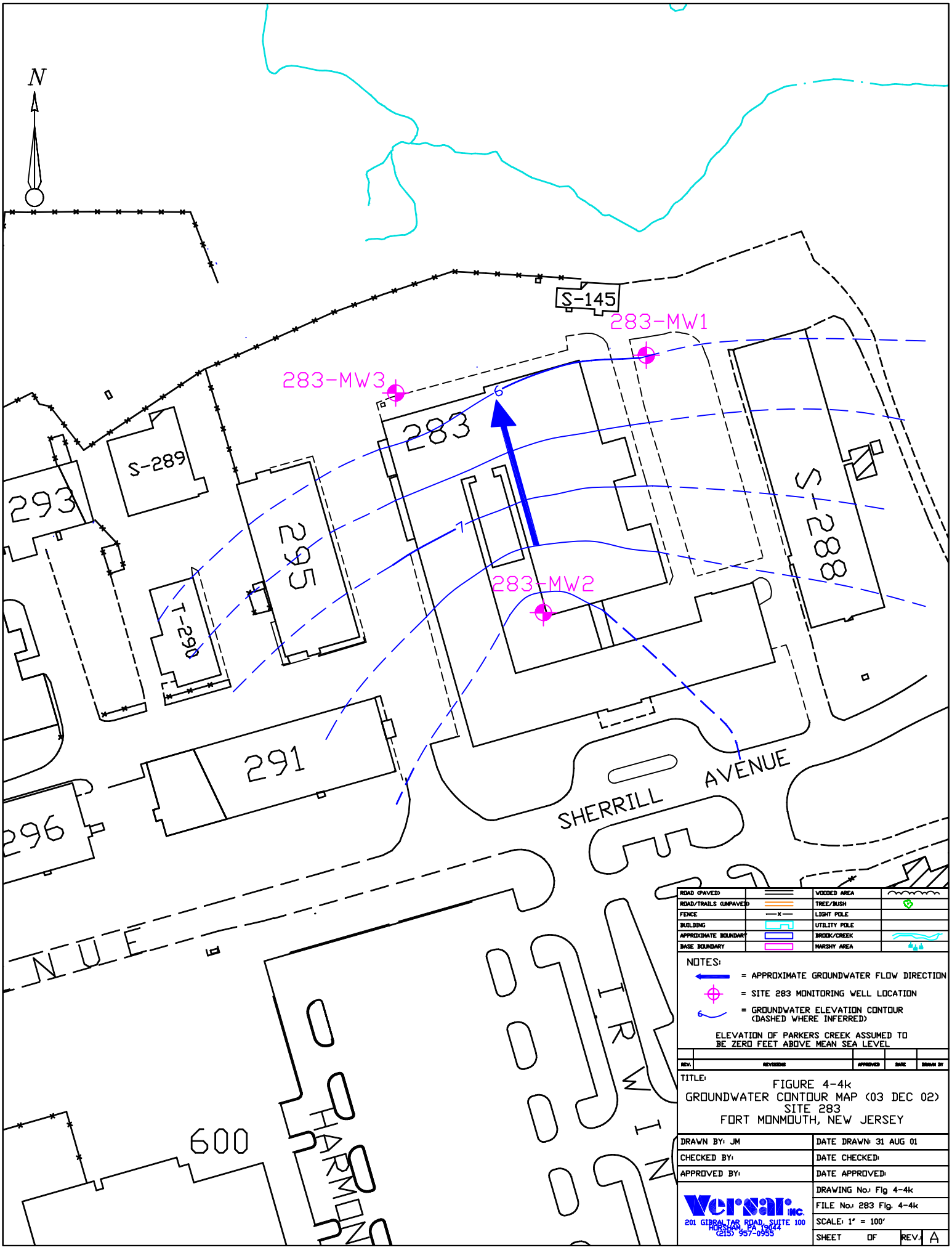
N
S-145
283-MW1
283-MW3
283-MW2
283
S-289
293
295
T-290
291
296
S-288
SHERRILL AVENUE
600
ROAD (PAVED)
ROAD/TRAILS (UNPAVED)
FENCE
BUILDING
APPROXIMATE BOUNDARY
BASE BOUNDARY
WOODED AREA
TREE/BUSH
LIGHT POLE
UTILITY POLE
BROOK/CREEK
MARSHY AREA
NOTES:
= APPROXIMATE GROUNDWATER FLOW DIRECTION
= SITE 283 MONITORING WELL LOCATION
= GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL
REV.
REVISIONS
APPROVED
DATE
DRAWN BY
TITLE:
FIGURE 4-4k
GROUNDWATER CONTOUR MAP (03 DEC 02)
SITE 283
FORT MONMOUTH, NEW JERSEY
DRAWN BY: JM
DATE DRAWN: 31 AUG 01
CHECKED BY:
DATE CHECKED:
APPROVED BY:
DATE APPROVED:
DRAWING No.: Fig 4-4k
FILE No.: 283 Fig. 4-4k
SCALE: 1" = 100'
SHEET OF
REV.: A
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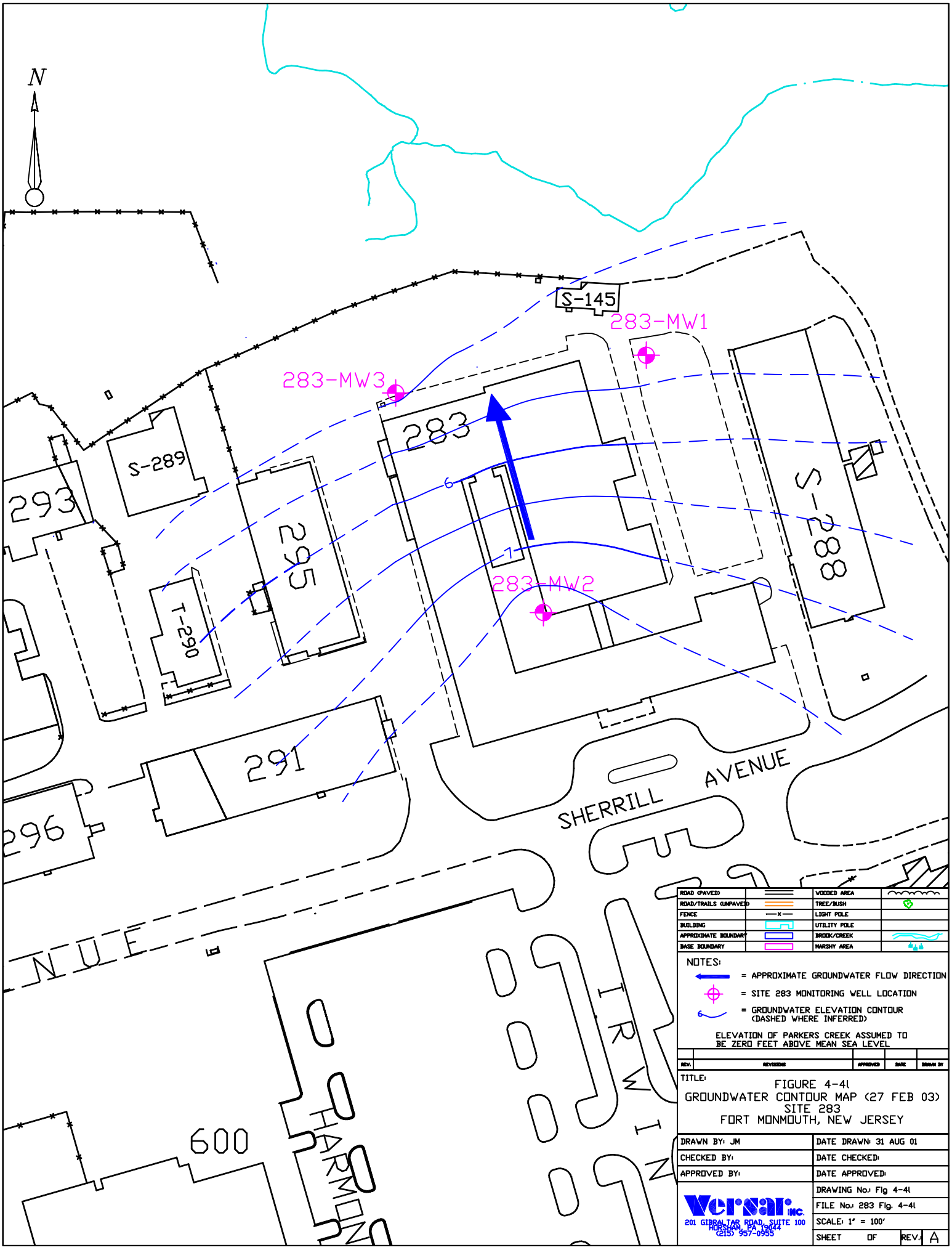

ROAD (PAVED)		WOODED AREA	
ROAD/TRAILS (UNPAVED)		TREE/BUSH	
FENCE	—x—	LIGHT POLE	
BUILDING		UTILITY POLE	
APPROXIMATE BOUNDARY		BROOK/CREEK	
BASE BOUNDARY		MARSHY AREA	

NOTES:

= APPROXIMATE GROUNDWATER FLOW DIRECTION

= SITE 283 MONITORING WELL LOCATION

= GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)

ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 4-4l
GROUNDWATER CONTOUR MAP (27 FEB 03)
SITE 283
FORT MONMOUTH, NEW JERSEY

DRAWN BY: JM	DATE DRAWN: 31 AUG 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: Fig 4-4l
	FILE No.: 283 Fig. 4-4l
	SCALE: 1" = 100'
	SHEET OF REV.: A

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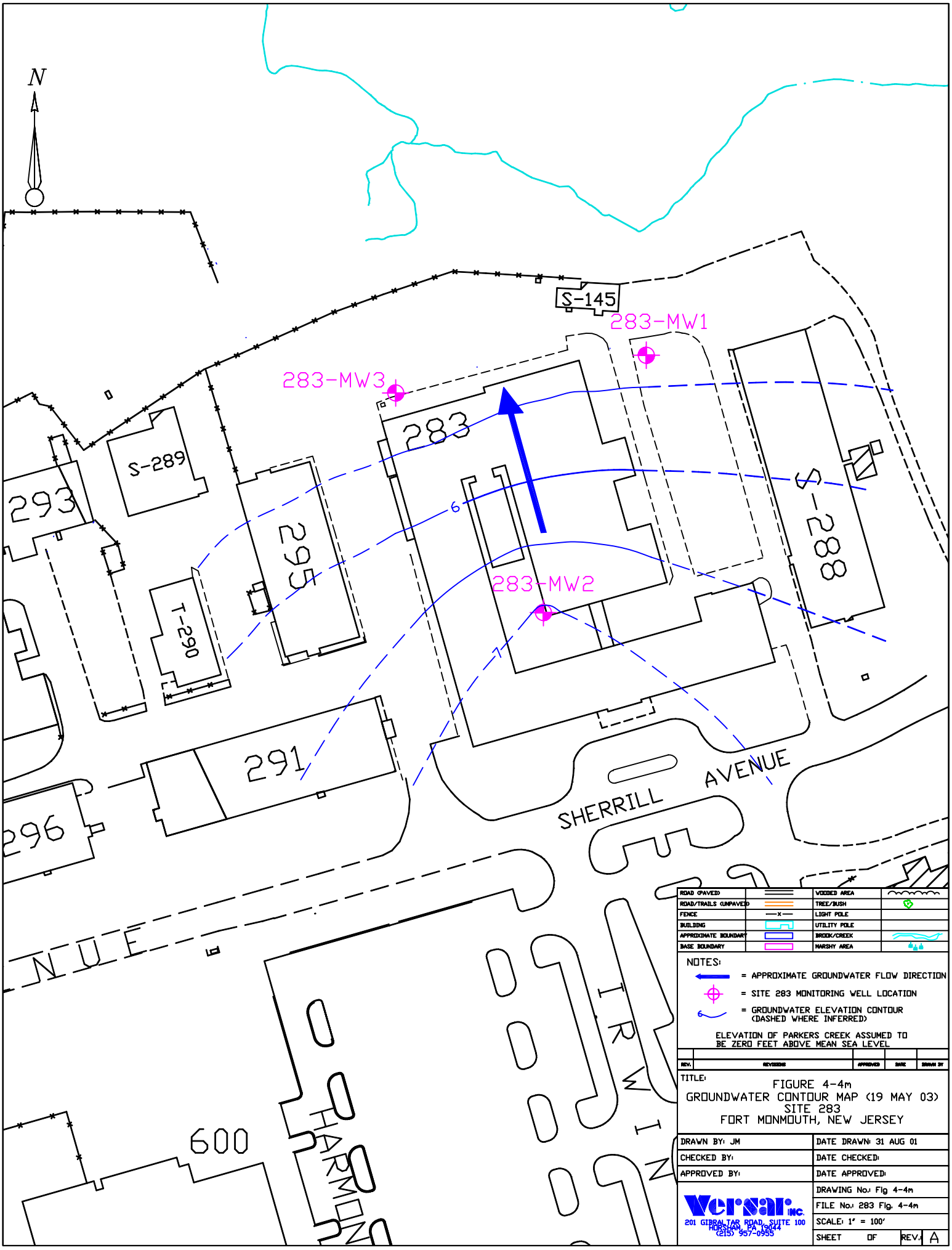

ROAD (PAVED)		WOODED AREA	
ROAD/TRAILS (UNPAVED)		TREE/BUSH	
FENCE	—x—	LIGHT POLE	
BUILDING		UTILITY POLE	
APPROXIMATE BOUNDARY		BROOK/CREEK	
BASE BOUNDARY		MARSHY AREA	

NOTES:

= APPROXIMATE GROUNDWATER FLOW DIRECTION

= SITE 283 MONITORING WELL LOCATION

= GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)

ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 4-4m
GROUNDWATER CONTOUR MAP (19 MAY 03)
SITE 283
FORT MONMOUTH, NEW JERSEY

DRAWN BY: JM	DATE DRAWN: 31 AUG 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: Fig 4-4m
	FILE No.: 283 Fig. 4-4m
	SCALE: 1" = 100'
	SHEET OF REV.: A

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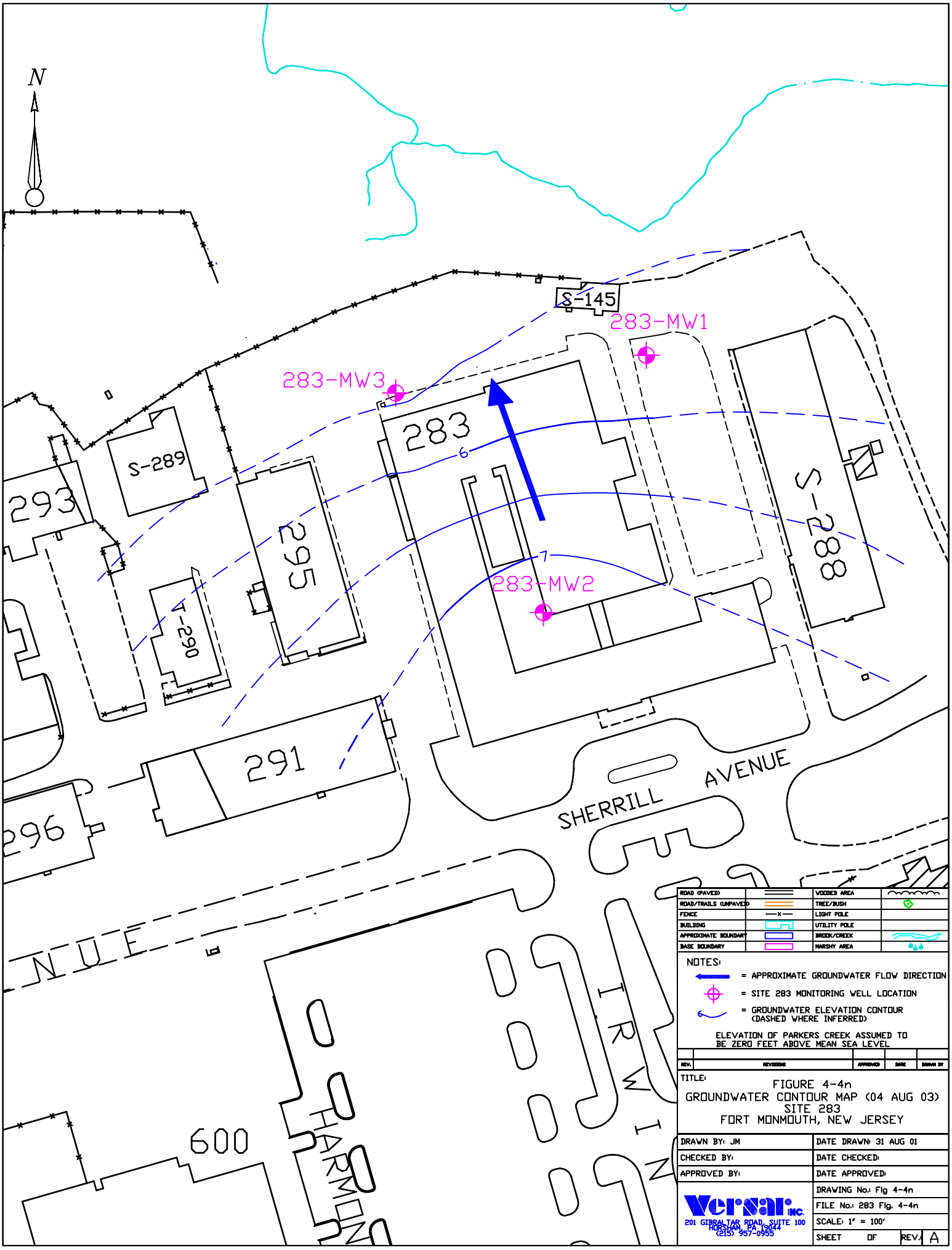
N
S-145
283-MW1
283-MW3
283
6
S-289
293
295
S-290
283-MW2
7
S-288
291
296
SHERRILL AVENUE
600
ROAD (PAVED)
ROAD/TRAILS (UNPAVED)
FENCE
BUILDING
APPROXIMATE BOUNDARY
BASE BOUNDARY
WOODED AREA
TREE/BUSH
LIGHT POLE
UTILITY POLE
BROOK/CREEK
MARSHY AREA
NOTES:
= APPROXIMATE GROUNDWATER FLOW DIRECTION
= SITE 283 MONITORING WELL LOCATION
= GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL
REV. REVISIONS APPROVED DATE DRAWN BY
TITLE:
FIGURE 4-4n
GROUNDWATER CONTOUR MAP (04 AUG 03)
SITE 283
FORT MONMOUTH, NEW JERSEY
DRAWN BY: JM
DATE DRAWN: 31 AUG 01
CHECKED BY:
DATE CHECKED:
APPROVED BY:
DATE APPROVED:
DRAWING No.: Fig 4-4n
FILE No.: 283 Fig. 4-4n
SCALE: 1" = 100'
SHEET OF REV.: A
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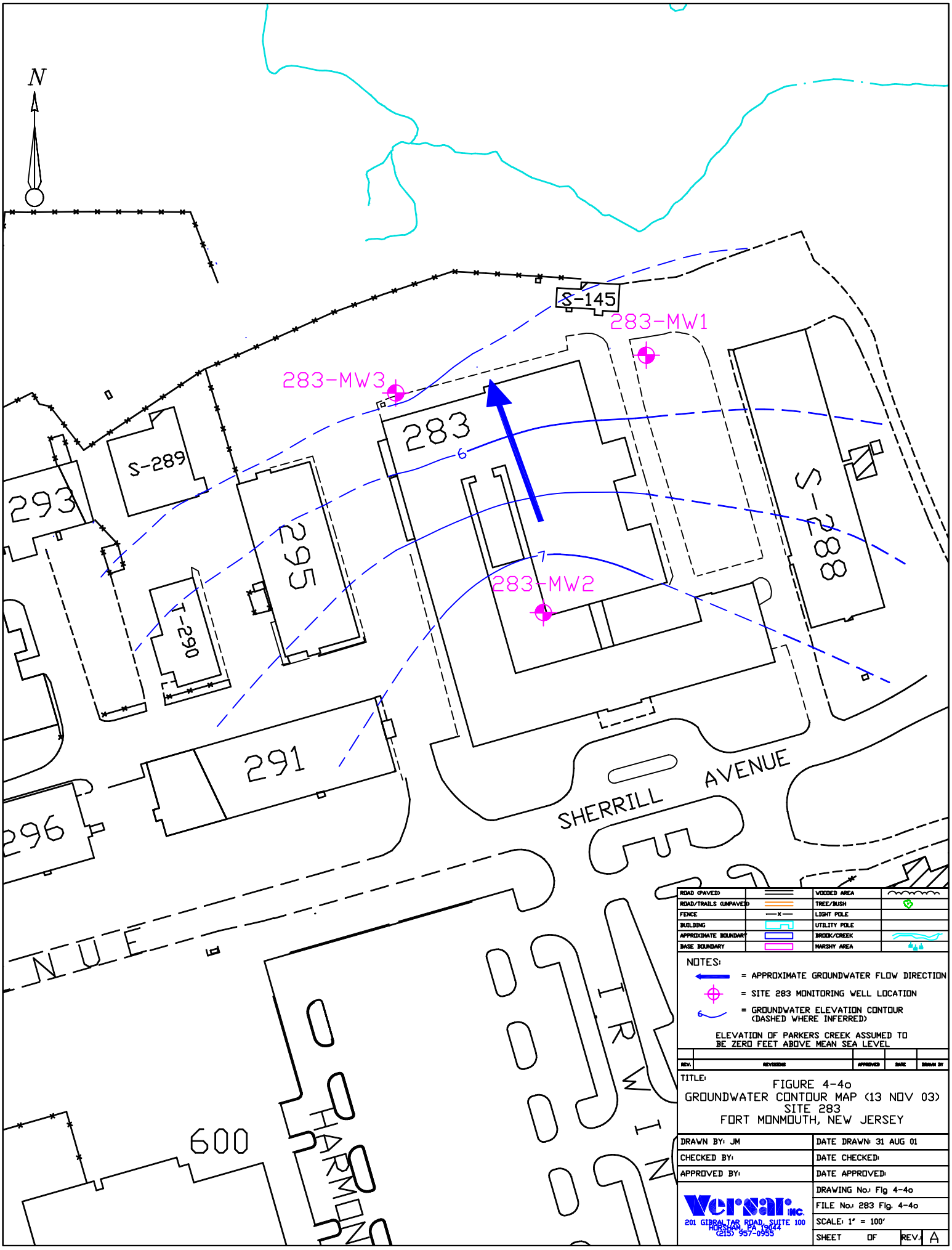
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283-MW1
283-MW3
283
6
S-289
293
295
S-288
283-MW2
7
T-290
291
296
SHERRILL AVENUE
600
ROAD (PAVED)
ROAD/TRAILS (UNPAVED)
FENCE
BUILDING
APPROXIMATE BOUNDARY
BASE BOUNDARY
WOODED AREA
TREE/BUSH
LIGHT POLE
UTILITY POLE
BROOK/CREEK
MARSHY AREA
NOTES:
= APPROXIMATE GROUNDWATER FLOW DIRECTION
= SITE 283 MONITORING WELL LOCATION
= GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL
REV. REVISIONS APPROVED DATE DRAWN BY
TITLE:
FIGURE 4-4o
GROUNDWATER CONTOUR MAP (13 NOV 03)
SITE 283
FORT MONMOUTH, NEW JERSEY
DRAWN BY: JM
DATE DRAWN: 31 AUG 01
CHECKED BY:
DATE CHECKED:
APPROVED BY:
DATE APPROVED:
DRAWING No.: Fig 4-4o
FILE No.: 283 Fig. 4-4o
SCALE: 1" = 100'
SHEET OF REV.: A
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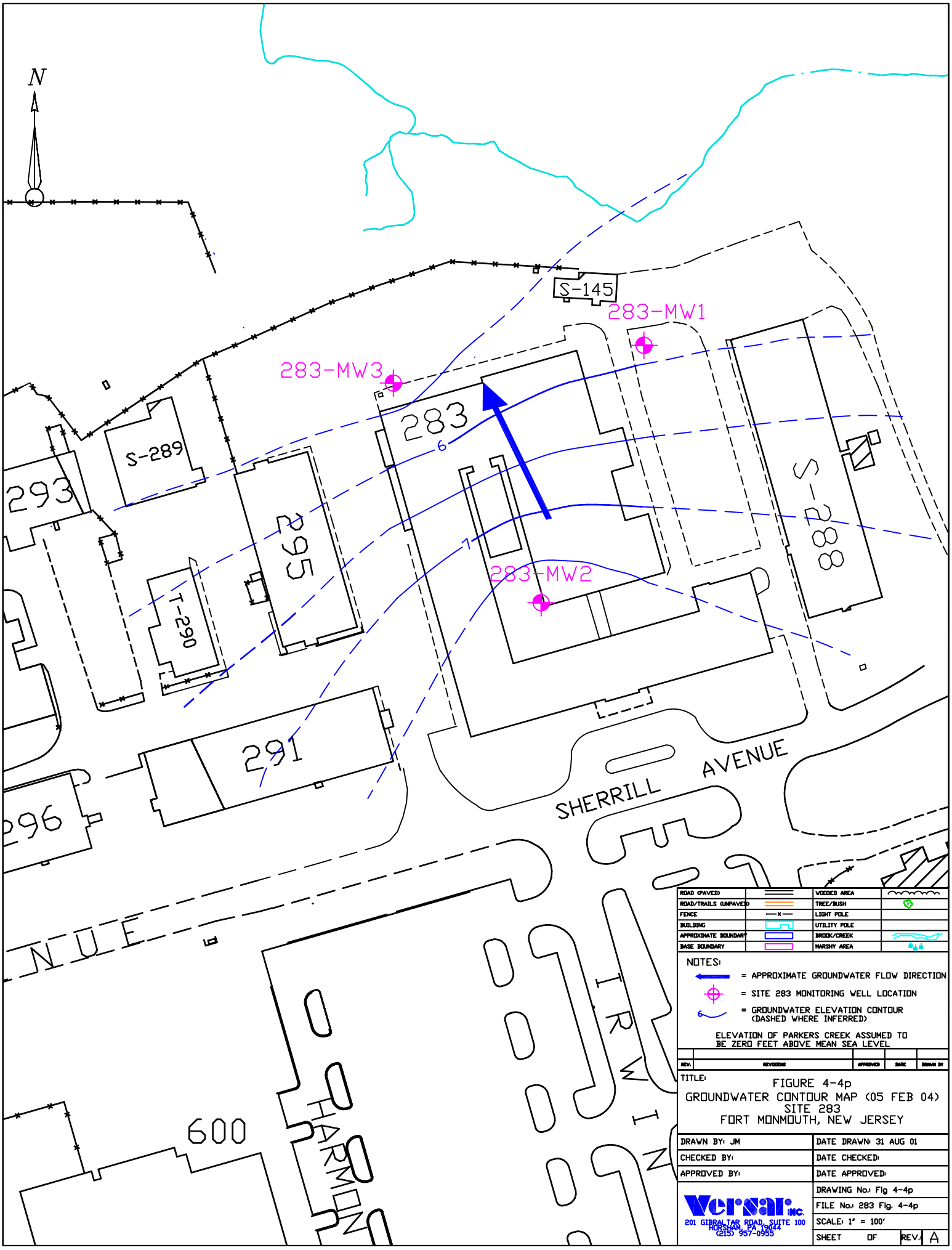
N
S-145
283-MW1
283-MW3
283
6
7
8
283-MW2
S-289
293
S-290
S-288
291
296
600
SHERRILL AVENUE
ROAD (PAVED)
ROAD/TRAILS (UNPAVED)
FENCE
BUILDING
APPROXIMATE BOUNDARY
BASE BOUNDARY
WOODED AREA
TREE/BUSH
LIGHT POLE
UTILITY POLE
BROOK/CREEK
MARSHY AREA
NOTES:
= APPROXIMATE GROUNDWATER FLOW DIRECTION
= SITE 283 MONITORING WELL LOCATION
= GROUNDWATER ELEVATION CONTOUR (DASHED WHERE INFERRED)
ELEVATION OF PARKERS CREEK ASSUMED TO BE ZERO FEET ABOVE MEAN SEA LEVEL
REV.
REVISIONS
APPROVED
DATE
DRAWN BY
TITLE:
FIGURE 4-4p
GROUNDWATER CONTOUR MAP (05 FEB 04)
SITE 283
FORT MONMOUTH, NEW JERSEY
DRAWN BY: JM
DATE DRAWN: 31 AUG 01
CHECKED BY:
DATE CHECKED:
APPROVED BY:
DATE APPROVED:
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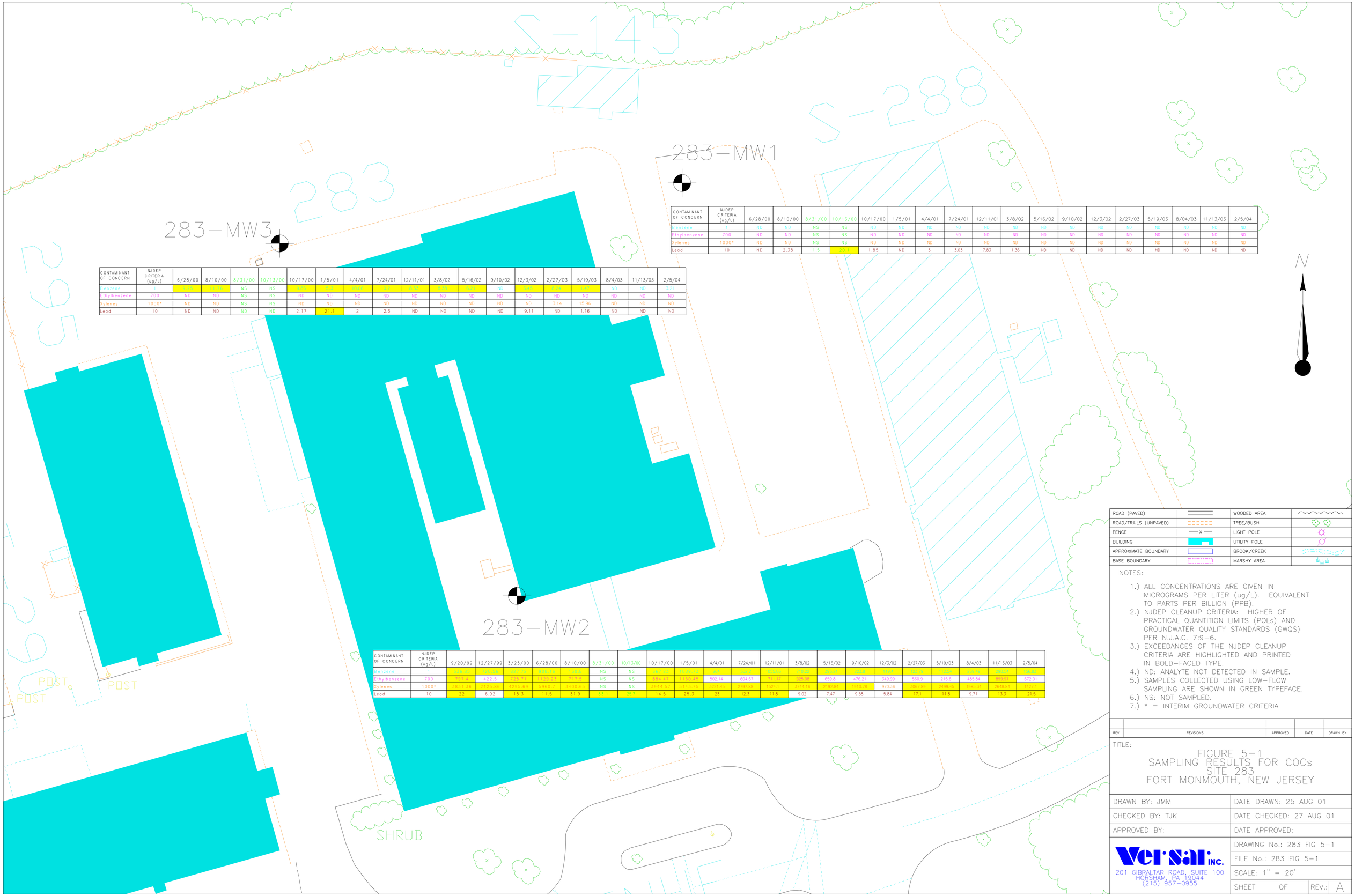
DRAWING No.: Fig 4-4p
FILE No.: 283 Fig. 4-4p
SCALE: 1" = 100'
SHEET OF
REV.: A



CONTAMINANT OF CONCERN	NJDEP CRITERIA (ug/L)	6/28/00	8/10/00	8/31/00	10/13/00	10/17/00	1/5/01	4/4/01	7/24/01	12/11/01	3/8/02	5/16/02	9/10/02	12/3/02	2/27/03	5/19/03	8/4/03	11/13/03	2/5/04
Benzene	1	9.35	11.75	NS	NS	9.86	9.3	10.08	10.2	9.53	9.39	6.21	ND	7.63	8.24	7.47	ND	ND	3.21
Ethylbenzene	700	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes	1000*	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.14	15.96	ND	ND	ND
Lead	10	ND	ND	ND	ND	2.17	21.1	2	2.6	ND	ND	ND	ND	9.11	ND	1.16	ND	ND	ND

CONTAMINANT OF CONCERN	NJDEP CRITERIA (ug/L)	6/28/00	8/10/00	8/31/00	10/13/00	10/17/00	1/5/01	4/4/01	7/24/01	12/11/01	3/8/02	5/16/02	9/10/02	12/3/02	2/27/03	5/19/03	8/4/03	11/13/03	2/5/04
Benzene	1	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes	1000*	ND	ND	NS	NS	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	10	ND	2.38	1.5	20.1	1.85	ND	3	3.03	7.83	1.36	ND	ND	ND	ND	ND	ND	ND	ND

CONTAMINANT OF CONCERN	NJDEP CRITERIA (ug/L)	9/20/99	12/27/99	3/23/00	6/28/00	8/10/00	8/31/00	10/13/00	10/17/00	1/5/01	4/4/01	7/24/01	12/11/01	3/8/02	5/16/02	9/10/02	12/3/02	2/27/03	5/19/03	8/4/03	11/13/03	2/5/04
Benzene	1	526.85	210.56	657.22	409.16	750.8	NS	NS	647.21	1009.71	284	302.7	1005.06	710.22	564.31	423.6	118.4	1157.9	132.84	256.48	290.61	106.61
Ethylbenzene	700	787.4	422.5	725.71	1129.23	717.5	NS	NS	884.47	1168.45	502.14	604.67	711.17	925.08	659.8	476.21	349.99	560.9	215.6	485.84	899.81	672.01
Xylenes	1000*	3811.36	2125.84	4295.89	5986.7	3400.65	NS	NS	3944.57	5143.75	3021.45	2797.86	1524.1	3744.16	2192.84	1910.78	970.36	3067.89	2499.45	1985.34	2648.84	1427.1
Lead	10	22	6.92	15.3	11.5	31.9	33.1	25.7	14.5	25.3	23	12.3	11.8	9.02	7.47	9.58	5.84	17.1	11.8	9.71	13.3	21.5

ROAD (PAVED)		WOODED AREA	
ROAD/TRAILS (UNPAVED)		TREE/BUSH	
FENCE	—x—	LIGHT POLE	
BUILDING		UTILITY POLE	
APPROXIMATE BOUNDARY		BROOK/CREEK	
BASE BOUNDARY		MARSHY AREA	

NOTES:

1.) ALL CONCENTRATIONS ARE GIVEN IN MICROGRAMS PER LITER (ug/L). EQUIVALENT TO PARTS PER BILLION (PPB).
2.) NJDEP CLEANUP CRITERIA: HIGHER OF PRACTICAL QUANTITION LIMITS (PQLs) AND GROUNDWATER QUALITY STANDARDS (GWQS) PER N.J.A.C. 7:9-6.
3.) EXCEEDANCES OF THE NJDEP CLEANUP CRITERIA ARE HIGHLIGHTED AND PRINTED IN BOLD-FACED TYPE.
4.) ND: ANALYTE NOT DETECTED IN SAMPLE.
5.) SAMPLES COLLECTED USING LOW-FLOW SAMPLING ARE SHOWN IN GREEN TYPEFACE.
6.) NS: NOT SAMPLED.
7.) * = INTERIM GROUNDWATER CRITERIA

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 5-1
SAMPLING RESULTS FOR COCs
SITE 283
FORT MONMOUTH, NEW JERSEY

DRAWN BY: JMM	DATE DRAWN: 25 AUG 01
CHECKED BY: TJK	DATE CHECKED: 27 AUG 01
APPROVED BY:	DATE APPROVED:
	DRAWING No.: 283 FIG 5-1
	FILE No.: 283 FIG 5-1
	SCALE: 1" = 20'
	SHEET OF REV.: A

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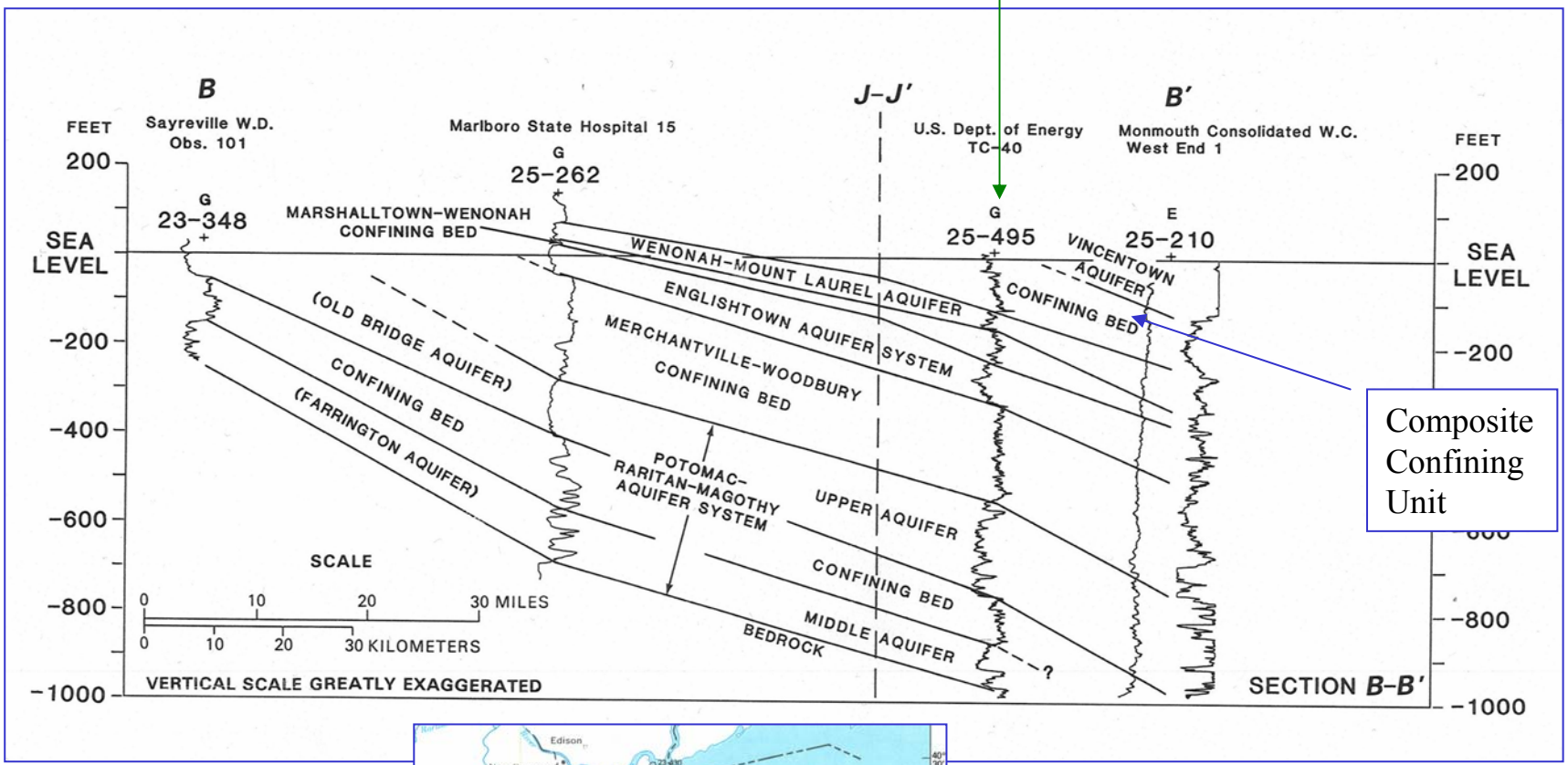
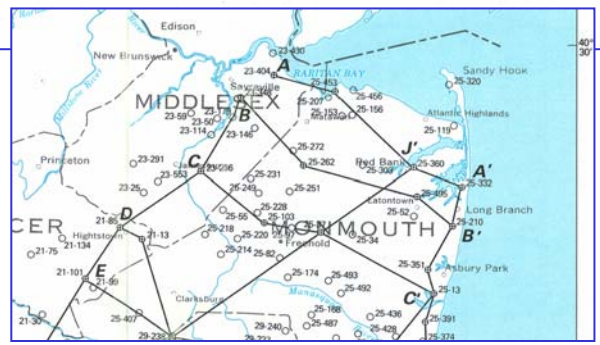
Fort Monmouth



Composite Confining Unit



Source: Zapecza, O. 1989. *Hydrogeologic Framework of the New Jersey Coastal Plain.* USGS Professional Paper 1404-B. U.S. Government Printing Office, Washington, DC.

FIGURE 6-1

Geologic Cross-Section B-B'
Site-283
Fort Monmouth, New Jersey

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(215) 788-7844

Notes:

1) Grid size is 20' by 20' in most of model area, 10' x 10' in vicinity of Site 283.
2) Monitoring wells at Site 283 are shown in purple. Other monitoring wells are shown in green.
3) Topographic contours for the ground surface are shown as brown lines. The contour interval is 2 feet.
3) Parkers Creek shown in solid blue, represents river boundary with constant head of zero feet (mean sea level).
4) Groundwater recharge in yellow-shaded areas is 0 inches/year. Elsewhere, recharge = 13.28 inches/year.
5) Coordinates shown represent NAD-83 survey feet.

FIGURE 6-2

MODFLOW Boundaries and Grid
Site 283
Fort Monmouth, New Jersey

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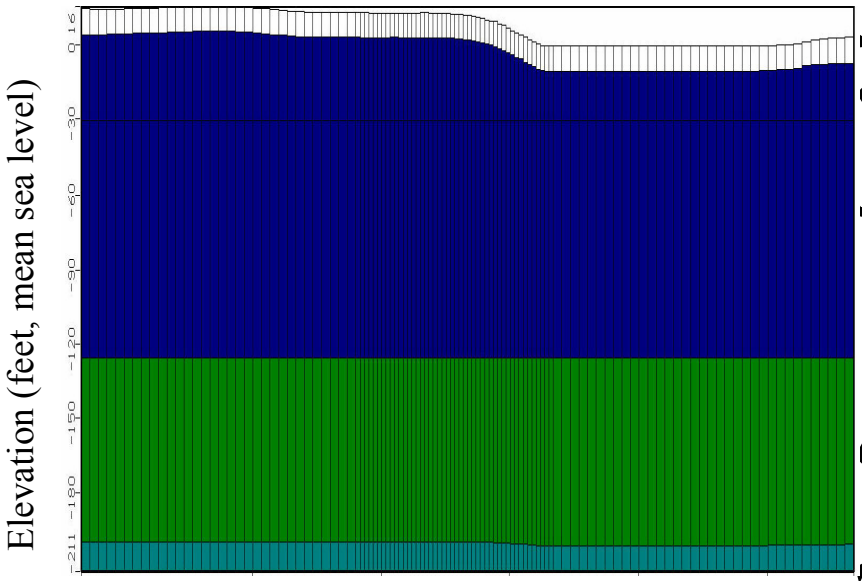

Layer 1: Fill

Thickness = 10 feet

K = 3.5 ft/day

(geometric mean from slug test at Site 283)

Layers 2 and 3: Navesink-Hornerstown Confining Unit

Thickness = 125 feet

K = 0.12 ft/day

Layer 4: Wenonah-Mount Laurel Aquifer

Thickness = 75 feet

K = 15.96 ft/day

Layer 5: Marshaltown-Wenonah Confining Unit

Thickness = 10 feet

K = 0.00018 ft/day

FIGURE 6-3

Cross Section of MODFLOW Area
Site 283
Fort Monmouth, New Jersey

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Source: Martin, M., 1998, *Groundwater Flow in the New Jersey Coastal Plain*. USGS Professional Paper 1404-H.

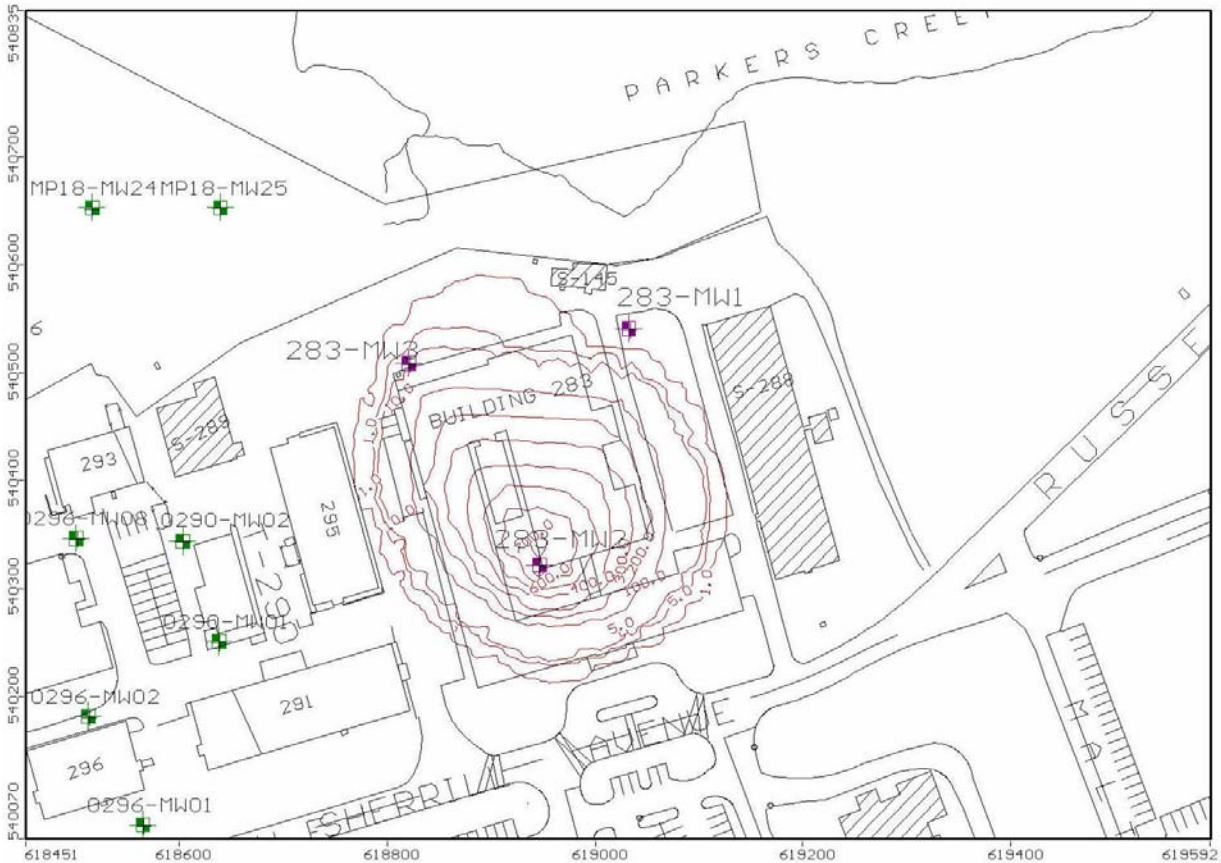

FIGURE 6-4

Initial Concentration of Benzene
In MODFLOW Simulation
Site 283
Fort Monmouth, New Jersey

Notes:
1) Isoconcentration lines represent initial concentrations of benzene in groundwater as used in the MODFLOW simulation.
2) The NJDEP groundwater quality criteria for benzene is 1 ug/L.
3) Monitoring wells for Site 283 are shown in purple. Other monitoring wells are shown in green.
4) Initial Concentrations based on from average of two most recent concentrations (10/17/00 and 01/05/01).
5) Coordinates shown represent NAD-83 survey feet.

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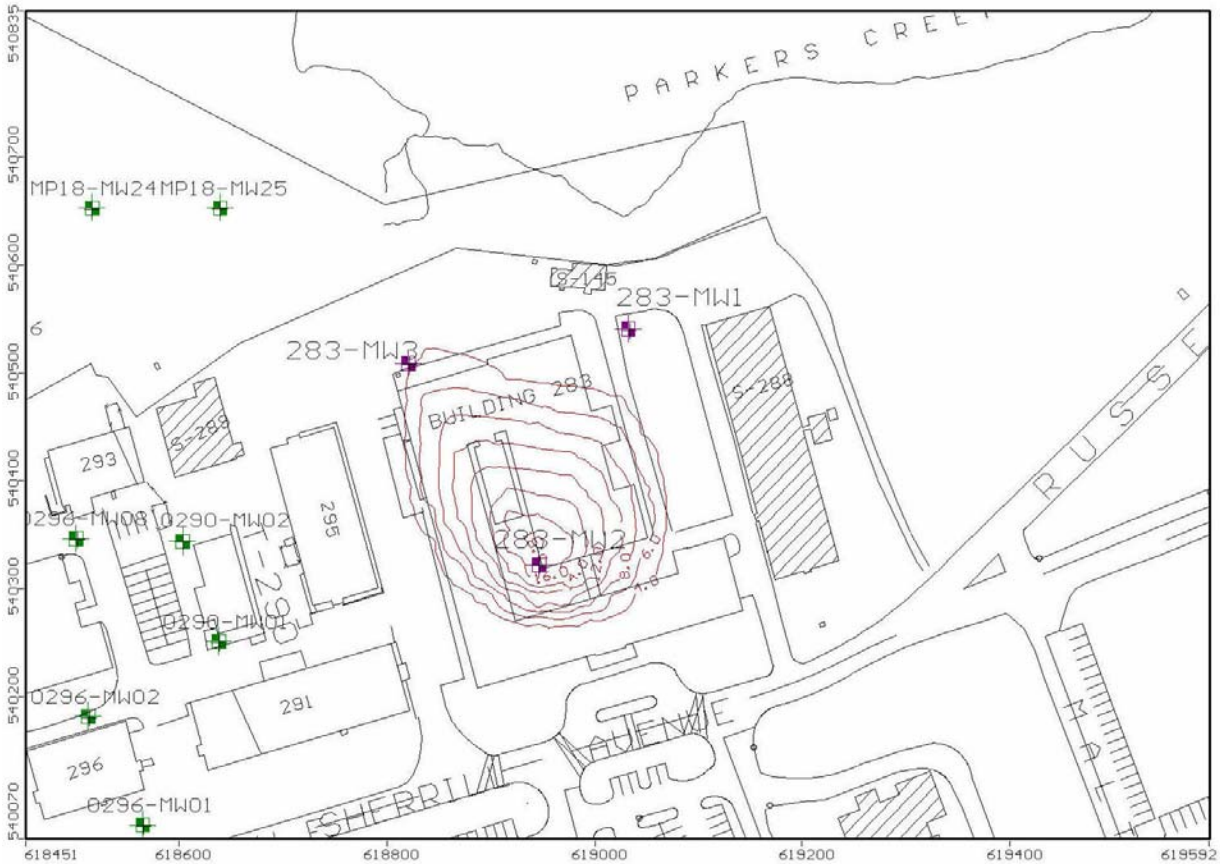

Notes:

1) Isoconcentration lines represent initial concentrations of lead in groundwater as used in the MODFLOW simulation.
2) The NJDEP groundwater quality criteria for lead is 10 ug/L.
3) Monitoring wells for Site 283 are shown in purple. Other monitoring wells are shown in green.
4) Initial Concentrations were were derived from average of groundwater sample results between 09/20/99 and 01/05/99 (See Table 6-3).
5) Coordinates shown represent NAD-83 survey feet.

FIGURE 6-5

Initial Concentration of Lead
In MODFLOW Simulation
Site 283
Fort Monmouth, New Jersey

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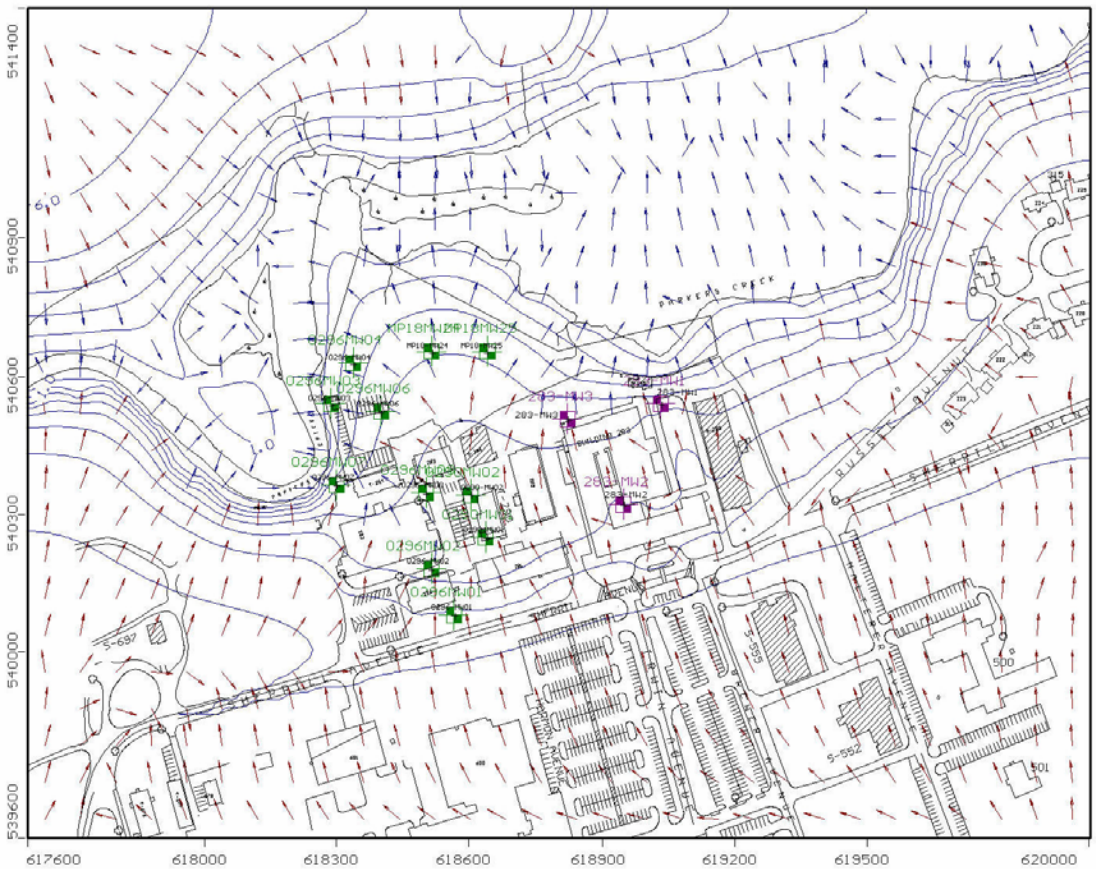

Notes:

1) Brown arrows indicate downward groundwater flow direction. Blue arrows indicate upward groundwater flow direction.
2) Monitoring wells for Site 283 are shown in purple. Other monitoring wells shown in green.
3) Contour Lines indicate groundwater elevation contours. Contour Interval = 1 ft.
4) Coordinates shown represent NAD-83 survey feet.
5) Modeling Software: *Visual MODFLOW Version 2.8.2*, Waterloo Hydrogeologic, Inc., 2000.

FIGURE 6-6

Flow Directions and Groundwater Elevation Contours – Map View
Site 283
Fort Monmouth, New Jersey

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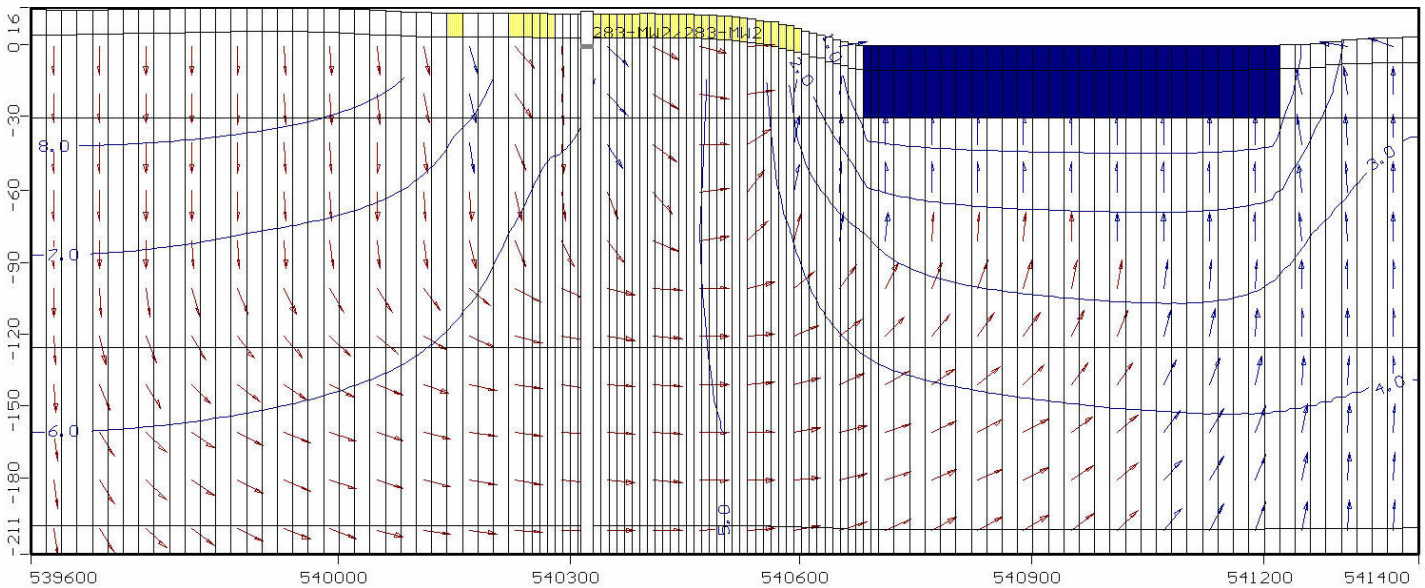

Notes:
1) Arrows indicate groundwater flow direction.
2) Cross Section runs from South to North through monitoring well 283-MW2.
3) Contour lines indicate groundwater elevation contours. Contour Interval = 1 ft.
4) Areas highlighted in yellow represent areas of with groundwater recharge of 0 inches/year.
5) Grid cells representing Parkers Creek shown in blue.
6) Coordinates shown represent NAD-83 survey feet.
7) Modeling Software: *Visual MODFLOW Version 2.8.2*, Waterloo Hydrogeologic, Inc., 2000.

FIGURE 6-7

Flow Directions and Groundwater Elevation Contours – Cross Section Site 283
Fort Monmouth, New Jersey

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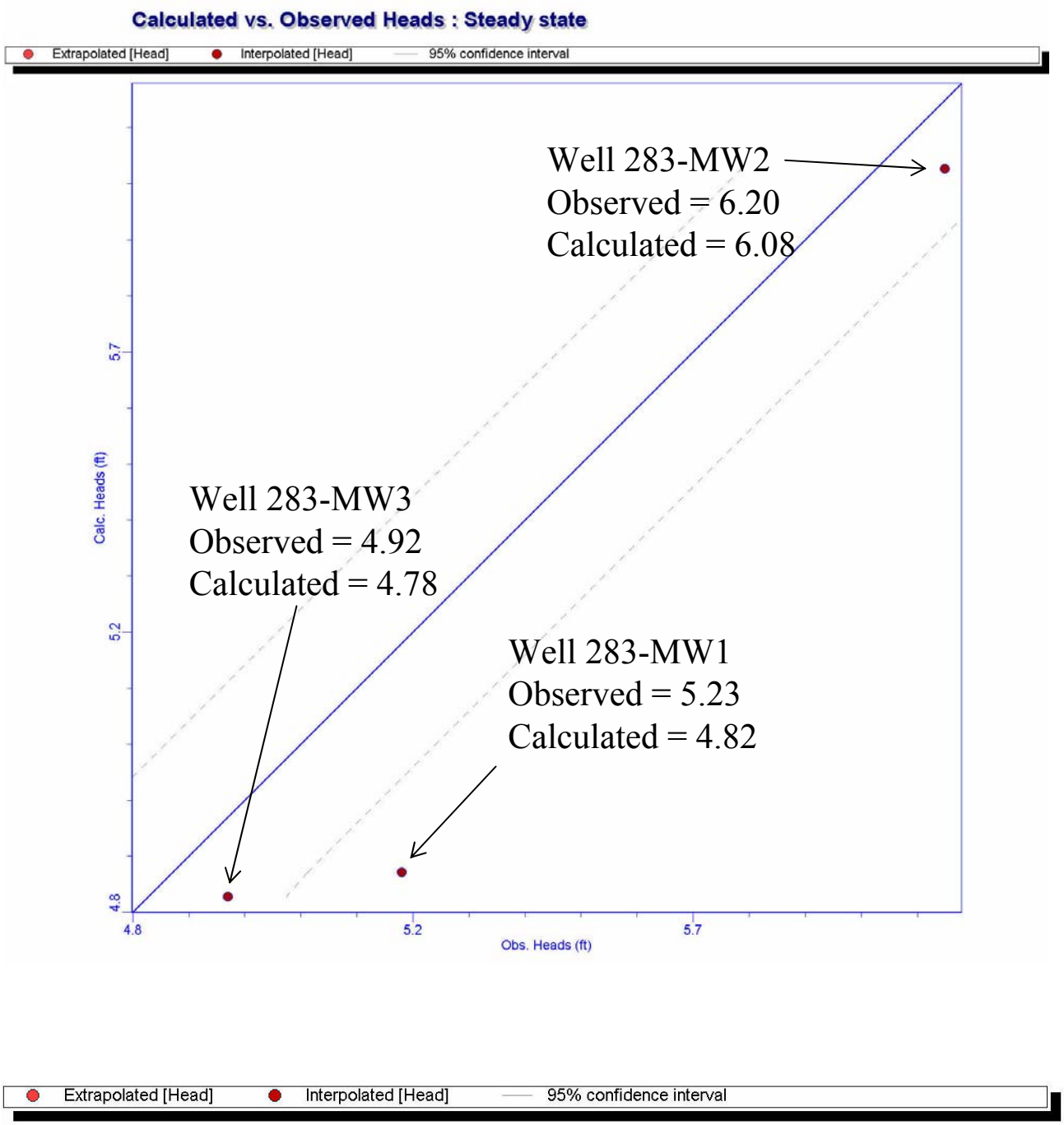

Notes:
1) This graph represents a comparison between heads calculated in the model with heads observed in monitoring wells at Site 283 in January 2001.
2) Measurements shown in feet above mean sea level (msl).
3) Modeling Software: *Visual MODFLOW Version 2.8.2*, Waterloo Hydrogeologic, Inc., 2000.

FIGURE 6-8

MODFLOW Calibration:
Calculated Versus Observed Head
Site 283
Fort Monmouth, New Jersey

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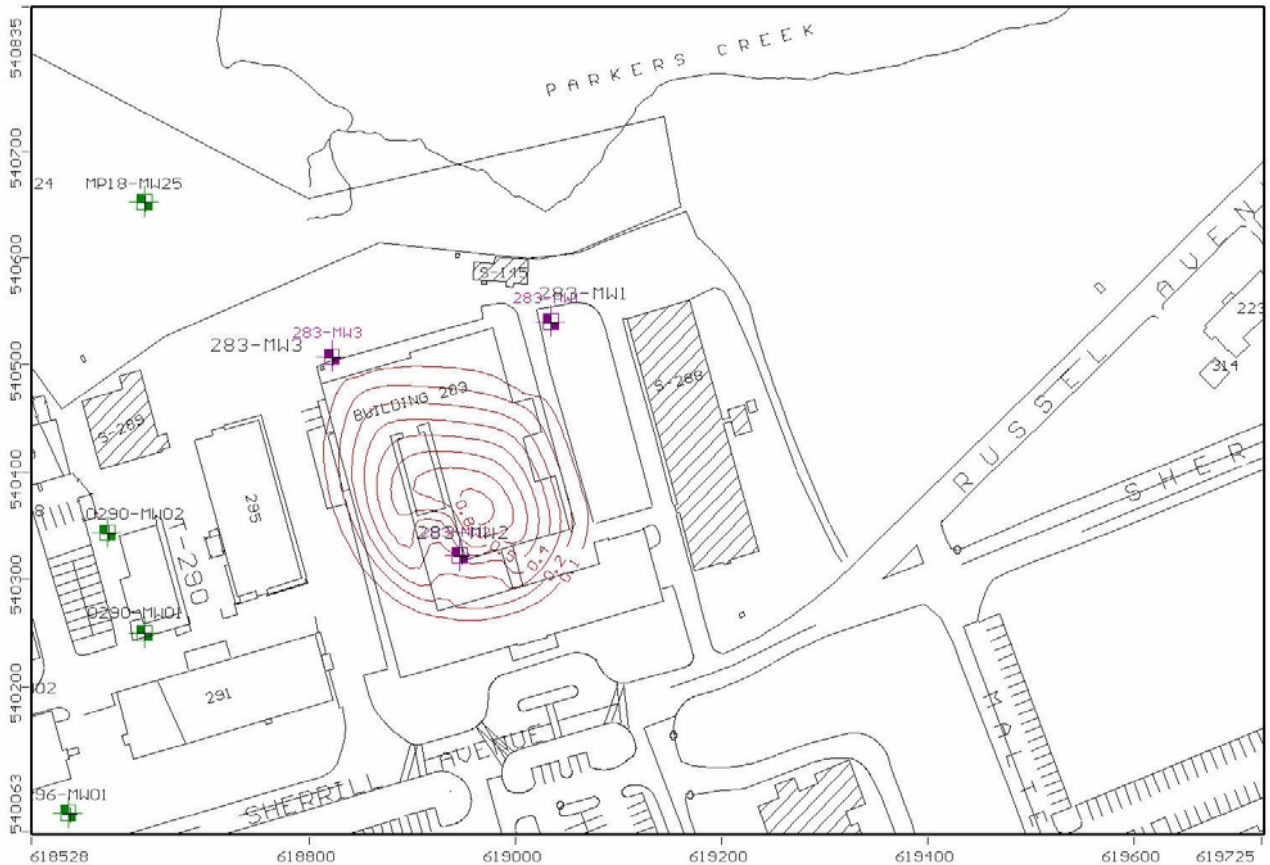

Notes:

1) Isoconcentration contours represent predicted benzene concentrations at 19 years for Layer 2 (depth of 10 feet below ground surface).
2) The NJDEP groundwater quality criteria for benzene is 1 ug/L.
3) Monitoring wells for Site 283 are shown in purple. Other monitoring wells are shown in green.
4) Coordinates shown represent NAD-83 survey feet.
5) Modeling Software: *Visual MODFLOW Version 2.8.2*, Waterloo Hydrogeologic, Inc., 2000.

FIGURE 6-9

Predicted Benzene Concentration
19 Years – Map View
Site 283
Fort Monmouth, New Jersey

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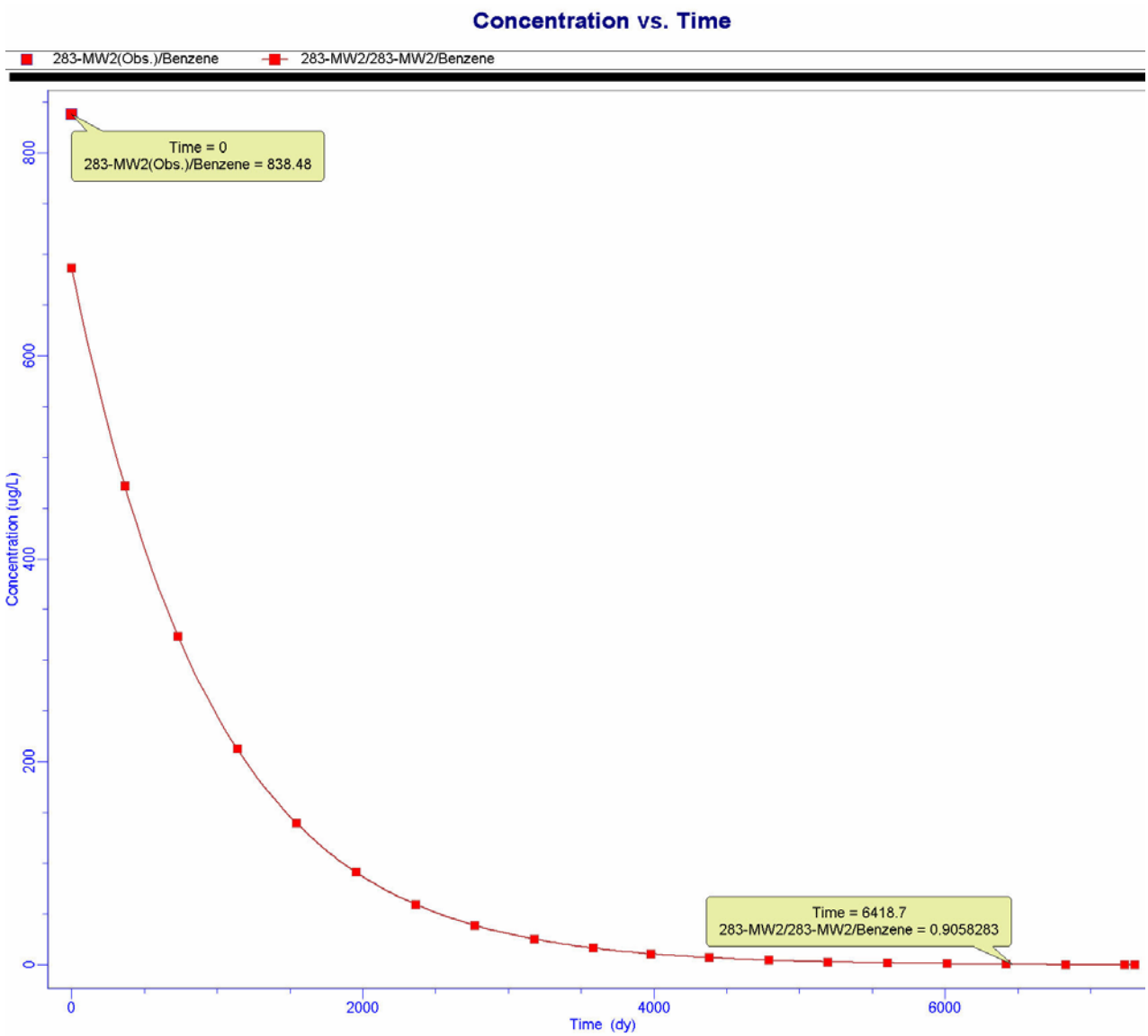

Notes:
1) NJDEP groundwater criteria for benzene is 1 ug/L.
2) Time for compliance is estimated from this graph to be approximately 17.6 years.
3) Modeling Software: *Visual MODFLOW Version 2.8.2*, Waterloo Hydrogeologic, Inc., 2000.

FIGURE 6-10

Predicted Benzene Concentration Versus Time at Well 283-MW2
Site 283
Fort Monmouth, New Jersey

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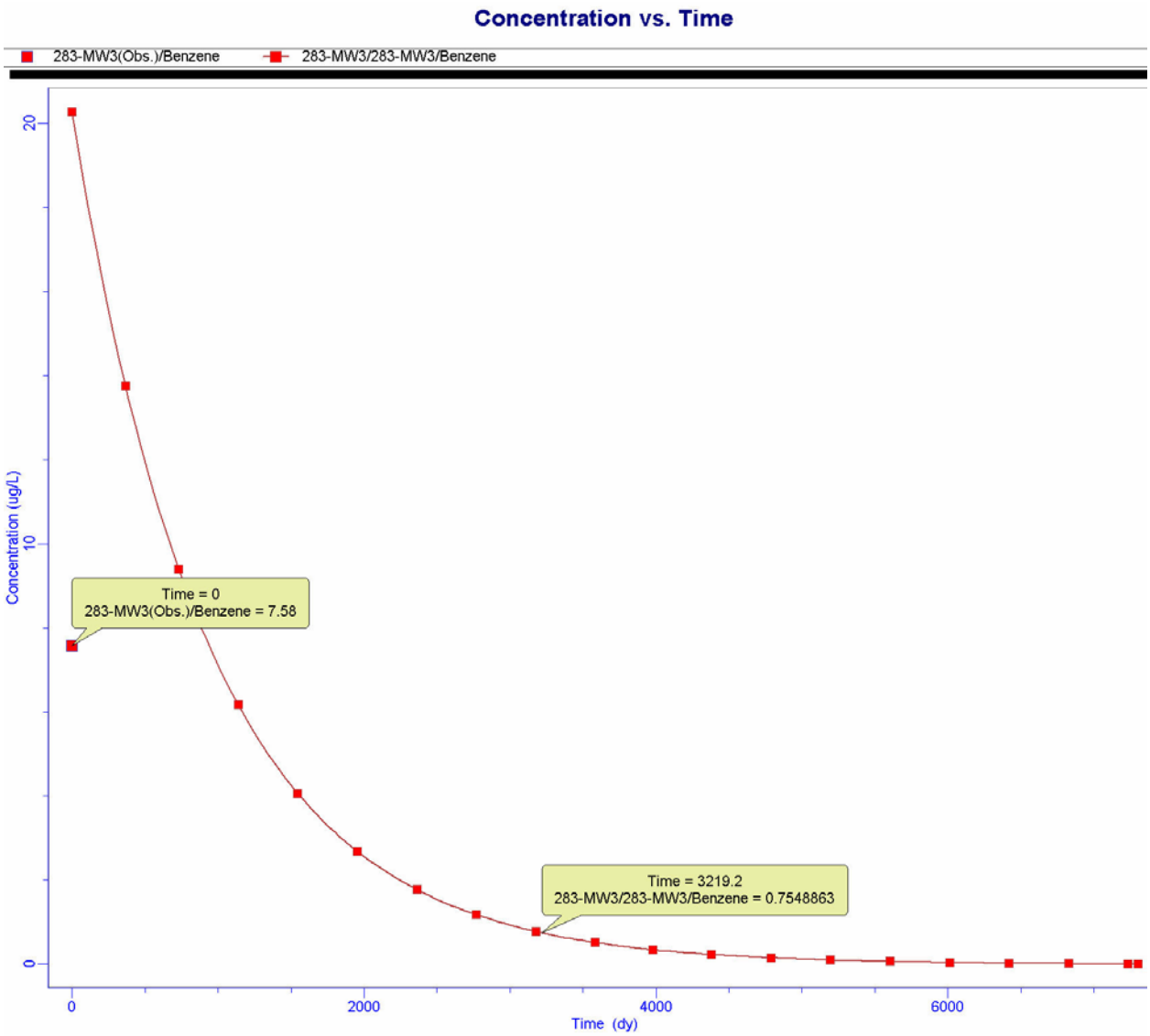

Notes:
1) NJDEP groundwater criteria for benzene is 1 ug/L.
2) Time for compliance at well 283-MW3 was estimated to be approximately 8.8 years.
3) Modeling Software: *Visual MODFLOW Version 2.8.2*, Waterloo Hydrogeologic, Inc., 2000.

FIGURE 6-11

Predicted Benzene Concentration Versus Time at Well 283-MW3
Site 283
Fort Monmouth, New Jersey

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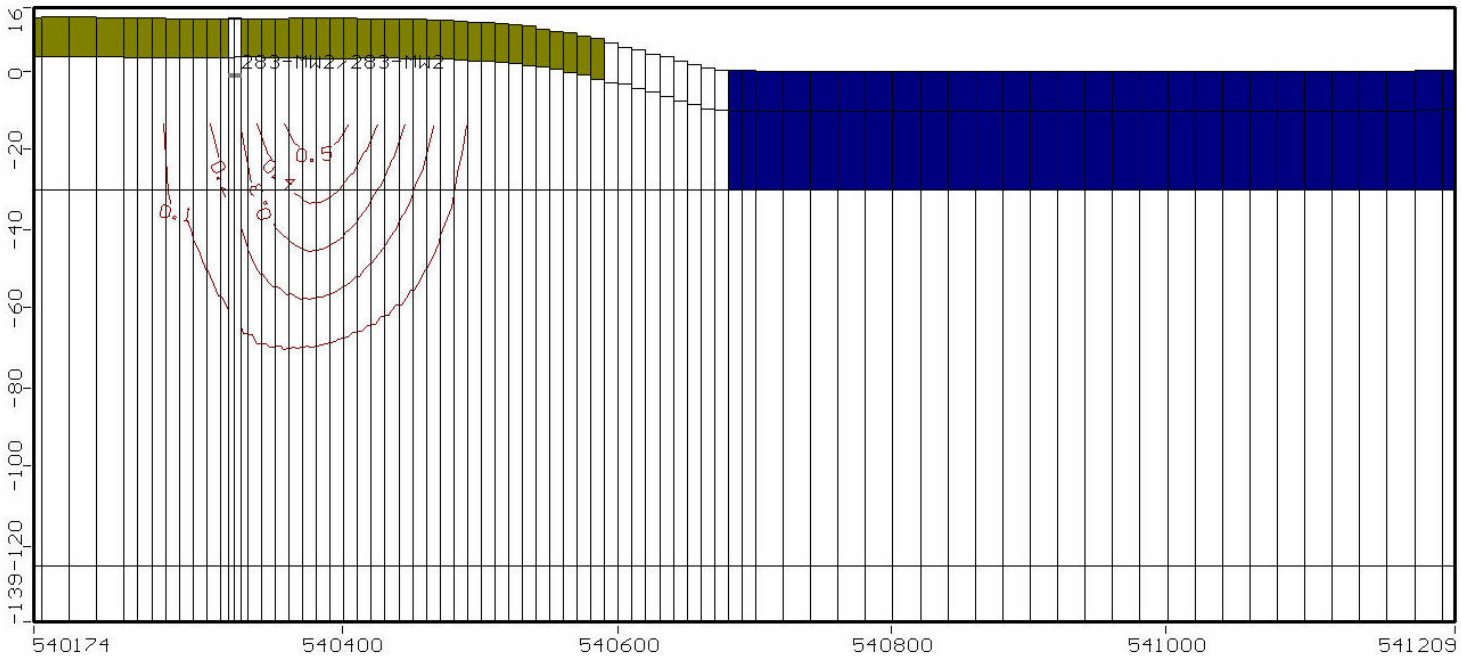

Notes:

1) Isoconcentration contours represent predicted benzene concentrations at 19 years in cross-section view (through well 283-MW2).
2) The NJDEP groundwater quality criteria for benzene is 1 ug/L.
3) Grid cells representing Parkers Creek shown in blue.
4) Grid cells that are dry are shown as olive-green.
5) Coordinates shown represent NAD-83 survey feet.
6) Modeling Software: *Visual MODFLOW Version 2.8.2*, Waterloo Hydrogeologic, Inc., 2000.

FIGURE 6-12

Predicted Benzene Concentration
19 Years – Cross Section View
Site 283
Fort Monmouth, New Jersey

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Bristol, PA 19007
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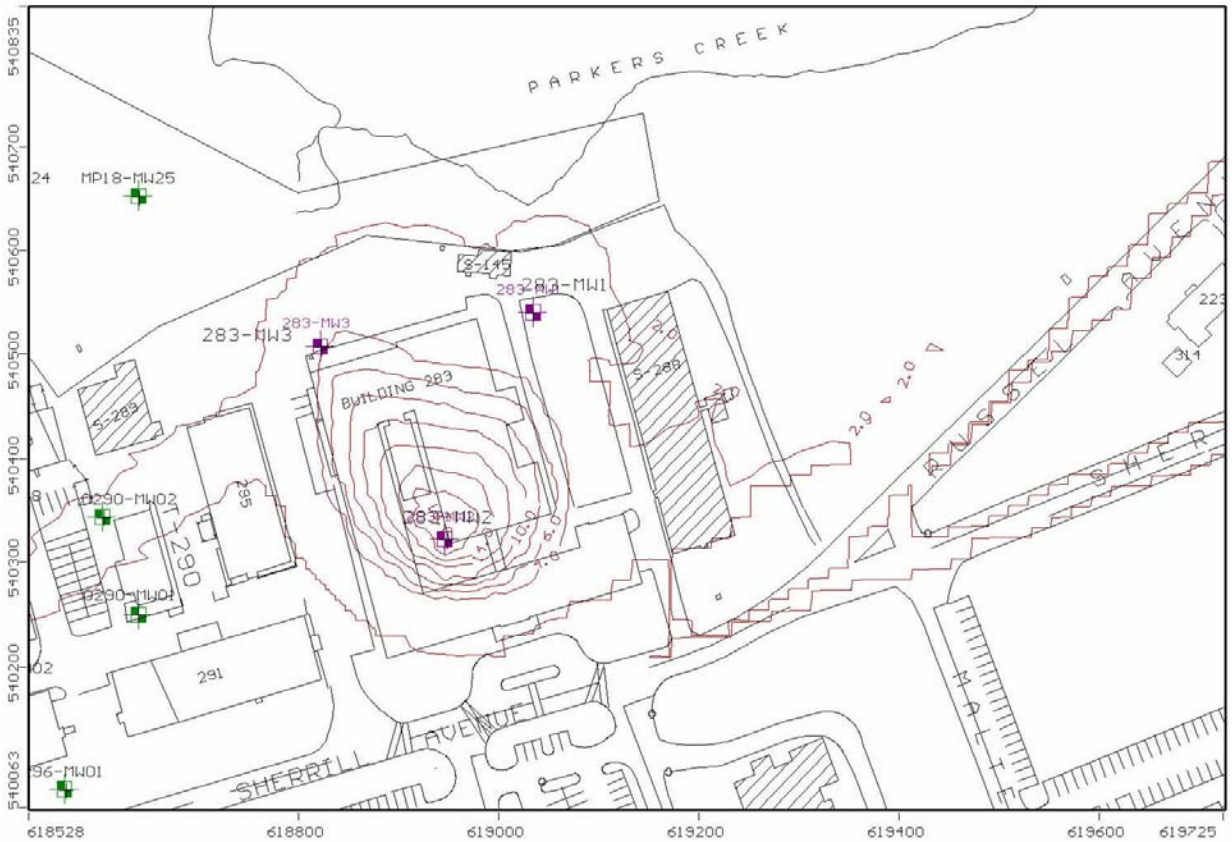

Notes:
1) Isoconcentration contours represent predicted lead concentrations at 20 years.
2) The NJDEP groundwater quality criteria for lead is 10 ug/L.
3) Monitoring wells for Site 283 are shown in purple. Other monitoring wells are shown in green.
4) Coordinates shown represent NAD-83 survey feet.
5) Modeling Software: *Visual MODFLOW Version 2.8.2*, Waterloo Hydrogeologic, Inc., 2000.

FIGURE 6-13

Predicted Lead Concentration
20 Years
Site 283
Fort Monmouth, New Jersey

Versar INC.
2558 Pearl Buck Road, Suite 1
Bristol, PA 19007
(215) 788-7844

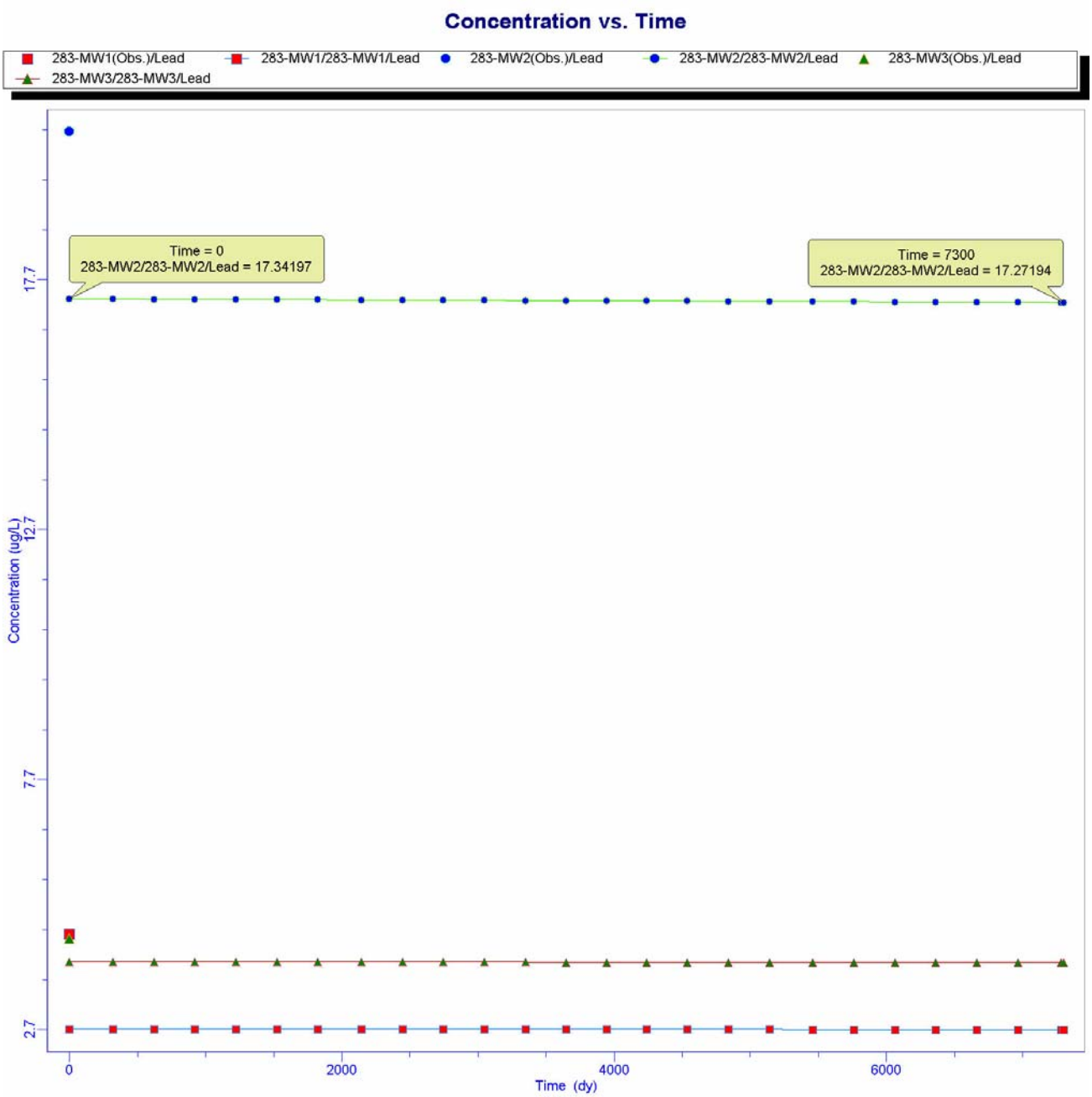

FIGURE 6-14

Predicted Lead Concentration Versus Time at Well 283-MW2
Site 283
Fort Monmouth, New Jersey

Notes:
1) NJDEP groundwater criteria for lead is 10 ug/L.
2) Time for compliance at well 283-MW2 was undetermined in the MODFLOW simulation (greater than 1,000 years).
3) Modeling Software: *Visual MODFLOW Version 2.8.2*, Waterloo Hydrogeologic, Inc., 2000.

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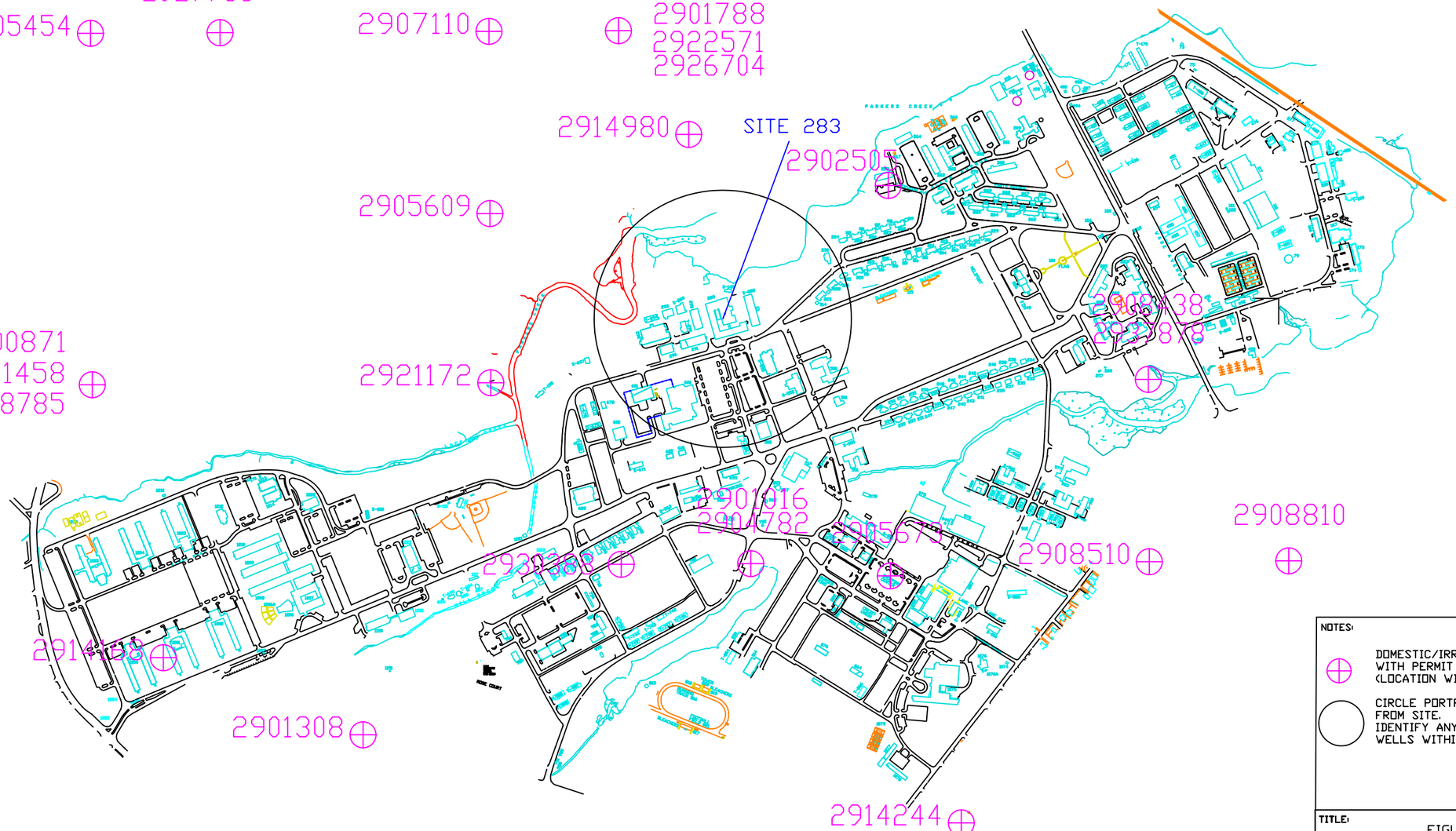


NOTES:

DOMESTIC/IRRIGATION WELL WITH PERMIT NUMBER (LOCATION WITHIN 100 FOOT ACCURACY)

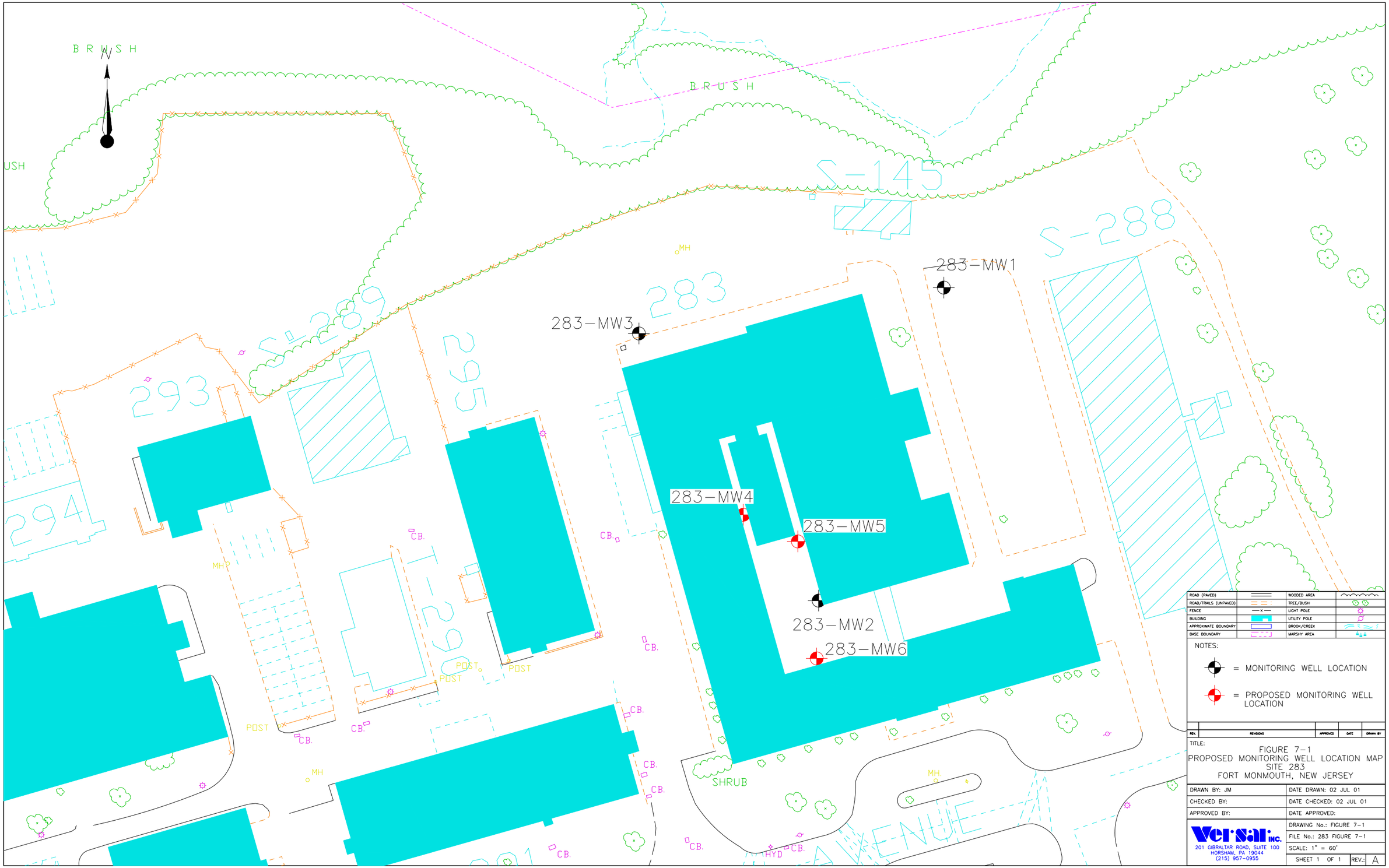
CIRCLE PORTRAYS 1000 FOOT DISTANCE FROM SITE. THE WELL SEARCH DID NOT IDENTIFY ANY DOMESTIC OR IRRIGATION WELLS WITHIN 1000 FT OF THE 283 SITE.

TITLE:

FIGURE 6-15
DOMESTIC AND IRRIGATION WELLS
SITE 283 - MAIN POST
FORT MONMOUTH, NEW JERSEY

DRAWN BY: TJK	DATE DRAWN: 30 AUGUST 01
CHECKED BY:	DATE CHECKED:
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIG. 6-15
	FILE No.: 283 FIG. 6-15
	SCALE: 1" = 1000'
	SHEET OF REV.: A

Versar INC.
2558 PEARL BUCK ROAD SUITE 1
BRISTOL, PA 19007
(215) 788-7844



ROAD (PAVED)		WOODED AREA	
ROAD/TRAILS (UNPAVED)		TREE/BUSH	
FENCE	—x—	LIGHT POLE	
BUILDING		UTILITY POLE	
APPROXIMATE BOUNDARY		BROOK/CREEK	
BASE BOUNDARY		MARSHY AREA	

NOTES:

= MONITORING WELL LOCATION

= PROPOSED MONITORING WELL LOCATION

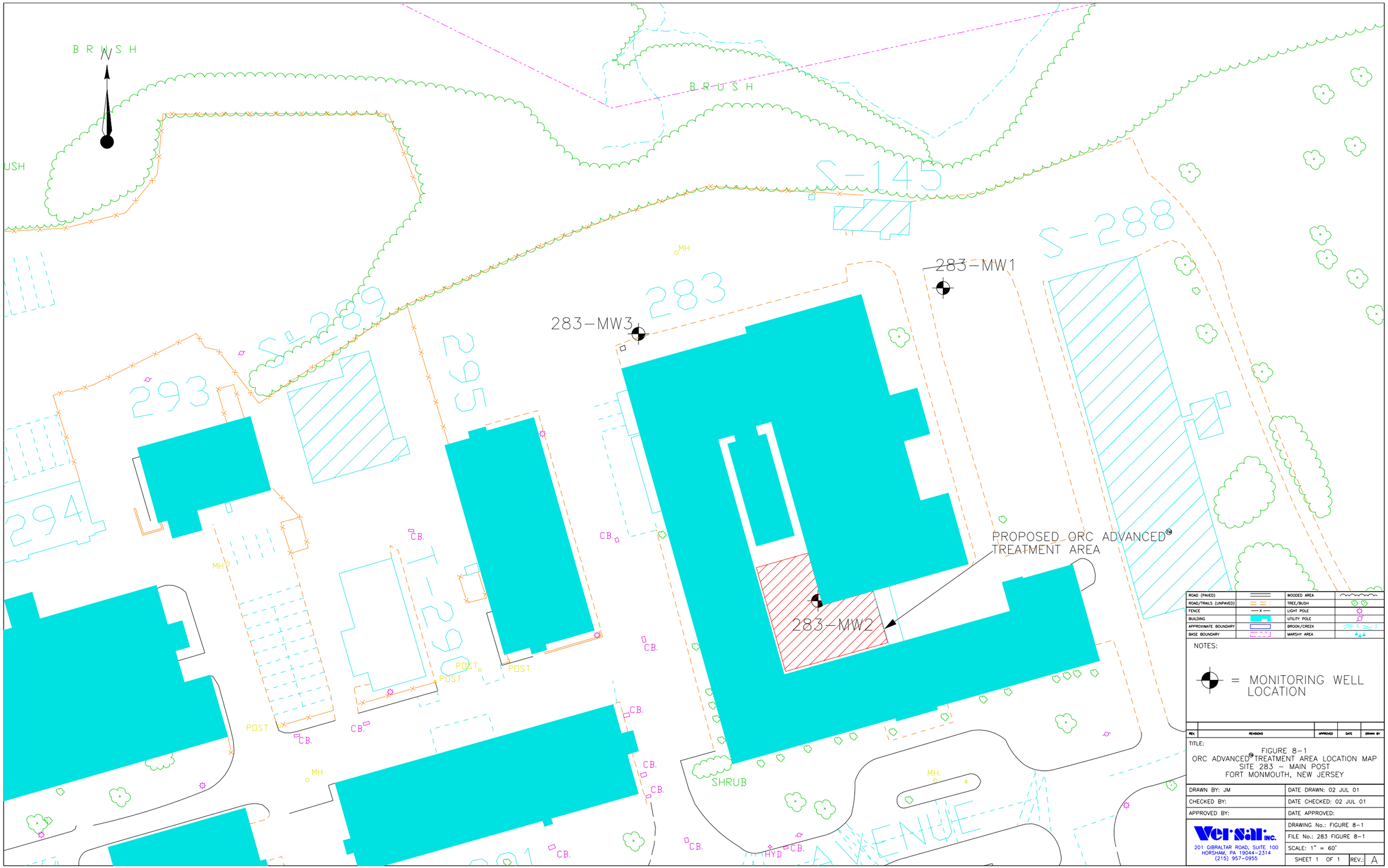
REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 7-1
PROPOSED MONITORING WELL LOCATION MAP
SITE 283
FORT MONMOUTH, NEW JERSEY

DRAWN BY: JM	DATE DRAWN: 02 JUL 01
CHECKED BY:	DATE CHECKED: 02 JUL 01
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIGURE 7-1
	FILE No.: 283 FIGURE 7-1
	SCALE: 1" = 60'
	SHEET 1 OF 1 REV.: A

Ver-Sal INC.
201 GIBRALTAR ROAD, SUITE 100
HORSHAM, PA 19044
(215) 957-0955



ROAD (PAVED)		WOODED AREA	
ROAD/TRAILS (UNPAVED)		TREE/BUSH	
FENCE	— x —	LIGHT POLE	
BUILDING		UTILITY POLE	
APPROXIMATE BOUNDARY		BROOK/CREEK	
BASE BOUNDARY		MARSHY AREA	

NOTES:

= MONITORING WELL LOCATION

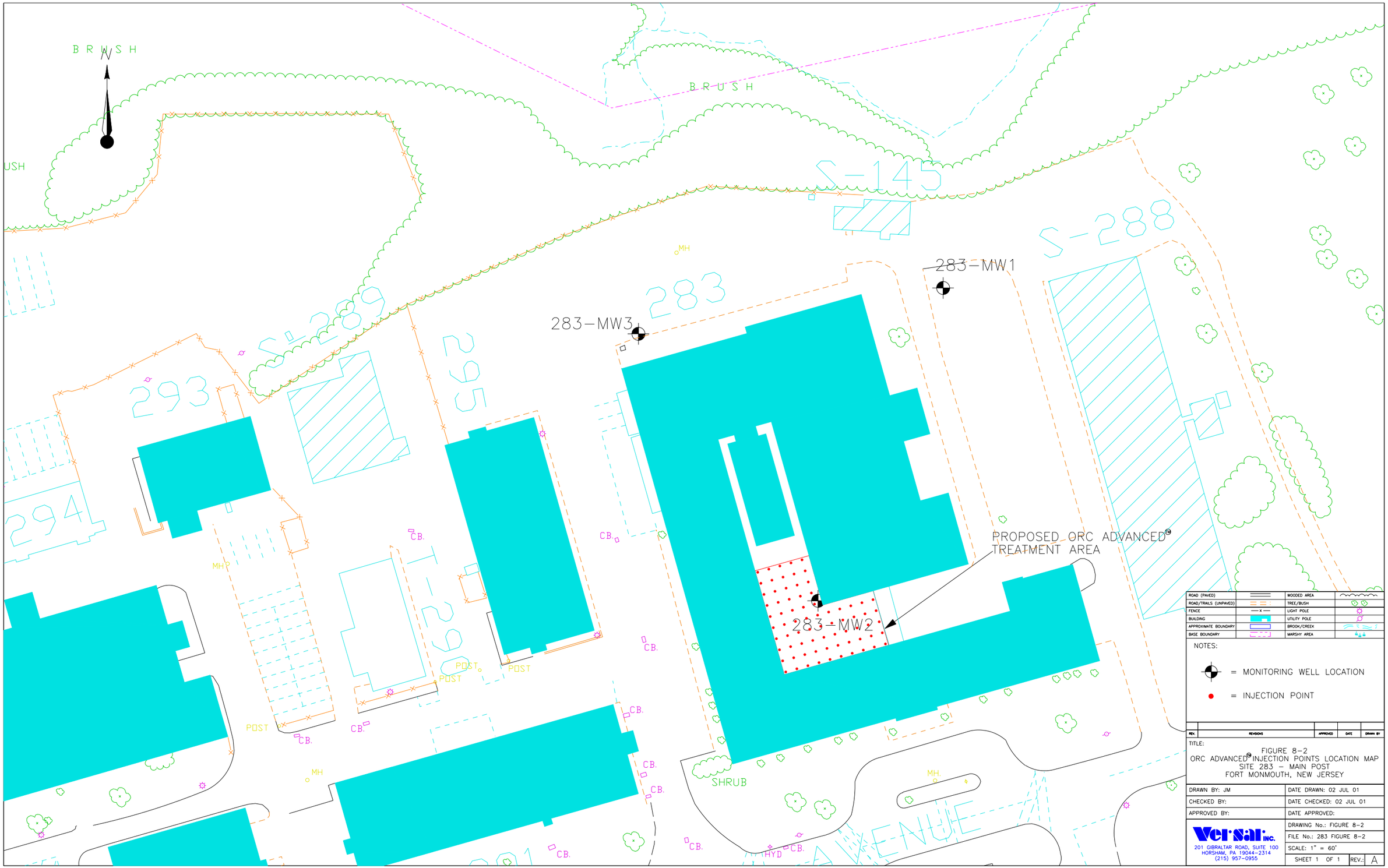
REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 8-1
ORC ADVANCED® TREATMENT AREA LOCATION MAP
SITE 283 - MAIN POST
FORT MONMOUTH, NEW JERSEY

DRAWN BY: JM	DATE DRAWN: 02 JUL 01
CHECKED BY:	DATE CHECKED: 02 JUL 01
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIGURE 8-1
	FILE No.: 283 FIGURE 8-1
	SCALE: 1" = 60'
	SHEET 1 OF 1 REV.: A

Ver-Sal INC.
201 GIBRALTAR ROAD, SUITE 100
HORSHAM, PA 19044-2314
(215) 957-0955



ROAD (PAVED)		WOODED AREA	
ROAD/TRAILS (UNPAVED)		TREE/BUSH	
FENCE	—x—	LIGHT POLE	
BUILDING		UTILITY POLE	
APPROXIMATE BOUNDARY		BROOK/CREEK	
BASE BOUNDARY		MARSHY AREA	

NOTES:

= MONITORING WELL LOCATION

= INJECTION POINT

REV.	REVISIONS	APPROVED	DATE	DRAWN BY

TITLE:

FIGURE 8-2
ORC ADVANCED® INJECTION POINTS LOCATION MAP
SITE 283 - MAIN POST
FORT MONMOUTH, NEW JERSEY

DRAWN BY: JM	DATE DRAWN: 02 JUL 01
CHECKED BY:	DATE CHECKED: 02 JUL 01
APPROVED BY:	DATE APPROVED:
	DRAWING No.: FIGURE 8-2
	FILE No.: 283 FIGURE 8-2
	SCALE: 1" = 60'
	SHEET 1 OF 1 REV.: A

Versar, Inc.
201 GIBRALTAR ROAD, SUITE 100
HORSHAM, PA 19044-2314
(215) 957-0955

3.11 Parcel 50 – IRP Sites FTMM-54, FTMM-55, and FTMM-61

3.11.1 Site Description

Site FTMM-54 is a former fuel distribution facility on the MP which was abandoned. The tanks and distribution piping were rediscovered during a renovation project at Bldg 296. The facility dates back to the 1940s and is located on Sherrill Avenue. The UST system was comprised of ten 1,000-gallon tanks which stored various types of fuel products. These products were distributed from remote pumping islands located over 450 ft from the UST field and within 50 ft of Parkers Creek (a sensitive estuarine marsh area).

FTMM-55 is the site of a former UST system which was located at Bldg 290. The site formerly served as a motor pool for a military unit that has since left FTMM.

Site FTMM-61 is located off of Sherrill Avenue in the northern section of the MP. On August 28, 1997, a 3,000-gallon steel UST (No. 0081533- 229) was removed. The tank was used to store gasoline. The UST was located within the courtyard of Bldg 283. Additional information pertaining to this parcel can be found in Section 5.2.1.1, Table 5-10, Section 5.13.2, and Appendix G of the Phase I ECP (1).

3.11.2 Previous Investigations

The Bldg 296 site, the Bldg 290 site, and the M-18 Landfill are located in close proximity to one another (44). Due to the close proximity, the RI results for all three sites were reported in one RI Report. This report, submitted to the NJDEP in October 2003, presents a groundwater flow and transport model to evaluate the migration of benzene and metals in groundwater.

FTMM-54: Bldg 296. Between November and December 1993, the previously unknown fuel distribution system was removed and the source of contamination was eliminated. Benzene and lead were detected in site monitoring wells above NJDEP GWQC. An NFA determination was requested for this site. Currently, as part of the monitoring program, seven groundwater monitoring wells are sampled on a quarterly basis. The cleanup strategy is to continue compliance monitoring of seven groundwater monitoring wells.

FTMM-55: Bldg 290. The UST tanks at this location were used to store gasoline and they were both removed on September 2, 1994. On July 2, 1996, a construction activity identified gasoline-contaminated soil within 50 ft of the former UST site. Soils were removed and disposed of in accordance with NJDEP requirements. Additional soil and groundwater samples were collected in March 1998 to further delineate the area of contamination. No additional contaminated soils were identified within the AOC. Arsenic and lead were detected in site monitoring wells above NJDEP GWQC. An NFA determination was requested for this site. The cleanup strategy is to continue compliance monitoring of two groundwater monitoring wells.

FTMM-61: Bldg 283. Approximately 400 cubic yards of contaminated soil (associated with the removed UST) were removed and disposed of in accordance with NJDEP requirements. Benzene, ethyl benzene, toluene, and lead were detected above the NJDEP GWQC. The cleanup strategy is to inject ORC for 2 years and continue compliance monitoring of groundwater (six wells quarterly) and surface water. This is a key component of monitored natural attenuation. ORC injection is anticipated for 2008 and 2009. Injection of ORC is subject to requirements pursuant to N.J.A.C 7:26E-4.1(a)4 and N.J.A.C. 7:26E-6.3(c) related to the performance of a pilot study and approval of a permit-by-rule.

3.11.3 Site Investigation Sampling

Through previous investigations conducted under the IRP, groundwater VO contamination has been identified in close proximity to Bldg 283. All groundwater is currently being addressed under the IRP. However, Bldg 283 is a two-story building with a basement and totals approximately 76,500 square feet in size. The footprint of Bldg 283 covers approximately 50,000 square feet. Per NJDEP guidance and consistent with USEPA policy, the NJDEP recommends investigation of VI where structures are within 100 ft horizontally or vertically of shallow groundwater contamination in excess of GWSLs. In the case of the presence of petroleum hydrocarbon contamination (particularly BTEX), a 30-ft distance criterion is utilized (12). BTEX contaminants have been detected above the GWSLs within 30 ft of the Bldg 283. Therefore, VI at Bldg 283 was evaluated through the collection of near-slab soil gas samples and indoor air samples. No sub-slab soil gas samples were collected at Bldg 283 due to the observation of groundwater intrusion within the basement during the 2006 VSI.

See **Table 3.11-1** for a summary of proposed field activities and **Figure 3.11-1** for sample locations. An analytical summary of sampling activities, including sample IDs, collection dates, and analytical parameters, is provided in **Table 3.11-2**.

Table 3.11-1
Parcel 50 Sampling Location, Rationale and Analytical

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
50SG-1 through 50SG-5 (5 samples)	Near-slab soil gas	Five near-slab soil gas samples were collected at Bldg 283. Groundwater flow direction is to the northwest, and VOs have been detected above GWSLs in groundwater within the courtyard area of Bldg 283 and near the northwestern corner of the building. Therefore, four sample locations were biased to the walls of Bldg 283 on the northwest side of the courtyard (50SG-1:4), and one was biased to the northwestern corner of the building (50SG-5).	NJDEP – SRWM USEPA TO-15 Method

Sample Location	Sample Media	Sample Location Rationale	Analytical Suite
50IA-1 through 50IA-10 (10 samples – includes 1 duplicate sample)	Indoor air	Nine indoor air samples were collected from within Bldg 283. One additional ambient air sample was collected from outside the building. Sample locations were biased towards potential source areas and potential migration pathways.	NJDEP – SRWM USEPA TO-15 Method

3.11.4 Site Investigation Results

A total of 25 VOs were detected in soil gas samples (**Table 3.11-3**) collected in Parcel 50. Of the 25 VOs detected, two (benzene and PCE) equaled and/or exceeded NJDEP Soil Gas NRSs for soil gas samples. Benzene was detected in two of the five soil gas samples at a concentration equal to the NRS of 26 $\mu g/m^3$ (samples 50SG-2 and 3). PCE was detected in two of the five soil gas samples at concentrations greater than the NRS of 36 $\mu g/m^3$; ranging from 97.6 $\mu g/m^3$ in sample 50SG-1 to 144 $\mu g/m^3$ in sample 50SG-5.

A total of 23 VOs were detected at concentrations below NJDEP Indoor Air NRSs in indoor air samples collected in Bldg 283 (**Table 3.11-4**).

3.11.5 Summary and Conclusions

No constituents were identified above applicable NJDEP criteria in indoor air samples collected from Bldg 283. Two VOs, benzene and PCE, equaled and/or exceeded NJDEP Soil Gas NRSs in soil gas at Parcel 50. Based on NJDEP VI guidance (12), one additional round of indoor air sampling is recommended to confirm constituents are not present above criteria in indoor air at Bldg 283.

Table 3.11-2
Parcel 50 Sample and Analytical Summary

Media	Type	Field Sample #	Sample Date	Sample Time	Begin Depth	End Depth	TPHC	VO+15	B\N+15	PCBs	TAL Metals	Cyanide	Mercury	Ammonia/ Nitrate/ Nitrite	COMMENTS/VARIANCES
IA	CANISTER	50IA-1	12/09/07	11:50	--	--		X							
IA	CANISTER	50IA-2	12/09/07	11:51	--	--		X							
IA	CANISTER	50IA-3	12/09/07	11:52	--	--		X							
IA	CANISTER	50IA-4	12/09/07	12:05	--	--		X							
IA	CANISTER	50IA-5	12/09/07	12:07	--	--		X							
IA	CANISTER	50IA-6	12/09/07	12:12	--	--		X							
IA	CANISTER	50IA-7	12/09/07	12:30	--	--		X							
IA	CANISTER	50IA-8	12/09/07	12:25	--	--		X							
IA	CANISTER	50IA-8 DUPLICATE	12/09/07	12:25	--	--		X							
IA	CANISTER	50IA-9	12/09/07	12:20	--	--		X							
BLANK	AMBIENT	50IA-AMBIENT	12/09/07	12:33	--	--		X							
SG	CANISTER	50SG-1	12/12/07	13:45	5.0	5.0		X							
SG	CANISTER	50SG-2	12/12/07	14:25	5.0	5.0		X							
SG	CANISTER	50SG-3	12/12/07	15:05	5.0	5.0		X							
SG	CANISTER	50SG-4	12/12/07	15:55	5.0	5.0		X							
SG	CANISTER	50SG-5	12/12/07	12:40	5.0	5.0		X							

X = Sample analyzed for the indicated analytical parameter suite

Table 3.11-3
Fort Monmouth ECP Site Investigation, Parcel 50
Summary of Analytical Parameters Detected in Indoor Air (µg/m^3)

Chemical	RAL[3]	IA Non-residential[2]	Analytical Results					
		Sample ID:	50IA-1	50IA-2	50IA-3	50IA-4	50IA-5	50IA-6
		Lab ID:	J78674-1	J78674-2	J78674-3	J78674-4	J78674-5	J78674-6
		Date Sampled:	12/09/07	12/09/07	12/09/07	12/09/07	12/09/07	12/09/07
			Result	Result	Result	Result	Result	Result
Volatiles								
Acetone	6,600	4,600	**4.5**	**4.3**	**11**	**8.1**	**7.8**	**7.1**
Benzene	14	2	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**	**1.1**
Chloromethane	NLE	130	**0.97**	**0.95**	**1.0**	**1.0**	**1.0**	**1.0**
Dichlorodifluoromethane	NLE	260	**2.2**	**2.2**	**2.5**	**2.3**	**2.4**	**2.3**
Dichloromethane	400	9	**1.1**	**0.52 J**	**0.80**	**0.49 J**	**0.52 J**	**0.52 J**
Ethanol	NLE	NLE	**4.7**	**6.2**	**4.1**	**18**	**16**	**14**
Ethyl Acetate	NLE	NLE	<0.3	**2.7**	**4.0**	**1.8**	<0.3	<0.3
Ethylbenzene	2,200	1,500	<0.083	<0.083	<0.083	<0.083	<0.083	<0.083
n-Heptane	NLE	NLE	<0.13	<0.13	<0.13	**0.61 J**	**0.57 J**	<0.13
Isopropyl Alcohol	NLE	NLE	**0.76**	**0.64**	**1.1**	**2.3**	**15**	**12**
Methyl ethyl ketone	NLE	7,200	**0.41 J**	**0.53 J**	**1.4**	**0.86**	**0.94**	**0.94**
Propylene	NLE	NLE	**2.1**	**1.9**	**2.2**	<0.12	<0.12	<0.12
Tetrahydrofuran	NLE	NLE	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	10,000	7,200	**2.0**	**2.1**	**1.9**	**2.1**	**2.1**	**2.2**
1,1,1-Trichloroethane	NLE	1,400	<0.27	<0.27	<0.27	**0.87 J**	<0.27	<0.27
1,1,2-Trichloro-1,2,2-trifluoroethane	NLE	44,000	<0.25	<0.25	**0.77 J**	<0.25	<0.25	<0.25
Trichloroethylene	20	3	<0.16	<0.16	<0.16	<0.16	<0.16	<0.16
Trichlorofluoromethane	NLE	1,000	**1.3**	**1.2**	**1.3**	**1.5**	**2.0**	**2.0**
1,2,4-Trimethylbenzene	NLE	NLE	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
1,3,5-Trimethylbenzene	NLE	NLE	<0.088	<0.088	<0.088	<0.088	<0.088	<0.088
o-Xylene	NLE	NLE	**0.61 J**	**0.43 J**	**0.43 J**	**0.37 J**	<0.096	**0.48 J**
Xylenes (m&p)	NLE	NLE	**1.4**	**1.1**	**1.2**	**1.0**	**0.96**	**1.2**
Xylenes (total)	220	150	**2.0**	**1.6**	**1.7**	**1.4**	**0.96**	**1.7**

[1] NJDEP Generic Vapor Intrusion Screening Levels, Indoor Air Screening Levels, Residential, March 2007.

[2] NJDEP Generic Vapor Intrusion Screening Levels, Indoor Air Screening Levels, Nonresidential, March 2007. Results were compared to these levels.

[3] NJDEP Rapid Action Levels for Indoor Air, March 2007.

J = Indicates an estimated value.

DUP = Duplicate Sample

NLE = No Limit Established

Bold = Analyte detected

Shaded = Concentration exceeds of IA Nonresidential.

Table 3.11-3
Fort Monmouth ECP Site Investigation, Parcel 50
Summary of Analytical Parameters Detected in Indoor Air (µg/m^3)

Chemical	RAL[3]	IA Non-residential[2]	Analytical Results				
		Sample ID:	50IA-7	50IA-8	50IA-8 DUP	50IA-9	50IA-AMBIENT
		Lab ID:	J78674-7	J78674-8	J78674-9	J78674-10	J78674-20
		Date Sampled:	12/09/07	12/09/07	12/09/07	12/09/07	12/09/07
			Result	Result	Result	Result	Result
Volatiles							
Acetone	6,600	4,600	**8.3**	**6.9**	**4.0**	**7.8**	**4.5**
Benzene	14	2	**1.2**	**1.2**	**1.2**	**1.1**	**1.2**
Chloromethane	NLE	130	**1.0**	**1.1**	**1.1**	**1.2**	**1.1**
Dichlorodifluoromethane	NLE	260	**2.3**	**2.3**	**2.6**	**2.7**	**2.7**
Dichloromethane	400	9	**0.52 J**	**0.52 J**	**0.49 J**	**0.56 J**	**0.76**
Ethanol	NLE	NLE	**18**	**6.2**	**3.2**	**19.2**	**5.7**
Ethyl Acetate	NLE	NLE	**2.6**	**2.5**	**4.7**	<0.3	**1.4**
Ethylbenzene	2,200	1,500	**0.78 J**	<0.083	<0.083	**0.42 J**	<0.083
n-Heptane	NLE	NLE	**0.49 J**	<0.13	**0.40 J**	**0.49 J**	<0.13
Isopropyl Alcohol	NLE	NLE	**2.1**	**1.7**	<0.15	**2.7**	**0.76**
Methyl ethyl ketone	NLE	7,200	**2.2**	**0.77**	**0.56 J**	**0.97**	**0.68**
Propylene	NLE	NLE	<0.12	<0.12	**2.2**	<0.12	**2.2**
Tetrahydrofuran	NLE	NLE	**0.83**	<0.2	<0.2	<0.2	<0.2
Toluene	10,000	7,200	**3.4**	**2.0**	**1.9**	**2.1**	**2.0**
1,1,1-Trichloroethane	NLE	1,400	<0.27	<0.27	<0.27	<0.27	<0.27
1,1,2-Trichloro-1,2,2-trifluoroethane	NLE	44,000	<0.25	<0.25	<0.25	<0.25	<0.25
Trichloroethylene	20	3	<0.16	<0.16	<0.16	<0.16	**0.64 J**
Trichlorofluoromethane	NLE	1,000	**2.4**	**1.3**	**1.4**	**2.6**	**1.4**
1,2,4-Trimethylbenzene	NLE	NLE	**2.1**	<0.1	<0.1	**1.2**	<0.1
1,3,5-Trimethylbenzene	NLE	NLE	**0.48 J**	<0.088	<0.088	<0.088	<0.088
o-Xylene	NLE	NLE	**1.1**	**0.40 J**	**0.40 J**	**0.43 J**	**0.40 J**
Xylenes (m&p)	NLE	NLE	**2.7**	**1.0**	**1.1**	**1.3**	**1.1**
Xylenes (total)	220	150	**3.9**	**1.4**	**1.5**	**1.7**	**1.5**

[1] NJDEP Generic Vapor Intrusion Screening Levels, Indoor Air Screening Levels, Residential, March 2007.

[2] NJDEP Generic Vapor Intrusion Screening Levels, Indoor Air Screening Levels, Nonresidential, March 2007. Results were compared to these levels.

[3] NJDEP Rapid Action Levels for Indoor Air, March 2007.

J = Indicates an estimated value.

DUP = Duplicate Sample

NLE = No Limit Established

Bold = Analyte detected

Shaded = Concentration exceeds of IA Nonresidential.

Table 3.11-4
Fort Monmouth ECP Site Investigation, Parcel 50
Summary of Analytical Parameters Detected Soil Gas (ug/m^3)

		Analytical Results				
	Sample ID:	50SG-1	50SG-2	50SG-3	50SG-4	50SG-5
	Lab ID:	J79249-6	J79249-7	J79249-8	J79249-9	J79249-5
	Date Sampled:	12/12/07	12/12/07	12/12/07	12/12/07	12/12/07
	Depth (ft. bgs):	5'	5'	5'	5'	5'
Chemical	SG Non-residential[2]	Result	Result	Result	Result	Result
Volatiles						
Acetone	230,000	**102**	**40.6**	**60.6**	**14**	**24.5**
Benzene	26	**22**	**26**	**26**	<0.7	<0.7
Carbon disulfide	51,000	**6.2**	**4.7 J**	**4.4 J**	**3.4 J**	**6.5**
Cyclohexane	430,000	**6.2**	**11**	**6.9**	<1.2	<1.2
Ethanol	NLE	**50.3**	<2.3	**26.6**	**34.3**	**25.4**
Ethylbenzene	74,000	**8.3**	**6.1 J**	**4.8 J**	<0.65	**3.6 J**
4-Ethyltoluene	NLE	**6.4 J**	<0.69	<0.69	<0.69	<0.69
n-Heptane	NLE	**20**	**32**	**32**	<0.98	<0.98
n-Hexane	51,000	**40.9**	**79.3**	**56.0**	<0.99	<0.99
2-Hexanone	NLE	**4.9 J**	<1.6	<1.6	<1.6	<1.6
Isopropyl Alcohol	NLE	**5.7**	<1.2	<1.2	<1.2	**9.8**
4-Methyl-2-pentanone (MIBK)	220,000	**8.2**	<0.82	<0.82	<0.82	<0.82
Methyl ethyl ketone	360,000	**4.7**	<0.91	<0.91	<0.91	<0.91
Methyl tertiary butyl ether (MTBE)	180	**6.1**	<1.3	<1.3	<1.3	<1.3
Propylene	NLE	**15**	**20.4**	**14**	**5.7 J**	**12**
Tertiary Butyl Alcohol	4,600	<1.1	<1.1	<1.1	**3.0 J**	<1.1
Tetrachloroethylene	36	**97.6**	**9.5 J**	**14**	<1.3	**144**
Toluene	360,000	**55.8**	**62.6**	**56.9**	**8.7**	**8.7**
Trichloroethylene	27	<1.3	**9.7**	<1.3	<1.3	**26**
1,2,4-Trimethylbenzene	NLE	**35**	**7.4 J**	<0.84	**6.4 J**	**17**
1,3,5-Trimethylbenzene	NLE	**7.9**	<0.69	<0.69	<0.69	<0.69
2,2,4-Trimethylpentane	NLE	**22**	**38**	**34**	**8.4**	<0.75
Xylenes (m&p)	NLE	**36**	**24**	**20**	**7.8**	**18**
o-Xylene	NLE	**13**	**8.3**	**6.9**	<0.74	**7.4**
Xylenes (total)	7,700	**49.5**	**32**	**27**	**7.8**	**25**

[1] NJDEP Generic Vapor Intrusion Screening Levels, Soil Gas Screening Levels, Residential, March 2007.

[2] NJDEP Generic Vapor Intrusion Screening Levels, Soil Gas Screening Levels, Nonresidential, March 2007. Results were compared to these levels.

(a) = Sum of cis-1,2-Dichloroethylene and trans-1,2-Dichloroethylene.

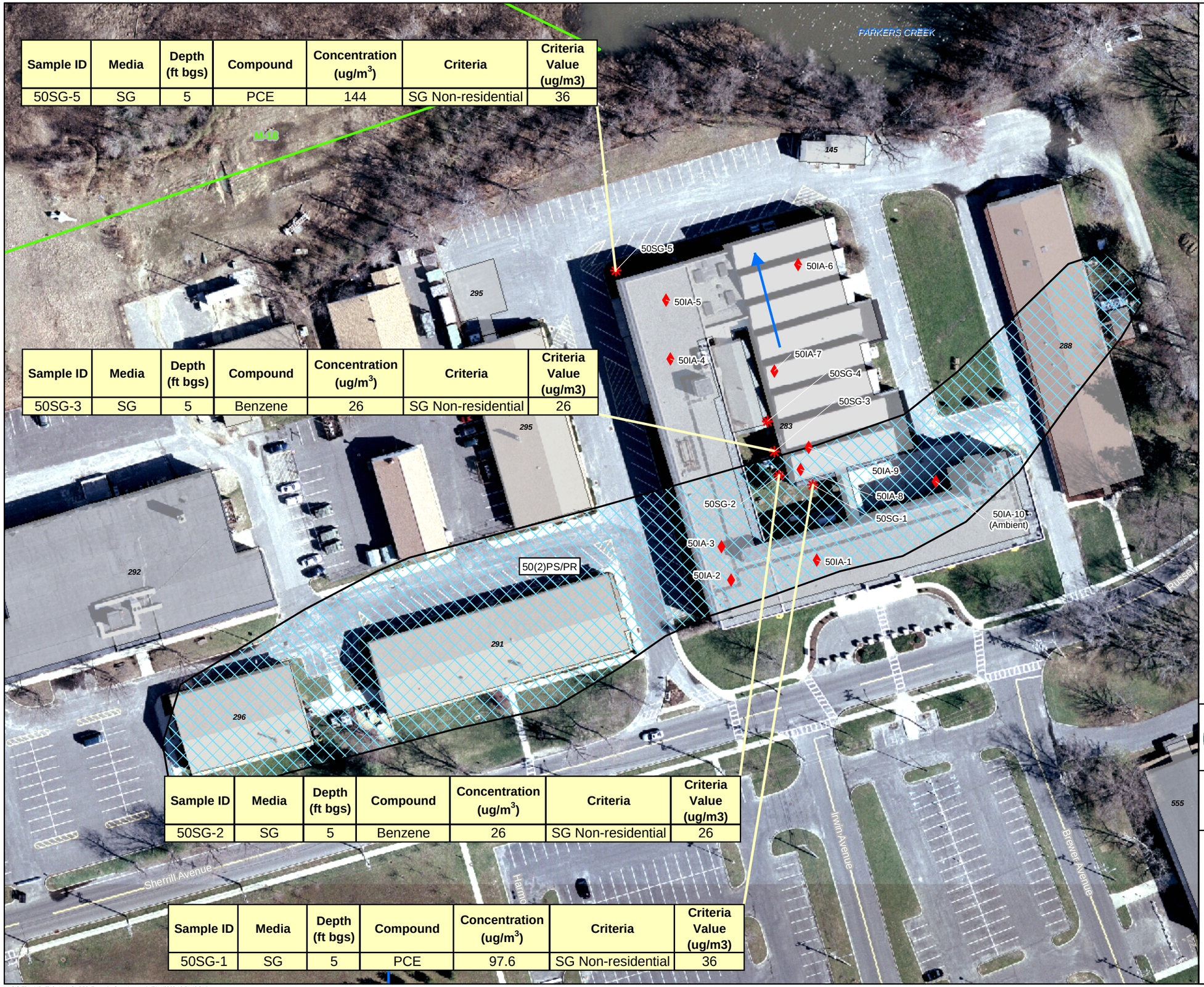
J = Indicates an estimated value.

DUP = Duplicate Sample

NLE = No Limit Established

Bold = Analyte detected.

Shaded = Concentration exceeds SG Nonresidential.



Sample ID	Media	Depth (ft bgs)	Compound	Concentration (ug/m^3)	Criteria	Criteria Value (ug/m3)
50SG-5	SG	5	PCE	144	SG Non-residential	36

Sample ID	Media	Depth (ft bgs)	Compound	Concentration (ug/m^3)	Criteria	Criteria Value (ug/m3)
50SG-3	SG	5	Benzene	26	SG Non-residential	26

Sample ID	Media	Depth (ft bgs)	Compound	Concentration (ug/m^3)	Criteria	Criteria Value (ug/m3)
50SG-2	SG	5	Benzene	26	SG Non-residential	26

Sample ID	Media	Depth (ft bgs)	Compound	Concentration (ug/m^3)	Criteria	Criteria Value (ug/m3)
50SG-1	SG	5	PCE	97.6	SG Non-residential	36

LEGEND

- Soil-Gas Sample Location
- Indoor Air Sample Location
- Generalized Groundwater Flow Direction. Direction of Generalized Groundwater Flow derived from qualitative evaluation of surface topography, surface water features, and pre-existing IRP site groundwater potentiometric maps where available.
- Building
- IRP Site Boundary

ECP PARCEL CATEGORY DEFINITIONS

2 — Areas where only release or disposal of petroleum products has occurred.

BRAC PARCEL LABEL DEFINITIONS

8(2)PS
- CONTAMINATION DESCRIPTION
  - HS - Hazardous Substance Storage
  - HR - Hazardous Substance Release
  - PS - Petroleum Storage
  - PR - Petroleum Release
  - (P) - Possible Release or Disposal
- CATEGORY NUMBER
- PARCEL NUMBER

N

SCALE:
0 37.5 75 150 Feet

Base Realignment and Closure 2005

U.S. Army Corps of Engineers

Shaw® Shaw Environmental, Inc.

FIGURE 3.11-1

FORT MONMOUTH ECP
SITE INVESTIGATION

PARCEL 50 SAMPLE LOCATIONS
AND CONSTITUENTS OF CONCERN

MAIN POST
FORT MONMOUTH
NEW JERSEY

ArcGIS File: MP_Fig3_11-1_SI_P50_Exceeds_SampLoc.mxd (7/14/2008 12:51:46 PM)

DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY GARRISON FORT MONMOUTH
FORT MONMOUTH, NEW JERSEY 07703-5000

REPLY TO
ATTENTION OF

Directorate of Public Works

Mr. Larry Quinn, Site Manager
New Jersey Department of Environmental Protection
Bureau of Investigation, Design and Construction
401 East State Street, P.O. Box 413
Trenton, New Jersey 08625-0413

OCT 2 2 2010

Re: Site 283 (FTMM-61) Remedial Action Progress Report
March 2004 through December 2008 (2nd Quarter 2004 – 4th Quarter 2008)
Dated: July 2010
Fort Monmouth, New Jersey

Dear Mr. Quinn:

U.S. Army Fort Monmouth, New Jersey is pleased to submit the *Remedial Action Progress Report* (RAPR) for Site 283 (FTMM-61), Fort Monmouth, New Jersey. This RAPR was prepared in accordance with the voluntary cleanup agreement between U.S. Army and the New Jersey Department of Environmental Protection (NJDEP) dated August 2000, and the NJDEP's *Technical Requirements for Site Remediation*, New Jersey Administrative Code 7:26E-6.5 (February 2002). Enclosed please find the Electronic Data Delivery (EDD) documents and the completed RAPR Checklist.

Should you have any questions or require any additional information, please contact Mr. Charles Appleby, Environmental Protection Specialist, at 732-532-2692 or email: **Charles.Appleby@US.Army.mil**

Sincerely,

Joseph M. Fallon

Joseph M. Fallon, CHMM
Chief, Environmental Division

Encl. 1: RAPR, (2nd Quarter 2004 through 4th Quarter 2008)
Encl. 2: Completed RAPR Checklist
Encl. 3: EDD, one disk

Encl. 2, Completed RAPR Checklist

SRP CHECKLIST:		REMEDIAL ACTION PROGRESS REPORT 2nd Quarter 2004 through 4th Quarter 2008 Site 283 (FTMM-61)		
	N.J.A.C. 7:26E-	**Use this checklist to assure that the remedial action progress report is complete and meets all technical requirements.**	**Included: Yes/No/NA**	**Page #**
	6.6(a)	Have progress reports been submitted as required?	NA	
	6.6(b)1	Is a description of each remedial action included and adequate?	Yes	3-1
	6.6(b)2	Is a discussion of problems and proposal for correction included and adequate?	NA	
	6.6(b)3	Are proposals for deviation from approved WP adequately addressed?	NA	
		6.3(e)3iii If requesting to reduce sampling frequency have the requirements at 6.3(e)3iii and in Appendix C been met?	NA	
	6.6(b)4	Is a revised schedule included and adequate?	Yes	6-2 & App.J
	6.6(b)5	Is the status of permit applications included and adequate?	Yes	3-1
	6.6(b)6	Is a list of upcoming remedial actions included and adequate?	Yes	6-2 & App.J
	6.6(b)7	Is the cost of each remedial action adequately documented?	Yes	6-1 & App.J
	6.6(b)8	Is a table of sampling results, summary of data and conclusions included and adequate?	Yes	6-1 & Tables Section
	6.6(b)9	Is information for active GW remediation included and adequate?	NA	
		6.6(b)9i Has a ground water Contour Map Reporting Form (Appendix G) been completed and included?	Yes	Figures Section
	6.6(b)10	Is information for natural GW remediation included and adequate?	Yes	3-1 & 4-1
	6.6(b)11	Is a description of wastes generated included and adequate?	Yes	4-2
	6.6(b)12	Has other important information been included:	NA	
		If not previously provided, has a map of the CEA been included along with a CEA Factsheet from Appendix F?	NA	
		If the RAPR includes a proposal to revise the CEA, has all the necessary information per 6.3 and Appendix F been included?	NA	
		Does the report indicate whether biennial certifications have been submitted for CEAs &/or DERs?	NA	

United States Army
Fort Monmouth, New Jersey

Site 283 (FTMM-61)
Remedial Action Progress Report
(2nd Quarter 2004 through 4th Quarter 2008)
NJDEP Case Number # 97-08-28-1330-33

U.S. Army Garrison Fort Monmouth, Main Post
Fort Monmouth, New Jersey

Prepared By:

VEETech, P. C.

113 Centrewest Court
Cary, N.C. 27513
919-388-0037

Work Order No. 1042-06-017

July 2010

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Appendix B Roy F. Weston, Inc., December 1995, *Final Site Investigation, Main Post and Charles Wood Areas, Fort Monmouth, New Jersey.*
Appendix C SMC Environmental Services Group, September 1998, *Underground Storage Tank Closure and Site Investigation Report, Building 283B, Main Post-West Area, NJDEP Registration No. 0081533-59*
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Appendix E Versar Inc. (VERSAR), October, 2005, *Site 283 Remedial Investigation Report and Remedial Action Work Plan (RIR/RAWP), Fort Monmouth, New Jersey*.
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EXECUTIVE SUMMARY

This *Remedial Action Progress Report* (RAPR) documents the quarterly sampling of six monitoring wells at Site 283 (FTMM-61) from the 2nd Quarter 2004 through the 4th Quarter 2008 (Rounds 20 through 38) to monitor the progress of the natural attenuation program in reducing contaminant levels in ground water.

Site 283 is located in the north portion of the Main Post at the intersection of Sherrill and Brewer Avenues. It is located approximately 200 feet south of the Parkers Creek. The only access road to the site is from Sherrill Avenue in the south. Building 283 and associated parking areas currently occupy the area defined as Site 283, which encompasses approximately 2.75 acres. On August 28, 1997 following the removal of a UST, a spill was reported to the NJDEP andthe Case Number 97-08-28-1330-33 was assigned to Site 283.

Ground water monitoring of the site identified concentrations of three Volatile Organic Compounds (VOCs) and one metal greater than the Ground Water Quality Standard (GQCS) for Class II-A aquifers. The *Remedial Investigation Report/Remedial Action Work Plan* (RIR/RAWP) was submitted by Versar, Inc. (VERSAR) in October 2005. The RIR identified benzene, ethylbenzene, total xylenes and lead as four Contaminant of Concerns (COCs) at Site 283. The VERSAR RIR/RAWP also requested NJDEP approval for the injection of ORC Advanced into ground water to remediate three aromatic hydrocarbon COCs. On October 24, 2007, Mr. Larry Quinn of NJDEP issued an approval letter to the DPW which constitutes a Permit-by-Rule for a discharge to ground water.

Analytical results for three monitoring wells during the current reporting period were greater than the New Jersey Department of Environmental Protection (NJDEP) GQCS for benzene, ethylbenzene, total xylenes or lead (283MW02, 283MW03, and 283MW04). Dibromochloromethane was detected greater than the GQCS in 283MW04 and 283MW05, and bromodichloromethane was detected greater than the GQCS in 283MW05; however, bothchlorinated compounds were not considered as COCs in previous reports. The detection of dibromochloromethane and bromodichloromethane could be from upgradient sources. Neither of these chlorinated compounds were detected in the most recent four quarters of sampling for 2008.

Surface water sampling results were compared to the appropriate freshwater or saline water NJDEP Surface Water Quality Standard (SWQS). Analytical results for three surface water sample locations during the current reporting period were greater than the NJDEP SWQS for trichloroethene, tetrachloroethene, lead, and arsenic. All these compounds were not considered as COCs except lead. Lead was detected greater than the SWQS in surface water sample (SS-15) in one quarterly event of the 19 included in this reporting period. This lead concentration was greater than the fresh water SWQS of 5 µg/L.

COC levels have decreased substantially in monitoring wells where concentrations were greater than the GQCS. However, monitoring results continue to detect concentrations of COCs greater than their respective GQCS. VEETech recommends that the Directorate of Public Works (DPW) continue quarterly ground water sampling and monitoring activities.

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1.0 INTRODUCTION

A natural attenuation program with Long Term Monitoring (LTM) to remediate the three VOC COCs, benzene, ethylbenzene, and total xylenes, at Site 283 (FTMM-61), located at Fort Monmouth, New Jersey, is being conducted in accordance with the RAWP prepared by VERSAR in October 2005.

The U.S. Army Garrison Fort Monmouth, DPW and Chenega Technology Services Corporation issued the contract under Chenega purchase order number C06-02456 to VEETech, P.C. (VEETech) to prepare this RAPR. The report documents ground water (Rounds 20 through 38) and surface water (Rounds 31 through 49) monitoring during the current reporting period of the 2nd Quarter 2004 through the 4th Quarter 2008.

1.1 Objectives

The objective of this RAPR is to document the implementation of remedial action program performed at Site 283 during the current reporting period of the 2nd Quarter 2004 through the 4th Quarter 2008. Monitored natural attenuation with a long-term ground water monitoring program was implemented by the DPW as a Remedial Action (RA) based on the recommendations found in the RIR/RAWP, prepared by VERSAR, dated October 2005. The purpose of the RA was to monitor the natural attenuation of the contaminant-affected area at the site as the contaminant concentrations degrade to comply with the NJDEP Class II-A aquifer GQCS. The remedial activities were conducted in accordance with the NJDEP *Technical Requirements for Site Remediation* (September 2, 2008), N.J.A.C. 7:26E *et seq*. and the Site 283 RIR/RAWP.

The RA and subsequent preparation of this RAPR encompassed the following:

- Conducting quarterly rounds of ground water and surface water sampling and documenting the results to evaluate the effectiveness of the RA,
- Comparing the results of the ground water sampling to the NJDEP GQCS,
- Comparing the results of the surface water sampling to the applicable NJDEP SWQS,
- Identifying and discussing recommendations with the DPW for the continuation of this RA, and
- Documenting remedial activities as required by the NJDEP *Technical Requirements for Site Remediation*, N.J.A.C. 7:26E *et seq*.

1.2 Report Organization

Section 2.0 discusses the site history and background information for Site 283. Section 3.0 discusses the remedial activities (natural attenuation) conducted at Site 283. Section 4.0 discusses ground water monitoring and sampling activities at the site. Section 5.0 presents the analytical results of the ground water sampling. Section 6.0 discusses the effectiveness of the RA and provides recommendations to the DPW for Site 283. Section 7.0 is the reference section.

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2.0 SITE BACKGROUND

The following sections describe the site background of Site 283. Included is a description of the site location, site history, background investigations, and previous RAPRs.

2.1 Site Location and Description

Fort Monmouth is located in the central-eastern portion of New Jersey in Monmouth County, approximately 45 miles south of New York City and 70 miles northeast of Philadelphia (Figure 2-1). Site 283 is located in the north portion of the Main Post at the intersection of Sherrill Avenue and Brewer Avenue. It is located approximately 200 feet south of the Parkers Creek. The only access road to the site is from Sherrill Avenue in the south. Building 283 and associated parking areas, currently occupy the area defined as Site 283, which encompasses approximately 2.75 acres. The environmental setting (regional/local geology and hydrogeology) of Site 283 is described in VERSAR's RIR/RAWP, dated October 2005.

2.2 Site History and Background Investigations

In early 1990s, the DPW developed an underground storage tank (UST) program for managing approximately 525 USTs throughout the Fort Monmouth installation (Main Post, and Charles Wood areas). This program was created to work toward replacing the use of heating oil as a major energy source with natural gas. The program also included the closure of regulated waste oil and gasoline USTs.

On August 28, 1997 following the removal of a UST, a spill was reported to the NJDEP and the Case Number 97-08-28-1330-33 was assigned to Site 283. Three steel USTs (Nos. 0081533-58, 0081533-59, and 0081533-229) located near Building 283, were cleaned, excavated and disposed in accordance with the NJDEP requirements. One 1,000 gallon #2 fuel oil UST was installed in 1958 and removed on May 28, 1990. One 10,000 gallon #2 fuel oil UST was installed in 1961 and removed on August 11, 1997. One 3,000 gallon gasoline UST with an unknown installation date was removed on August 28, 1997. A No Further Action (NFA) Letter dated February 24, 2000 was received from the NJDEP. The UST Report Certification Forms along with the UST Status Summary Reports for three USTs are located in Appendix A.

In 1995, the DPW submitted a *Site Investigation* (SI) report to the NJDEP (Weston, 1995) for the Main Post and Charles Wood areas. As part of the DPW's UST management program, two gasoline tank closure reports (September 1998 and October 2000) have been submitted to the NJDEP for USTs in the immediate vicinity of Site 283. Both reports and investigations have been summarized in the following subsections.

The October 2000 UST report also includes the SI report for the Site 283 detailing the installation of three monitoring wells (283MW01, 283MW02, and 283MW03) and results of a LTM program for Site 283. The LTM covered sampling activities carried out at three monitoring wells between 1999 and 2000. One monitoring well (283MW02) was installed in July 1999 and two monitoring wells (283MW01 and 283MW03) were installed in March 2000.

The remaining three monitoring wells (283MW04, 283MW05 and 283MW06) at the site were installed by the DPW in October 2004 as part of further investigation at the site. The wells are identified on the Site Layout Map (Figure 2-2).

2.2.1 Site Investigation Report, 1995 – Weston

Weston prepared a SI report in December 1995 titled, *Site Investigation, Main Post and Charles Wood Area Report, Fort Monmouth, New Jersey*(Appendix B). As part of the SI for Fort Monmouth military installation, Weston conducted soil sampling, monitoring well installation, ground water sampling and geophysical surveying. In addition to soil and ground water sampling at different sites throughout the Main Post and Charles Wood areas of Fort Monmouth, Weston established background concentrations for soil and ground water for Fort Monmouth installation. These background concentrations have been used by the DPW for comparing sample results for native constituents of soil and ground water. The area M-18 in the SI report is identified as the area immediately north of the Building 283. Nine soil borings were placed in the area M-18; two soil samples were collected from each of the soil boring. Two of the soil borings were converted into monitoring wells and one ground water sample was collected from each well. In the ground water results tables included in the 1995 Weston SI report, Weston identified six metals (aluminum, arsenic, iron, manganese, sodium and lead) at concentrations greater than the NJDEP GQCS. Lead was the only constituent which was considered as a COC, and the remaining metal exceedances were considered as background concentrations.

2.2.2 UST Closure and Site Investigation Report, 1998 – SMC

SMC Environmental Services Group (SMC) prepared an UST Closure and SI report in 1998 titled, *Underground Storage Tank Closure and Site Investigation Report-Building 283B* (Appendix C). This report documented that on August 11, 1997, a 10,000-gallon tar-coated steel UST, located on the north side of Building 283, was closed and removed in accordance with NJDEP UST closure procedures. The NJDEP Registration No. 0081533-59 for this UST identified a 10,000-gallon capacity No. 2 fuel oil tank.

The post-excavation soil sampling results did not identify contaminated soils. Analysis for Total Petroleum Hydrocarbon (TPHC) was conducted, and concentrations did not exceed the NJDEP standard at the former location of the UST or associated piping. No further action was proposed regarding the UST closure and site assessment, and a Closure Approval Letter dated February 24, 2000 was received from the NJDEP. There is not a perceived or implied association between the location of the former UST and the environmental conditions at Site 283 addressed within this report.

2.2.3 UST Closure and Site Investigation Report, 2000 – VERSAR

VERSAR prepared an UST Closure and SI report in 2000 titled, *Underground Storage Tank Closure and Site Investigation Report- Building 283C* (Appendix D). This report documented that on August 28, 1997, a 3,000-gallon steel UST, located on the south side of Building 283, was closed and removed in accordance with NJDEP UST closure procedures. The NJDEP Registration No. 0081533-229 for this UST identified a 3,000-gallon capacity gasoline storage tank.

Following removal, numerous holes were observed in the UST during inspection by the subsurface evaluator. Soils at the location of the holes were dark in color and appeared to be contaminated. Ground water was encountered at 8 feet below ground surface (bgs) and a sheen was observed on the ground water. Following the removal of the UST, a spill was reported to the NJDEP and case no. 97-08-28-1330-33 was assigned.

Approximately 398 cubic yards of potentially contaminated soil to a maximum depth of 14 feet were removed and disposed off-site from September 3, 1997 to October 3, 1997. During the six rounds of post-excavation soil sampling and the one round of Geoprobe soil sampling, a total of 40 soil samples were collected and analyzed for TPHC, VOC plus 15 tentatively identified compounds (TICs), and lead. Six VOCs were detected in soil samples (acetone, benzene, ethylbenzene, methylene chloride, toluene, and total xylenes). Benzene was detected at concentrations greater than the NJDEP Residential Direct Contact Soil Cleanup Standard (RDCSCS) of 3 mg/kg in four of 13 soil samples collected on September 3, 1997, at a maximum concentration of 21 mg/kg. TPHC was detected in 19 of the 40 samples at concentration less than NJDEP cleanup standard of 10,000 mg/kg. Lead was detected in 11 of 40 soil samples less than the RDCSCS of 40 mg/kg at a maximum concentration of 59.38 mg/kg.

In response to post excavation soil sampling results, one monitoring well (283MW02) was installed on July 28, 1999 and two additional monitoring wells (283MW01 and 283MW03) were installed on March 28, 2000. Ground water samples from five sampling rounds at 283MW02 and two sampling rounds at 283MW01 and 283MW03 collected between September 1999 and August 2000 were analyzed for VOCs plus 15 TICs, semi-volatile organic compounds (SVOCs) plus 15 TICs, pesticides, polychlorinated biphenyls (PCBs), and Target Analyte List (TAL) metals. Sampling results indicated that benzene, ethylbenzene, total xylenes, aluminum, iron, and lead were detected at concentrations greater than their respective NJDEP GQCS. Ground water flow direction was determined to be toward the northwest direction.

2.2.4 Remedial Investigation Report / Remedial Action Work Plan (RIR/RAWP), 2004 – VERSAR

VERSAR submitted a RIR/RAWP to Fort Monmouth in October 2005 (Appendix E). Fort Monmouth DPW conducted a RI, including a ground water sampling program, to define the aerial extent of potential contaminants and evaluate impacts to ground water in the vicinity of Site 283 and the former UST locations. As part of the RI, a quarterly ground water sampling program was conducted from September 1999 through February 2004 at Site 283.

During the 21 quarterly sampling events, three VOCs and eight TAL metals were detected in ground water samples at concentrations greater than their respective NJDEP GQCS. Based on frequency and concentration levels, benzene, ethylbenzene, total xylenes and lead were identified as COCs at Site 283. *Tert*-butyl alcohol (TBA) and methyl *tert*-butyl ether (MTBE) were analyzed for and not detected during the 21 quarterly sampling events. The RI also included collection of ground water samples for wet chemistry analyses, ground water depth measurements, performance of slug tests, evaluation of aquifer classification, and the completion of a sensitive receptor survey.

The October 2005 report by Versar recommended continued ground water monitoring and sampling to be included in future RAPRs. It recommended the construction of three additional ground water monitoring wells (283MW04, 283MW05 and 283MW06) and the collection of surface water samples at locations in Parkers Creek, which is north of Site 283.These samples were to be analyzed for VOCs and TAL metals.

2.2.5 DPW Response to October 24, 2007 NJDEP Comments

DPW responded to NJDEP's October 24, 2007 comments on the RIR/RAWP. A copy of the response correspondence letter is included in Appendix F.

3.0 REMEDIAL ACTIVITIES

No remedial actions were completed during this reporting period. Sampling results documented in VERSAR's RIR/RAWP (October 2005) for Site 283 indicated that the shallow ground water contained three VOC COCs (benzene, ethylbenzene, and total xylenes) and one metal COC (lead) at concentrations that were greater than the NJDEP GQCS. In Section 8.0 of the RIR/RAWP entitled Remedial Action Workplan, VERSAR requested NJDEP approval for the injection of ORC Advanced into ground water to remediate three aromatic hydrocarbon COCs reported at concentrations greater than the GQCS for a Class II-A aquifer. On October 24, 2007, Mr. Larry Quinn of the NJDEP issued an approval letter to the DPW which constitutes a Permit-by-Rule for a discharge to ground water. The existing monitoring wells (283MW01 through 283MW06) and surface water sampling locations (SS-14, SS-15 and SS-27) were adequately placed to monitor downgradient ground water and surface water; therefore, the DPW proposed natural attenuation with LTM as the remediation remedy for Site 283. Ground water and surface water samples are collected on a quarterly basis.

While COC concentrations have shown a general decreasing trend since monitoring began, statistical analysis of the source well (283MW02) COC concentrations for the current reporting period does not support the trend. The Mann-Whitney U-test was performed for benzene, ethylbenzene, total xylenes, and lead concentrations from the 1st Quarter 2007 through the 4th Quarter 2008 (Tables 3-1 through 3-4). A U-value greater than 10 was calculated, which favored the null hypothesis and the inability to conclude that COC concentrations had decreased during the reporting period.

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4.0 MONITORING AND SAMPLING ACTIVITIES

As part of the LTM program at Site 283, quarterly ground water monitoring (Rounds 20 through 38) continued from the 2nd Quarter 2004 through the 4th Quarter 2008. Ground water samples were initially collected from three monitoring wells (283MW01, 283MW02 and 283MW03) during Rounds 20 and 21. Monitoring wells 283MW04, 283MW05 and 283MW06 were not installed until October 2004 and these wells were first sampled in November 2004 (Round 22). Laboratory analytical reports for the Site 283 LTM during this reporting period are presented in Appendix G, and the analytical results are presented and discussed in the following Section 5.0 and Tables 5-1 through 5-7 of this RAPR. Static depth to water was measured to determine ground water elevations for all six monitoring wells at Site 283 during this reporting period.

As a part of the investigation, DPW conducted surface water sampling at three locations around the site to evaluate potential for off-site impact of COCs. Quarterly surface water sampling (surface water Rounds 31 through 49) continued from the 2nd Quarter 2004 through the 4th Quarter 2008. Laboratory analytical reports for surface water associated with the Site 283 during this reporting period are presented in Appendix H, and the analytical results are presented and discussed in the following Section 5.0 and Tables 5-8 through 5-11 of this RAPR.

Sampling was conducted by the DPW in accordance with the established protocols as described in the *Fort Monmouth Standard Sampling Operating Procedure* (SOP No.: SAM-0205, August 1999, Revision #1 January 2003, Revision #2 September 2004, Revision #3 January 2006, and Revision #4 April 2008, Appendix I) and the *NJDEP Field Sampling Procedures Manual,* August 2005. Ground water samples were analyzed for VOCs + 15, SVOCs + 15, Pesticides, PCBs and TAL Metals from Rounds 20 to 22. Laboratory analyses were reduced to VOCs + 15 and TAL Metals for Rounds 23 to 38. Laboratory analyses of the samples were conducted at the Fort Monmouth Environmental Testing Laboratory (FMETL), a New Jersey certified laboratory (Certification No. 13461).

4.1 Ground Water Monitoring

During this reporting period at Site 283 (2nd Quarter 2004 through the 4th Quarter 2008), ground water was encountered at elevations ranging from 2.89 to 9.98 feet greater than mean sea level (msl). Static depth-to-water from the top of the well casings were measured at each monitoring well on May 11, 2004, July 21, 2004, November 3, 2004, January 20, 2005, April 20, 2005, August 09, 2005, November 2, 2005, January 13, 2006, April 18, 2006, July 25, 2006, October 30, 2006, February 1, 2007, May 3, 2007, July 27, 2007, November 20, 2007, March 06, 2008, May 2, 2008, August 6, 2008, and October 23, 2008. Separate-phase product was not observed in the six monitoring wells during this reporting period. Figure 2-2 illustrates the locations of the monitoring wells. Depth to water measurement results are summarized in Table 4-1. Ground water elevation contour maps were generated for each round based on ground water elevations calculated for the six monitoring wells in Rounds 20 through 38. These contour maps are presented in Figures 4-1 through Figure 4-19 along with the required NJDEP contour map reporting forms.

The contour maps indicate that shallow ground water underlying Site 283 consistently flows to the north-northwest. Significant variations in ground water flow conditions were not observed through the current monitoring period.

4.2 Ground Water Sampling

Quarterly ground water sampling of the six monitoring wells was conducted by the DPW. Quality control samples for the monitoring period included 35 method blanks, 19 trip blanks, 19 field blanks, and 18 field duplicate samples.

Sampling was conducted by the DPW in accordance with the established protocols as described in the *Fort Monmouth Standard Sampling Operating Procedure* (SOP No.: SAM-0205, August 1999, Revision #1 January 2003, Revision #2 September 2004, Revision #3 January 2006, and Revision #4 April 2008, Appendix I) and the *NJDEP Field Sampling Procedures Manual,* August 2005. Sampling equipment was thoroughly decontaminated before and after each use. Following collection, the ground water samples were immediately placed in laboratory-supplied bottle ware. Sample containers were labeled, sealed, packed in ice, and transported to the FMETL under proper chain-of-custody procedures. Copies of the chain-of-custody forms and the laboratory analytical data sheets are presented in Appendix G.

A summary of the ground water sampling activities for the remediation monitoring (Rounds 20 through 38) including round numbers, well IDs, sample IDs, sample locations, collection dates, analytical parameters, and analysis methods is provided in Table 4-2. Figure 2-2 illustrates the locations of the monitoring wells. The analytical results are discussed in Section 5.1.

4.3 Surface Water Sampling

Surface water sampling was conducted by the DPW for the current reporting period as part of a base-wide surface water sampling program. A total of 57 surface water samples were collected over 19 rounds of sampling from three locations (SS-14, SS-15, and SS-27) along Parkers Creek. All the samples were analyzed by the FMETL for VOCs, PCBs, and TAL metals.

Sampling equipment was thoroughly decontaminated before and after each use. Following collection, the surface water samples were collected and immediately placed in laboratory-supplied bottle ware. Sample containers were labeled, sealed, packed in ice, and transported to the FMETL under proper chain-of-custody procedures. Copies of the chain-of-custody forms and the laboratory analytical data are presented in Appendix H.

A summary of the surface water sampling activities for surface water Rounds 31 through 49 including round numbers, sample IDs, stream sampling locations, collection dates, analytical parameters, and analysis methods is provided in Table 4-3. Figure 2-3 illustrates the locations of the surface sampling points. The analytical results are discussed in Section 5.2.

4.4 Types of Waste Generated and Disposal Methods

The waste types generated by the remedial activities included three-gallon polyethylene pails, polyethylene tubing, Teflon® bailers, mason string, and personal protective equipment (PPE). The pails were recycled, and the other materials were disposed of in accordance with the Fort Monmouth Solid Waste Management Plan.

5.0 SITE ANALYTICAL RESULTS

This section includes a summary discussion of the chemical characterization of Site 283 based on the samples collected and analyzed for the current reporting period, including nineteen quarterly rounds of ground water monitoring well and surface water samples.

5.1 Ground Water Sampling Results

Summaries of the analytical results from each of the six monitoring wells on the Site 283 for the current reporting period (Rounds 20 through 38) are summarized in Tables 5-1 through Table 5-6. Ground water summary tables include detected analytical results for Site 283 and are divided by monitoring well number and sampling date. The characterization of ground water quality at Site 283 (283MW01 through 283MW06) contains 19 quarterly ground water sampling events conducted from May 2004 through October 2008. The ground water results are compared to the NJDEP GQCS and are presented in three different tabs reflecting changes to the NJDEP standard. The first set of data is compared against the January 7, 1993 standard; the next is when a standard change occurred on November 7, 2005; followed by another standard change on July 27, 2007.

The results in the ground water summary tables include analyte detections as well as exceedances of the NJDEP GQCS, which are bolded and shaded. VOCs, metals and wet chemistry are presented as required to summarize results for detected compounds. Detections are presented in the ground water sampling result summary tables as follows:

- Xylenes are reported as total xylenes (the sum of *o*-xylene and *m,p*-xylenes).
- TICs are added and reported as a total concentration for the sum of TICs detected for VOCs and SVOCs.
- Duplicate samples are included after the respective primary sample.
- Low Flow sampling method results are identified as "LF."
- A "J" value is a concentration greater than the Method Detection Limit (MDL) but less than the Reporting Limit (RL) for VOCs.
- Estimated Results "ER" are concentrations greater than the MDL and less than the RL for metals.
- A "B" value is a compound detected in the sample and its associated blank sample.
- Sample suites that were discontinued are recorded in the footnotes along with a date of NJDEP case manager approval.
- If a particular sample suite or analyte was not detected in a monitoring well, the suite/analyte is not presented in the monitoring well summary table.

Six monitoring wells (283MW01, 283MW02, 283MW03, 283MW04, 283MW05, and 283MW06) were sampled during the current reporting period (2nd Quarter 2004 through the 4th Quarter 2008) and analyzed for VOCs, SVOCs, pesticides/PCBs, and metals. Analysis for SVOCs and pesticides/PCBs was discontinued for all six monitoring wells starting with Round 27.

VOCs

During 19 quarterly sampling events for the current reporting period, nine VOCs were detected in Site 283 ground water samples. Five VOCs (benzene, bromodichloromethane, ethylbenzene, total xylenes, and dibromochloromethane) were detected at concentrations that were greater than their respective GQCS. Four VOCs (acetone, chloroform, toluene, and styrene) were detected less than their respective GQCS.

Analytical results for the two monitoring wells (283MW02 and 283MW03) sampled during the current reporting period were greater than the NJDEP GQCS for benzene. The concentration of ethylbenzene and total xylenes were greater than the NJDEP GQCS in only one monitoring well (283MW02). Benzene, ethylbenzene and total xylenes have been identified as COCs. The concentration of dibromochloromethane was greater than the NJDEP GQCS in monitoring well 283MW04 and 283MW05 whereas the concentration of bromochloromethane was only greater than the NJDEP GQCS in monitoring well 283MW05. Dibromochloromethane and bromochloromethane are not considered as COCs, and could be from upgradient sources. Neither of the chlorinated compounds were detected in the most recent four quarters of sampling for 2008. The remaining VOCs were detected less than their respective GQCS.

SVOCs

During nineteen quarterly sampling events for the current reporting period, three SVOCs were detected in Site 283 ground water samples. All three SVOCs [bis(2-ethylhexyl) phthalate, 2-methylnapthalene, and naphthalene] were detected less than their respective GQCS.

Metals

Seven metals (arsenic, beryllium, cadmium, chromium, lead, nickel and thallium) were detected at concentrations greater than their respective GQCS. The concentrations of arsenic, beryllium, nickel and thallium were less than the maximum background concentration (89.3 µg/L for arsenic, 7 µg/L for beryllium, 187 µg/L for nickel, and 5.5 µg/L for thallium) for ground water established in the Weston (1995) report. The concentration of cadmium and chromium was greater than the maximum background concentrations (9.5 µg/L for cadmium and 191 µg/L for chromium) for one round (#22) for monitoring well 283MW04. Lead was detected greater than the maximum background concentration of 22.7 µg/L in monitoring well 283MW02 and 283MW04 for two rounds of sampling out of 19 quarterly sampling events reported.

Table 5-7 summarizes the analytical results which were greater than the GQCS during the current reporting period. Figure 5-1A illustrates the results for the COCs on the Site Layout Map.

5.1.1 Ground Water Contaminants of Concern

The following paragraphs summarize the results of the COCs, benzene, ethylbenzene, total xylenes and lead, detected greater than the GQCS during the current reporting period.

- Benzene was detected in 283MW02 at concentrations ranging from 5.34 (Round 30) to 205.3 µg/L (Round 27 duplicate). Benzene concentrations were greater than the GQCS of 1.0 µg/L in all 19 sampling rounds. Figure 5-2A illustrates the benzene concentration with time in monitoring well 283MW02, including all quarters of LTM since September 1999.
- Ethylbenzene was detected in 283MW02 at concentrations ranging from 41.77 (Round 33) to 1,006.91 µg/L (Round 22). Ethylbenzene concentrations were greater than the GQCS of 700 µg/L in five of 19 sampling rounds. Ethylbenzene was less than the GQCS in the last 11 quarters of monitoring. Figure 5-2B illustrates the ethylbenzene concentration with time throughout the LTM program in 283MW02.
- Total xylenes were detected in 283MW02 at concentrations ranging from 237.22 (Round 33) to 2,630.01 µg/L (Round 22). Total xylenes concentrations were greater than the GQCS of 1000 µg/L in eight of 19 sampling rounds. Total xylenes were less than the GQCS in the last 11 quarters. Figure 5-2C illustrates the total xylenes concentration with time throughout the LTM program in 283MW02.
- Lead was detected in 283MW02 at concentrations ranging from 5.12 (Round 30) to 32.5 µg/L (Round 20). The NJDEP GQCS for lead was 10 µg/L until Round 26 and then was revised to 5 µg/L in November of 2005 and remained 5 µg/L throughout the remainder of the current reporting period. Lead concentrations were greater than the specified GQCS in 17 of 19 sampling rounds. Lead was detected greater than the maximum background concentration of 22.7 µg/L in monitoring well 283MW02 for two rounds (Rounds 20 and 21) of sampling out of 19 sampling rounds. Figure 5-2D illustrates the lead concentration with time throughout the LTM program in 283MW02.
- Benzene was detected in 283MW03 at a concentration of 2.24 µg/L in one round of sampling out of 19 rounds. Benzene has been less than the detection limit in 283MW03 in the last 18 rounds of quarterly sampling. Figure 5-3A illustrates the benzene concentration with time throughout the LTM in monitoring well 283MW03.
- Lead was detected greater than the GQCS in one round of sampling out of 19 in 283MW03 at a concentration of 18.0 µg/L (Round 22). This lead concentration in 283MW03 was less than the maximum background concentration of 22.7 µg/L for ground water established in the Weston (1995) report. Lead was less than the GQCS in 283MW03 in the last 16 rounds of sampling. Figure 5-3B illustrates the lead concentration in 283MW03 with time throughout the LTM program.
- Lead was detected in 283MW04 at concentrations ranging from 14.0 (Round 23 duplicate) to 28 µg/L (Round 23). Lead concentrations were greater than the GQCS of 10 µg/L for these rounds in two out of 11 sampling rounds. Lead was detected greater than the maximum background concentration of 22.7 µg/L in monitoring well 283MW04 for two rounds (Rounds 22 and 23) of sampling out of 11 sampling rounds. Figure 5-4 illustrates the lead concentration in 283MW04 with time throughout the LTM program.

All other monitoring wells had benzene, ethylbenzene, total xylenes and lead concentrations that were non-detect or less than the NJDEP GQCS.

5.2 Surface Water Sampling Results

Quarterly surface water samples were collected along Mill Creek (SS-15) and Lafetra Creek (SS-14) at two upstream locations and along Parkers Creek at one downstream location (SS-27) during the current sampling period (Surface Water Rounds 31 through 49). Summaries of the analytical results from each of the surface water sample locations are summarized in Tables 5-8 through Table 5-10. Surface water summary tables include detected analytical results for three surface water sample locations and are divided by surface water sample number and sampling date. A total of 19 quarterly surface water sampling events conducted from May 2004 through October 2008. The surface water sampling results were compared to the appropriate fresh or saline NJDEP SWQS. Concentrations of VOCs and metals that were greater than their respective SWQS are summarized in Table 5-11.

The results in the surface water summary tables include analyte detections as well as exceedances of the NJDEP SWQS, which are bolded and shaded. VOCs, metals and wet chemistry are presented as required to summarize results for detected compounds. Detections are presented in the ground water sampling result summary tables as follows:

- Xylenes are reported as total xylenes (the sum of *o*-xylene and *m,p*-xylenes).
- TICs are added and reported as a total concentration for the sum of TICs detected for VOCs.
- Duplicate samples are included after the respective primary sample.
- A "J" value is a concentration greater than the MDL but less than the Reporting Limit (RL) for VOCs.
- Estimated Results "ER" are concentrations greater than the MDL and less than the RL for metals.
- A "B" value is a compound detected in the sample and its associated field blank sample.
- If a particular sample suite or analyte was not detected in a surface water sample location, the suite/analyte is not presented in the summary table.

The three surface water sample locations sampled during the current reporting period (2nd Quarter 2004 through the 4th Quarter 2008) were analyzed for VOCs, PCBs, metals, and wet chemistry. Analysis for metals was started for the three sample locations in Round 33.

VOCs

During 19 quarterly surface water sampling events for the current reporting period, 10 VOCs were detected in the three surface water samples. Two VOCs (trichloroethene and

tetrachloroethene) were detected at concentrations that were greater than their respective SWQS. Both VOCs were detected greater than SWQS at only one surface water sample location (SS-15). The remaining eight VOCs (acetone, chloroform, *cis*-1,2-dichloroethene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, methyl *tert*-butyl ether, and *tert*-butyl alcohol) were detected less than their respective SWQS.

SS-15 is approximately 3,600 feet southwest of Site 283 and is upstream of Site 283 along Mill Creek. This location is not indicative of impacts from Site 283.

PCBs

During 19 quarterly surface water sampling events for the current reporting period, PCBs were not detected in any surface water samples associated with Site 283.

Metals

Two metals (arsenic and lead) were detected at concentrations that were greater than their respective SWQS. The concentration of arsenic was greater than the NJDEP SWQS in surface water samples SS-14, SS-15 and SS-27; whereas, the concentration of lead was greater than the NJDEP SWQS only in surface water sample SS-15. However, both metals were detected less than the maximum background concentration for ground water established in the Weston (1995) report.

Table 5-11 summarizes the analytical results which were greater than the SWQS during the current reporting period. Figure 5-1B illustrates the results for the COCs on the Site Layout Map.

5.2.1 Surface Water Contaminants of Concern

The following paragraphs summarize the results of the COCs, benzene, ethylbenzene, total xylenes and lead, detected greater than the SWQS during the current reporting period.

- Benzene, ethylbenzene and total xylenes were not detected in the surface water samples associated with Site 283.
- Lead was detected in SS-15 at a concentration of 5.74 µg/L (Round 49). This lead concentration was greater than the fresh water SWQS of 5 µg/L in only one of the 19 sampling rounds. SS-15 is located upstream of Site 283 and not indicative of impacts from Site 283.

All other surface water samples had lead concentrations that were non-detect or less than the NJDEP SWQS.

5.3 Tentatively Identified Compounds (TICs)

During this reporting period, all of the six monitoring wells sampled had VOC TICs detected. Analytical results for the VOC TICs in five of these wells (283MW01, 283MW03, 283MW04, 283MW05, and 283MW06) indicated low level concentrations of one single TIC ranging from 4 to 6 µg/L. TICs were detected in 283MW02 during all 19 sampling rounds during this reporting

period. Thirteen samples from 283MW02 had TIC concentrations that were greater than either the NJDEP GQCS of 100 µg/L for an individual compound or 500 µg/L for total TIC concentrations. Table 5-12 summarizes the analytical results for the ground water TICs during this reporting period.

During this reporting period, all three surface water sample locations had VOC TICs detected at very low level concentrations of one single TIC ranging from 3 µg/L to 11 µg/L. None of the three surface water samples had TIC concentrations that were greater than either the NJDEP SWQS of 100 µg/L for an individual compound or 500 µg/L for total TIC concentrations. Table 5-13 summarizes the analytical results for the surface water TICs during this reporting period.

5.4 Ground Water Quality Assurance/Quality Control (QA/QC)

To verify the reliability of the analytical results, VEETech reviewed the holding times for each sample and the results of the analyses of 35 method blanks, 19 trip blanks, 19 field blanks, and 18 field duplicate samples for the ground water samples. The discussion below is based on QA/QC for the ground water samples. Samples were analyzed by the FMETL within the prescribed holding time requirements for the analytical method.

Method Blanks

Laboratory method blanks were prepared by the laboratory for each batch of analyses performed for Site 283. These method blanks consisted of laboratory-grade water that is processed identically to the samples and analyzed with the sample batch. A total of 35 VOC method blanks were analyzed with the Site 283 samples during this reporting period.

Acetone was detected in seven method blank samples at concentrations ranging from 0.83 (Round 33) to 7.90 µg/L (Round 32), less than the NJDEP GQCS of 6,000 µg/L for acetone. Acetone is a common laboratory contaminant and detection in the seven method blank samples is not indicative of a widespread laboratory contamination problem.

Chloroform was detected in three of the method blank samples at concentrations ranging from 0.42 (Round 13) to 0.82 µg/L (Round 22), less than the NJDEP GQCS of 70 µg/L for chloroform. Chloroform is also a common laboratory contaminant, and detection in three of the method blank samples is not indicative of a widespread laboratory contamination problem.

The COCs were not detected in any of the method blank samples.

Trip Blanks

A total of 19 trip blanks were included as part of the Site 283 sampling program for this reporting period to check for the potential for volatile organics to have been introduced into the samples during the handling process. The trip blanks were prepared by the FMETL and consisted of sample bottles filled with laboratory deionized water. The trip blanks remained with the sample bottles in coolers and were returned to the laboratory for analysis along with the ground water samples.

Acetone was detected in two of the trip blanks at concentrations of 0.83 (Round 34) and 2.65 µg/L (Round 36), less than the NJDEP GQCS of 6,000 µg/L for acetone.

Chloroform was detected in five of the trip blanks samples at concentrations ranging from 0.65 (Round 24) to 1.18 µg/L (Round 28), less than the NJDEP GQCS of 70 µg/L for chloroform.

2-Butanone was also detected in one of the trip blanks (Round 36) at a concentration of 2.94 µg/L, less than the NJDEP GQCS of 300 µg/L for 2-butanone.

The detection of acetone, chloroform and 2-butanone in trip blanks indicates that sample handling procedures, including sample containers, may have introduced VOC contamination into the sampling and analysis process. However, the COCs were not detected in any of the trip blank samples.

Field Blanks

One field blank sample was obtained during each day's sampling activities to check for potential introduction of contaminants from the field sampling and equipment decontamination procedures. A total of 19 field blanks were collected during the Site 283 sampling program during this reporting period. The field blanks were collected by rinsing deionized water, supplied by the laboratory, over the sampling equipment used for daily activities. The water was collected in clean laboratory-supplied containers and submitted for analysis along with the Site 283 ground water samples.

Acetone was detected in two of the field blanks at concentrations of 1.27 (Round 34) and 36 µg/L (Round 36), less than the NJDEP GQCS of 6,000 µg/L for acetone.

Chloroform was detected in four of the trip blanks samples at concentrations ranging from 0.65 (Round 24) to 1.06 µg/L (Round 22), less than the NJDEP GQCS of 70 µg/L for chloroform.

2-Butanone was also detected in one field blank (Round 36) at a concentration of 2.77 µg/L, less than the NJDEP GQCS of 300 µg/L for 2-butanone.

As noted for the trip blanks, these detections indicate that sample handling procedures, including sample containers, may have introduced contamination into the sampling and analysis process. However, COCs were not detected in any of the field blanks.

Duplicate Samples

A total of 18 field duplicate samples were also collected during this reporting period for the Site 283 sampling events to verify the consistency of the entire sampling and analytical procedure. One of the field duplicates collected (Round 21) was not analyzed. Multiple field duplicates were analyzed using different sample multipliers of 1, 5, 10, 20 and 50. These sample multipliers, resulted in multiple duplicate analysis sets for comparison. A total of 36 duplicate analyses results were available for comparison. The Relative Percent Differences (RPDs) for the duplicate sample analyses ranged from 0.00 percent to 144.51 percent. The average RPD for the total sets of duplicate analyses was 18.81 percent. The duplicate sample analyses indicate a high

level of precision relative to typical environmental laboratory analytical result data sets. Table 5-14 summarizes the RPD calculations for duplicate samples collected for ground water.

5.5 Surface Water QA/QC

Surface water sampling activities were conducted base-wide during a single sampling event. To verify the reliability of surface water analytical results, VEETech reviewed the holding times for each sample and the results of the analyses of 31 method blanks, 26 trip blanks, 26 field blanks, and 19 field duplicate samples for the surface water samples. The discussion below is based on QA/QC for the VOC surface water samples. Samples were analyzed by the FMETL within the prescribed holding time requirements for the analytical methods.

Method Blanks

Laboratory method blanks accompanied each batch of surface water samples. These method blanks consisted of laboratory-grade water that is processed identically to the samples and analyzed with the sample batch. A total of 31 VOC method blanks were analyzed with the base wide surface water samples.

Chloroform was detected in two of the 31 method blank samples at concentrations of 0.91 and 1.07 µg/L, less than the fresh water SWQS of 68 µg/L and saline SWQS of 2,100 µg/L. Acetone was detected in three of the 31 method blank samples at concentrations ranging from 0.82 to 1.59 µg/L. NJDEP did not establish a SWQS for acetone. Methylene chloride was detected in one of the 31 method blank samples at a concentration of 0.66 µg/L, which is less than both the fresh water SWQS (2.5 µg/L) and the saline SWQS (310 µg/L).

Acetone, chloroform, and methylene chloride are common laboratory contaminants, and the detections in a few method blank samples are not indicative of a widespread laboratory contamination problem.

COCs were not detected in the method blank samples.

Trip Blanks

A total of 26 trip blanks were included as part of base wide surface water sampling program to document that volatile organics were not introduced into the samples during the handling process. The trip blanks were prepared by the FMETL and consisted of sample bottles filled with laboratory deionized water. The trip blanks remained with the sample bottles in coolers and were returned to the laboratory for analysis along with the surface water samples.

Chloroform was detected in 7 of the 26 trip blanks at concentrations ranging from 0.34 to 1.23 µg/L, less than the SWQS. Acetone was detected in two of the 26 trip blanks at concentrations of 13.50 and 22.34 µg/L. As previously stated, chloroform and acetone are common laboratory contaminants, and the detections are not indicative of a laboratory contamination problem.

COCs were not detected in the trip blanks.

Field Blanks

One field blank sample was collected on each day to document the equipment decontamination procedures. A total of 26 field samples (e.g., field blanks) were collected during the base wide surface water sampling program. The field blanks were collected by rinsing deionized water, supplied by the laboratory, over the sampling equipment used for daily activities. The water was collected in laboratory-supplied containers and submitted for analysis along with the surface water samples.

Chloroform was detected in 7 of the 26 field blanks at concentrations ranging from 0.34 to 1.38 µg/L, which are both less than the SWQS. Acetone was detected in two of the 26 field blank samples at concentrations of 0.95 and 12.52 µg/L. Methylene chloride was detected in one of the 26 field blank samples at a concentration of 0.52 µg/L, which are is less than the SWQS.

COCs were not detected in the field blanks.

Duplicate Samples

A total of 19 field duplicate samples were also collected during the base wide surface water sampling events to verify the consistency of the entire sampling and analytical procedure. One field duplicate sample was not collected during second day of sampling for Round 35 and therefore was not included in the analytical report. Results from two of the field duplicates collected for Round 46 were not analyzed by the laboratory and, therefore, were not reported in the analytical data report for that quarter. Two field duplicate samples were collected for two days of sampling for Round 43. Stream sampling locations for field duplicate samples collected for Round 34 through Round 36 were not identified in the field notes.

The results for the duplicate samples were close to those obtained for the original samples, where locations could be identified. The RPDs for the duplicate sample analyses (where identifiable for comparison) ranged from 0.0 per cent to 57.22 percent. The average RPD for the 16 duplicates available for comparison was 16.63 percent. Based on average RPD, the QA/QC sample results indicate a high level of precision. Table 5-15 summarizes the RPD calculations for duplicate samples collected for surface water.

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6.0 REMEDIAL ACTION PROGRESS

The long-term ground water monitoring results indicate the concentrations of COCs have decreased in ground water at Site 283 as a result of natural attenuation. There is no indication the plume has migrated offsite.

6.1 Cost of Remediation Incurred To Date

The total cost to date for the annual implementation of the remedial actions performed at Site 283 is approximately $187K (Appendix J). This includes the preliminary assessment phase, site investigation, remedial investigation/feasibility study (RI/FS), remedial design (RD), long term monitoring (LTM), and reporting.

6.2 Conclusions

COCs were detected at concentrations greater than the GQCS in three monitoring wells (283MW02, 283MW03, and 283MW04) during this reporting period. COCs were less than the GQCS in the three monitoring wells (23MW01, 283MW05, and 283MW06) during this reporting period, which covers over four years of ground water monitoring.

Results from the Mann-Whitney U-test performed using COC concentrations from the source well (283MW02) sampled from the 1st Quarter 2007 through the 4th Quarter 2008 cannot conclude that the concentrations of COCs are currently decreasing. In situ treatment to inject ORC Advanced at Site 283is being considered for the future.

6.3 Recommendations

VEETech recommends that the DPW continue quarterly ground water sampling and monitoring activities, as concentrations of benzene, ethylbenzene, total xylenes, and lead in ground water continue to exceed NJDEP GQCS. Remedial action progress will be monitored and reported to the NJDEP periodically.

Surface water sampling and monitoring is also planned to continue.

6.3.1 Sampling Program

The following table provides a summary of the current quarterly ground water sampling program at Site 283. At this time, no change in the current ground water monitoring program is recommended.

Monitoring Well	Analyzed for	Recommended Future Sampling	Reason
283MW01	VOCs, Metals	Continue VOCs and lead Quarterly	Downgradient well
283MW02	VOCs, Metals	Continue VOCs and lead Quarterly	Exceedance of VOCs and Lead
283MW03	VOCs, Metals	Continue VOCs and lead Quarterly	Exceedance of Benzene and Lead
283MW04	VOCs, Metals	Continue VOCs and lead Quarterly	Exceedance of Lead

Monitoring Well	Analyzed for	Recommended Future Sampling	Reason
283MW05	VOCs, Metals	Continue VOCs and lead Quarterly	Downgradient of 283MW02
283MW06	VOCs, Metals	Continue VOCs and lead Quarterly	Upgradient of 283MW02

Surface water sampling at SS-14, SS-15, and SS-27 will also be continued.

6.4 Remedial Action Schedule

The table and Gantt Chart provided in Appendix J is a schedule summary for remedial activities at Site 283 from the Preliminary Assessment phase through the end of this reporting period and estimated into the future. This table/chart includes actual costs and schedule to date and estimated/anticipated costs and schedule projected for future activities.

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FIGURES

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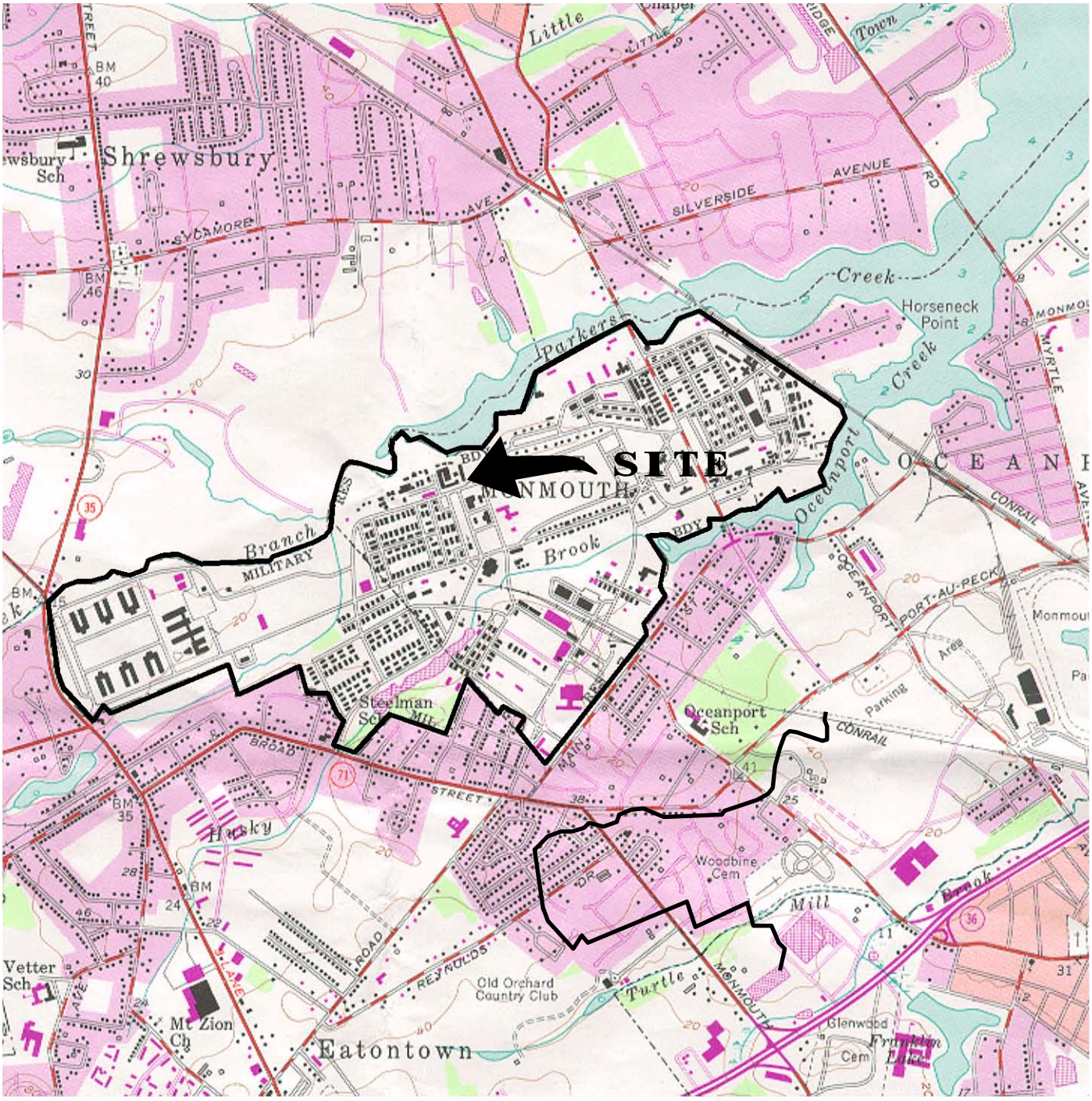

LONG BRANCH, N. J.

40073-C8-TF-024

1954

PHOTOREVISED 1981

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QUADRANGLE LOCATION

Mapped, edited and published by the Geological Survey

Figure 2-1
Site 283 Location Map
Fort Monmouth, New Jersey

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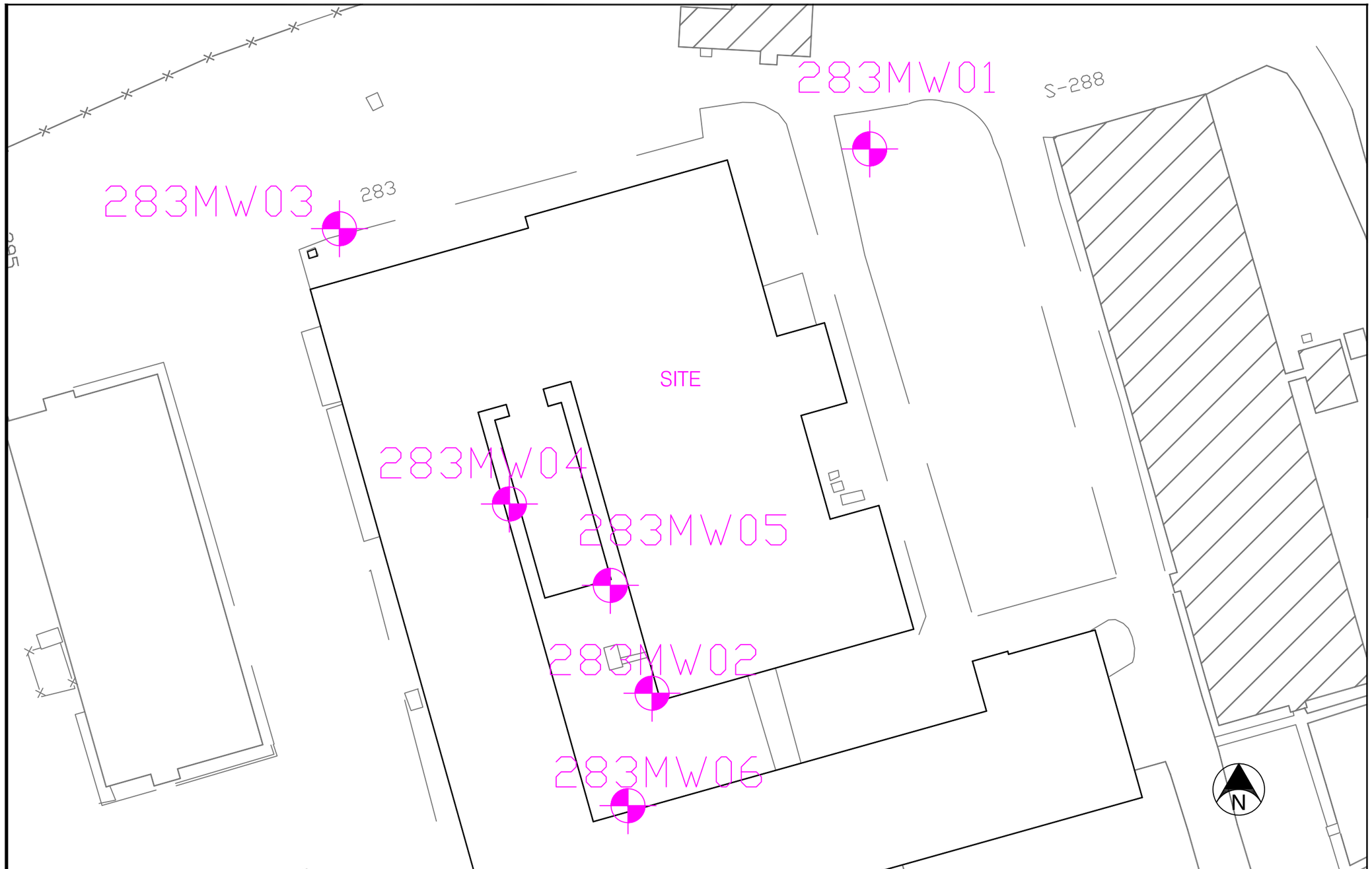

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SITE LAYOUT MAP

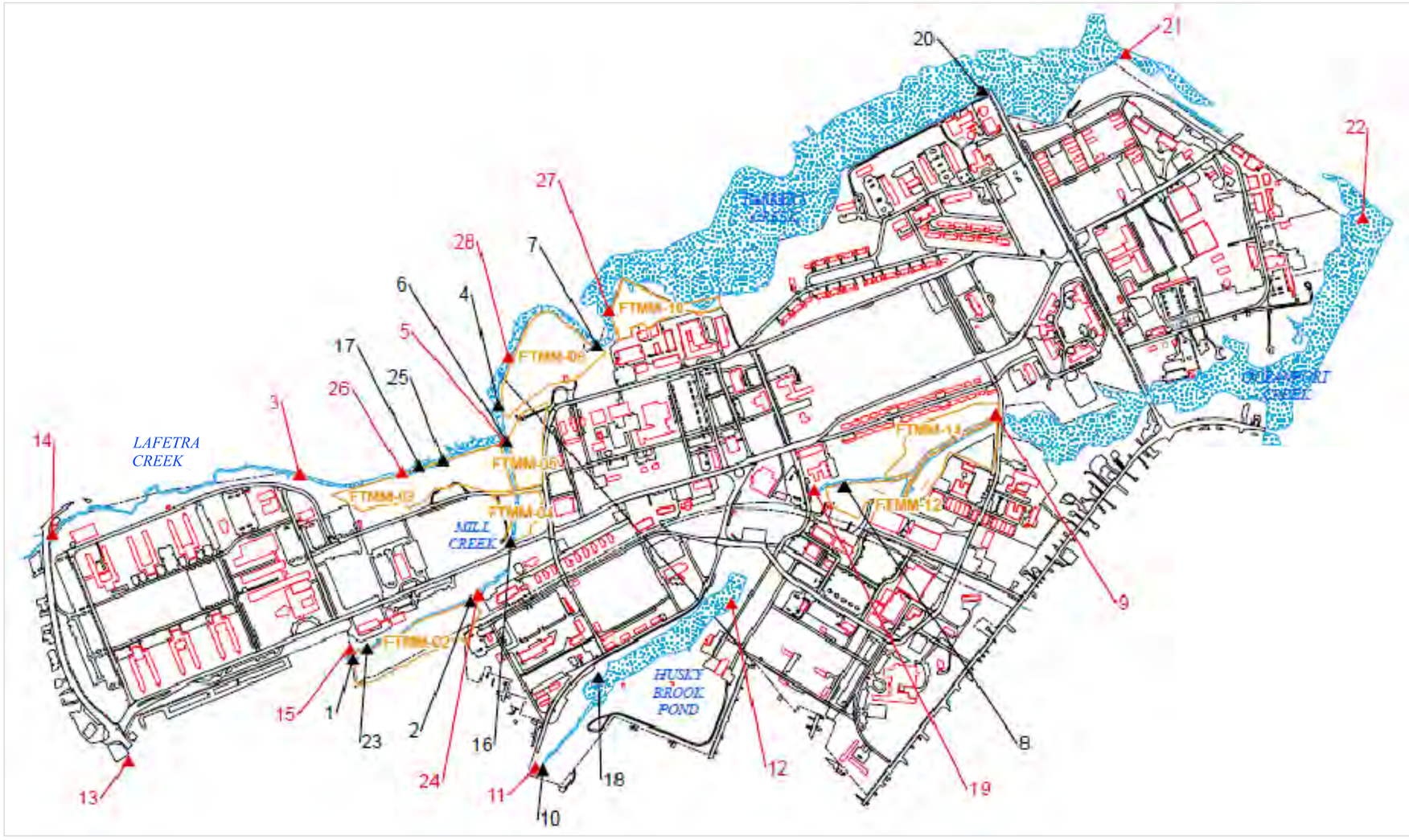
SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042-06-017

SCALE
1"=40'

30-NOV-09

FIGURE NO.
2-2



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SURFACE WATER SAMPLE LOCATION MAP

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042-06-017
SCALE: 1"=1000'
DATE: 7/30/2010
REVISION
FIGURE NO. 2-3

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-1 (May 11, 2004)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

2. Are there any monitor wells in unconfined aquifers in which the water table elevation is higher than the top of the well screen? Yes___ No_X_. If yes, identify these wells.

3. Are there any monitor wells present at the site but omitted from the contour map? Yes___ No_X_. Unless the omission of the well(s) has been previously approved by the Department, justify the omissions.

4. Are there any monitor wells containing separate phase product during this measuring event? Yes___ No_X_. Were any of the monitor wells with separate phase product included in the ground water contour map? Yes___ No___. If yes, show the formula used to correct the water table elevation.

5. Has the ground water flow direction changed more than 45 degrees from the previous ground water contour map? Yes___ No_X_. If yes, discuss the reasons for the change.

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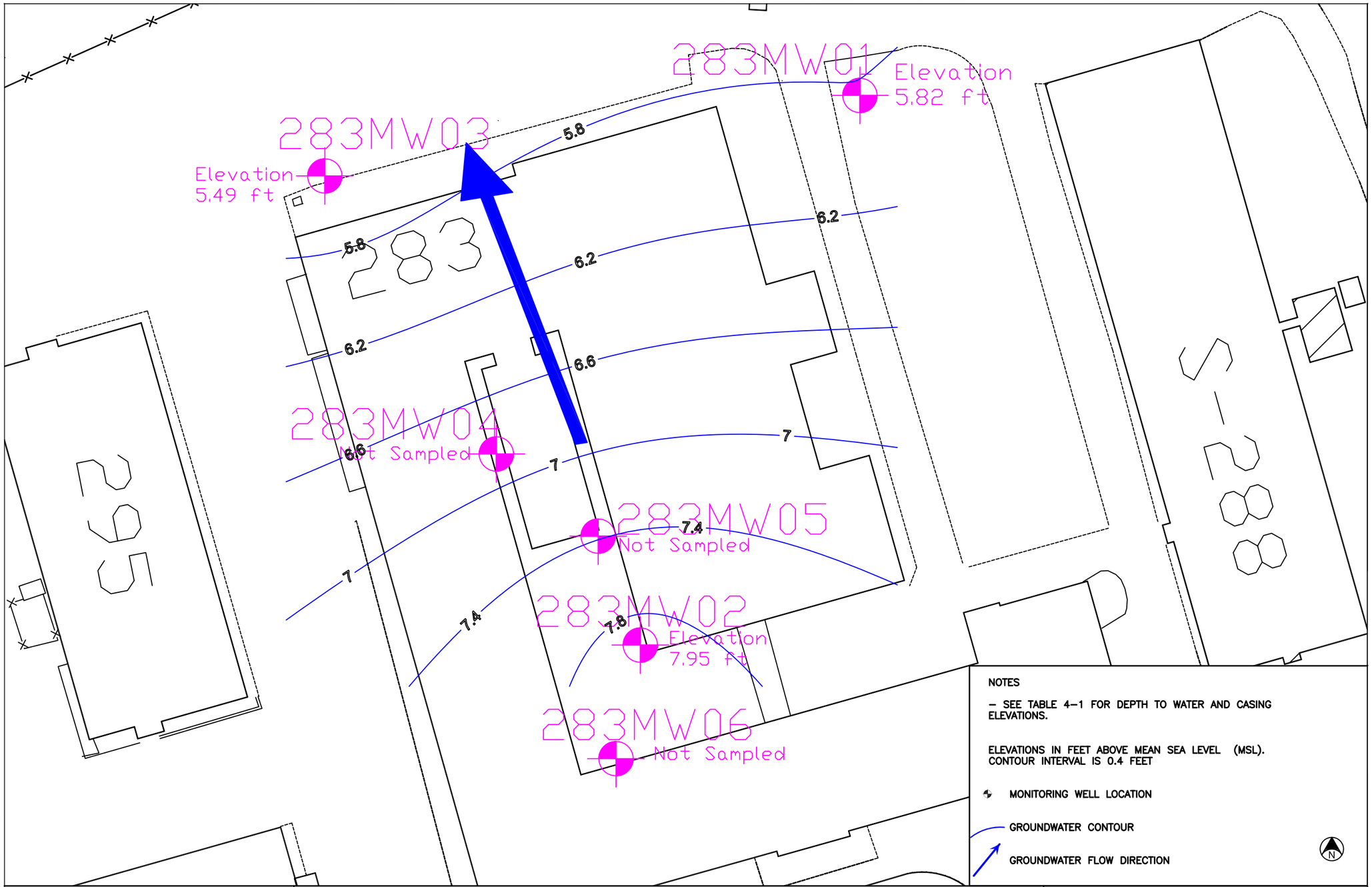
6. Has ground water mounding and/or depressions been identified in the ground water contour map? Yes___ No_X_. Unless the ground water mounds and/or depressions are caused by the ground water remediation system, discuss the reasons for this occurrence.

N/A

7. Are all the wells used in the contour map screened in the same water-bearing zone? Yes_X_ No___. If no, justify inclusion of those wells.

8. Were the ground water contours computer generated_X_, computer aided___, or hand-drawn___? If computer aided or generated, identify the interpolation method(s) used.

Surfer Contour Mapping Software



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GROUND WATER CONTOUR MAP (MAY 11, 2004)

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

REVISION

FIGURE NO.
4-1

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-2 (July 21, 2004)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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5. Has the ground water flow direction changed more than 45 degrees from the previous ground water contour map? Yes___ No_X_. If yes, discuss the reasons for the change.

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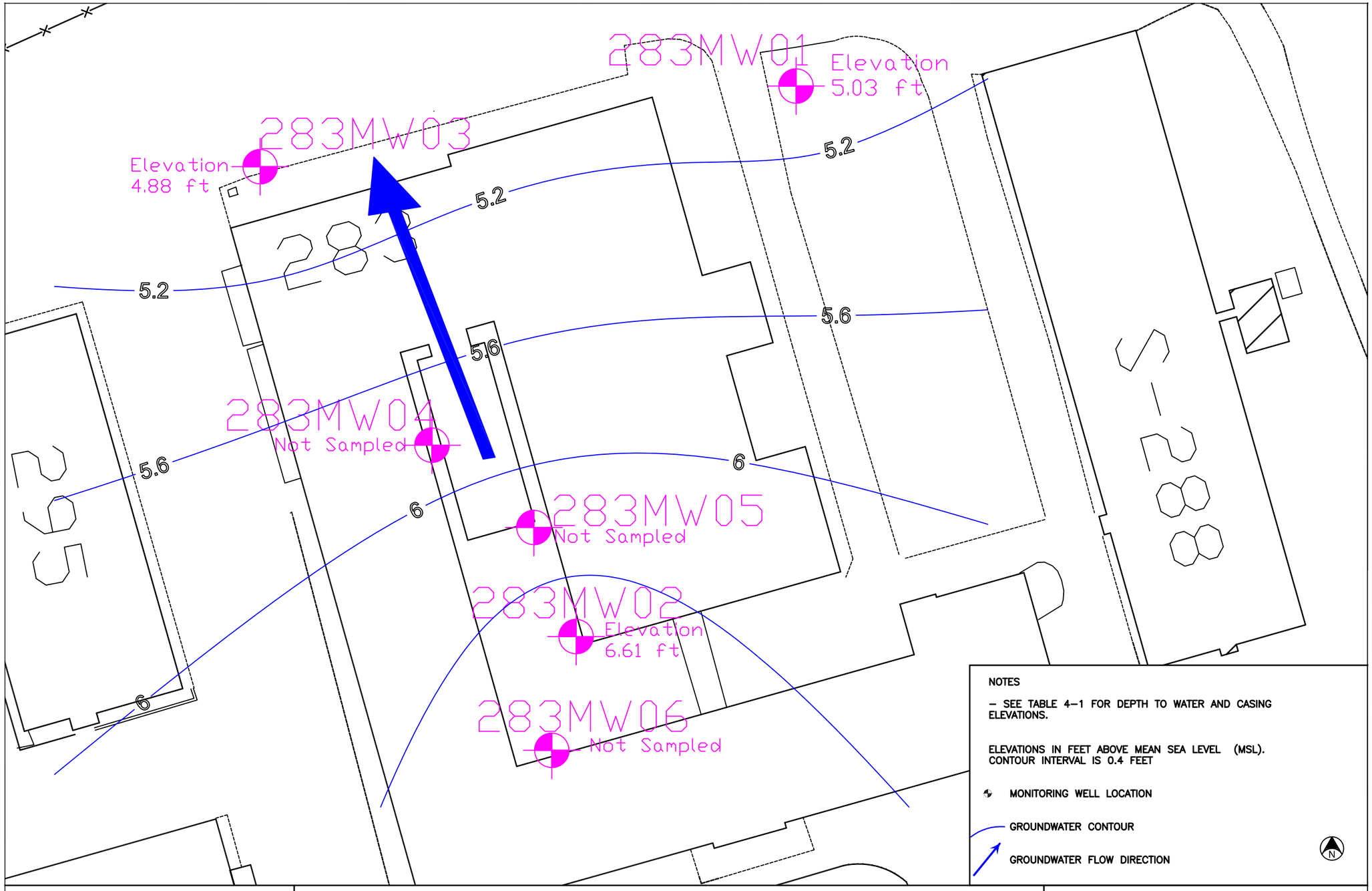
6. Has ground water mounding and/or depressions been identified in the ground water contour map? Yes___ No_X_. Unless the ground water mounds and/or depressions are caused by the ground water remediation system, discuss the reasons for this occurrence.

N/A

7. Are all the wells used in the contour map screened in the same water-bearing zone? Yes_X_ No___. If no, justify inclusion of those wells.

8. Were the ground water contours computer generated_X_, computer aided___, or hand-drawn___? If computer aided or generated, identify the interpolation method(s) used.

Surfer Contour Mapping Software



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GROUND WATER CONTOUR MAP (JULY 21, 2004)

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

REVISION

FIGURE NO.
4-2

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APPENDIX G
Contour Map Reporting Form

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Site 283 Figure 4-3 (November 3, 2004)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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5. Has the ground water flow direction changed more than 45 degrees from the previous ground water contour map? Yes___ No_X_. If yes, discuss the reasons for the change.

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6. Has ground water mounding and/or depressions been identified in the ground water contour map? Yes___ No_X_. Unless the ground water mounds and/or depressions are caused by the ground water remediation system, discuss the reasons for this occurrence.

N/A

7. Are all the wells used in the contour map screened in the same water-bearing zone? Yes_X_ No___. If no, justify inclusion of those wells.

8. Were the ground water contours computer generated_X_, computer aided___, or hand-drawn___? If computer aided or generated, identify the interpolation method(s) used.

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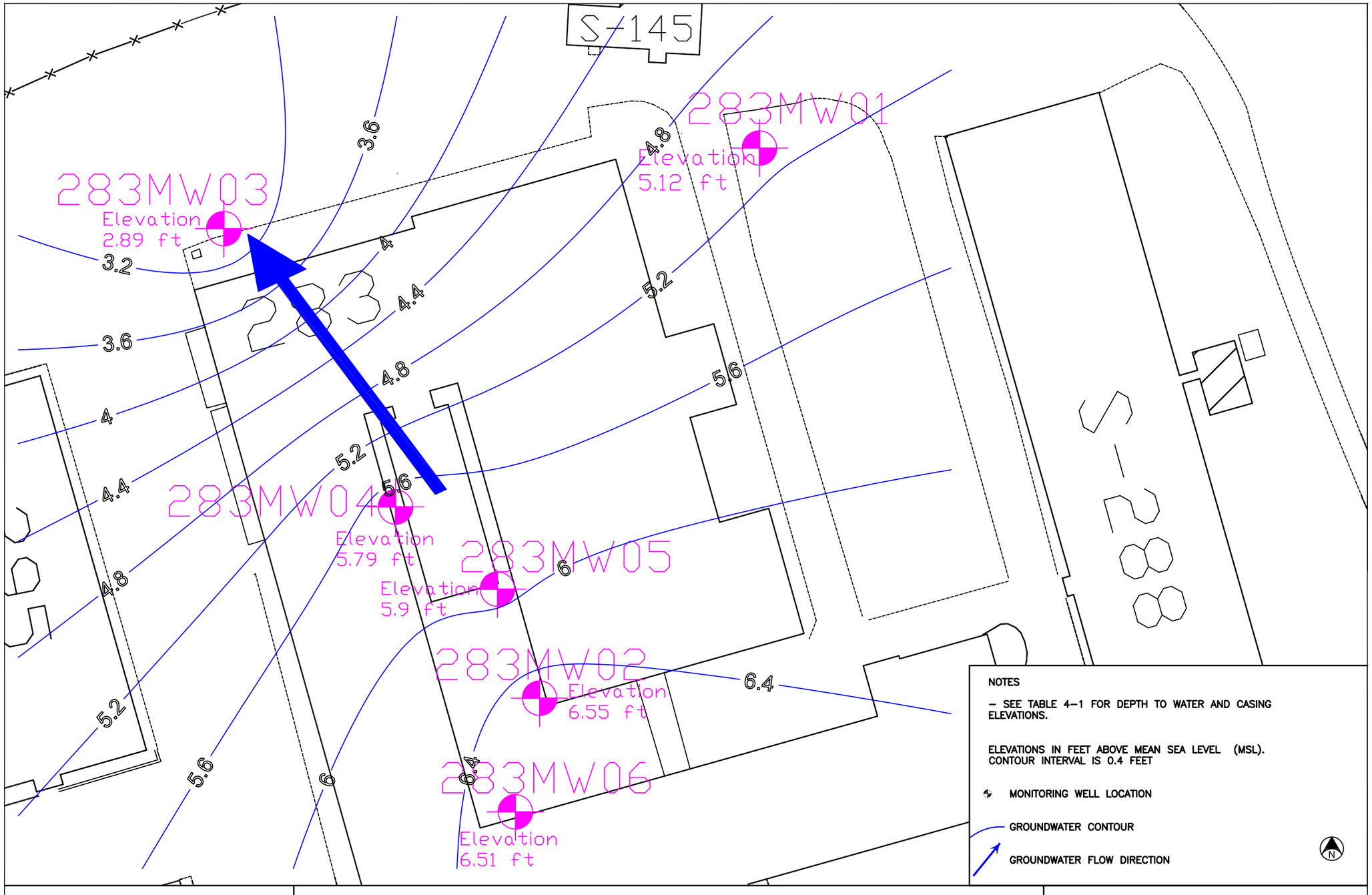

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GROUND WATER CONTOUR MAP (NOV 03, 2004)

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

SITE 283
FORT MONMOUTH, NEW JERSEY

REVISION

FIGURE NO.
4-3

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-4 (January 20, 2005)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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5. Has the ground water flow direction changed more than 45 degrees from the previous ground water contour map? Yes___ No_X_. If yes, discuss the reasons for the change.

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6. Has ground water mounding and/or depressions been identified in the ground water contour map? Yes___ No_X_. Unless the ground water mounds and/or depressions are caused by the ground water remediation system, discuss the reasons for this occurrence.

N/A

7. Are all the wells used in the contour map screened in the same water-bearing zone? Yes_X_ No___. If no, justify inclusion of those wells.

8. Were the ground water contours computer generated_X_, computer aided___, or hand-drawn___? If computer aided or generated, identify the interpolation method(s) used.

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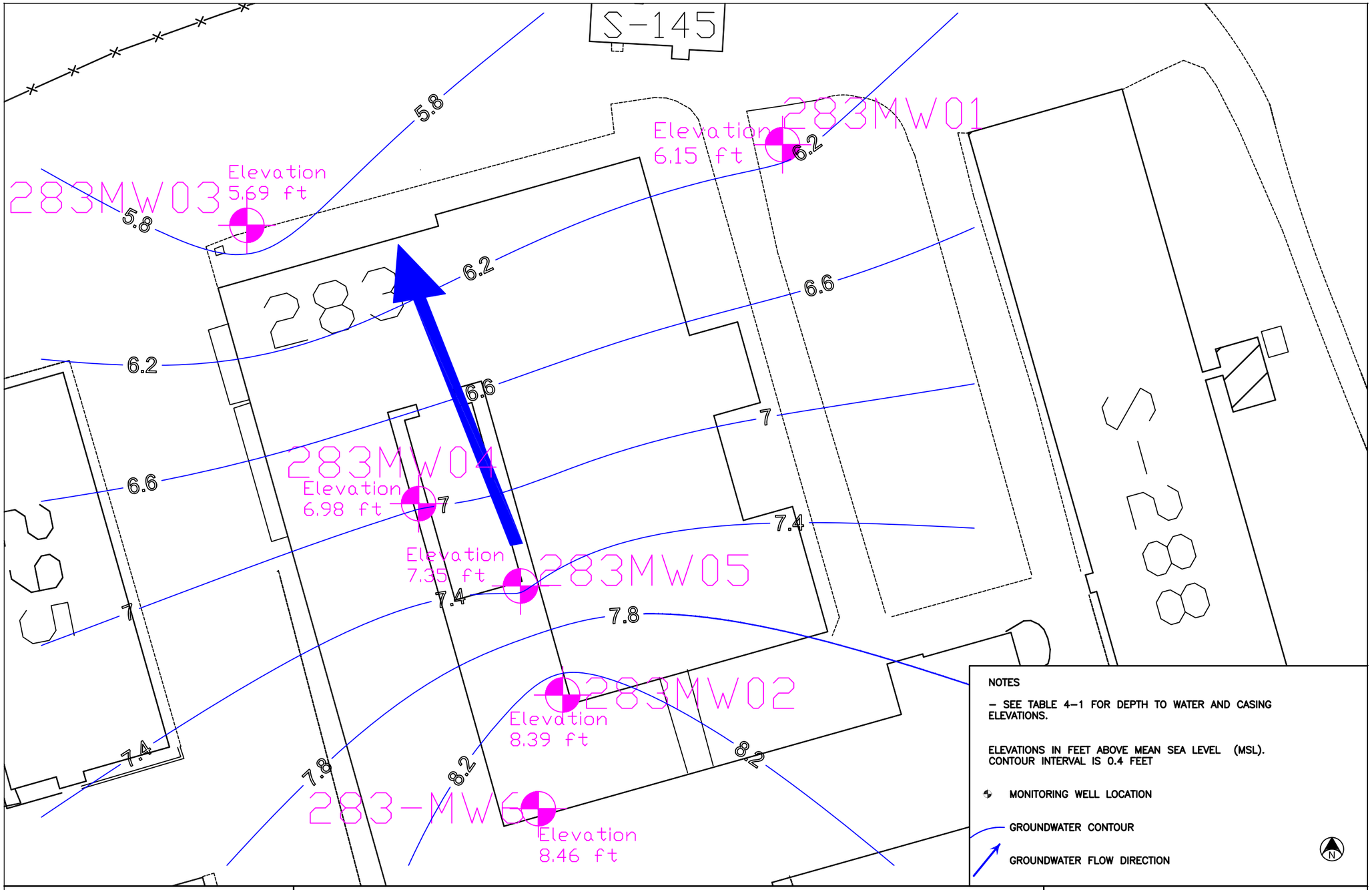

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GROUND WATER CONTOUR MAP (JAN 20, 2005)

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

SITE 283
FORT MONMOUTH, NEW JERSEY

REVISION

FIGURE NO.
4-4

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-5 (April 20, 2005)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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N/A

7. Are all the wells used in the contour map screened in the same water-bearing zone? Yes_X_ No___. If no, justify inclusion of those wells.

8. Were the ground water contours computer generated_X_, computer aided___, or hand-drawn___? If computer aided or generated, identify the interpolation method(s) used.

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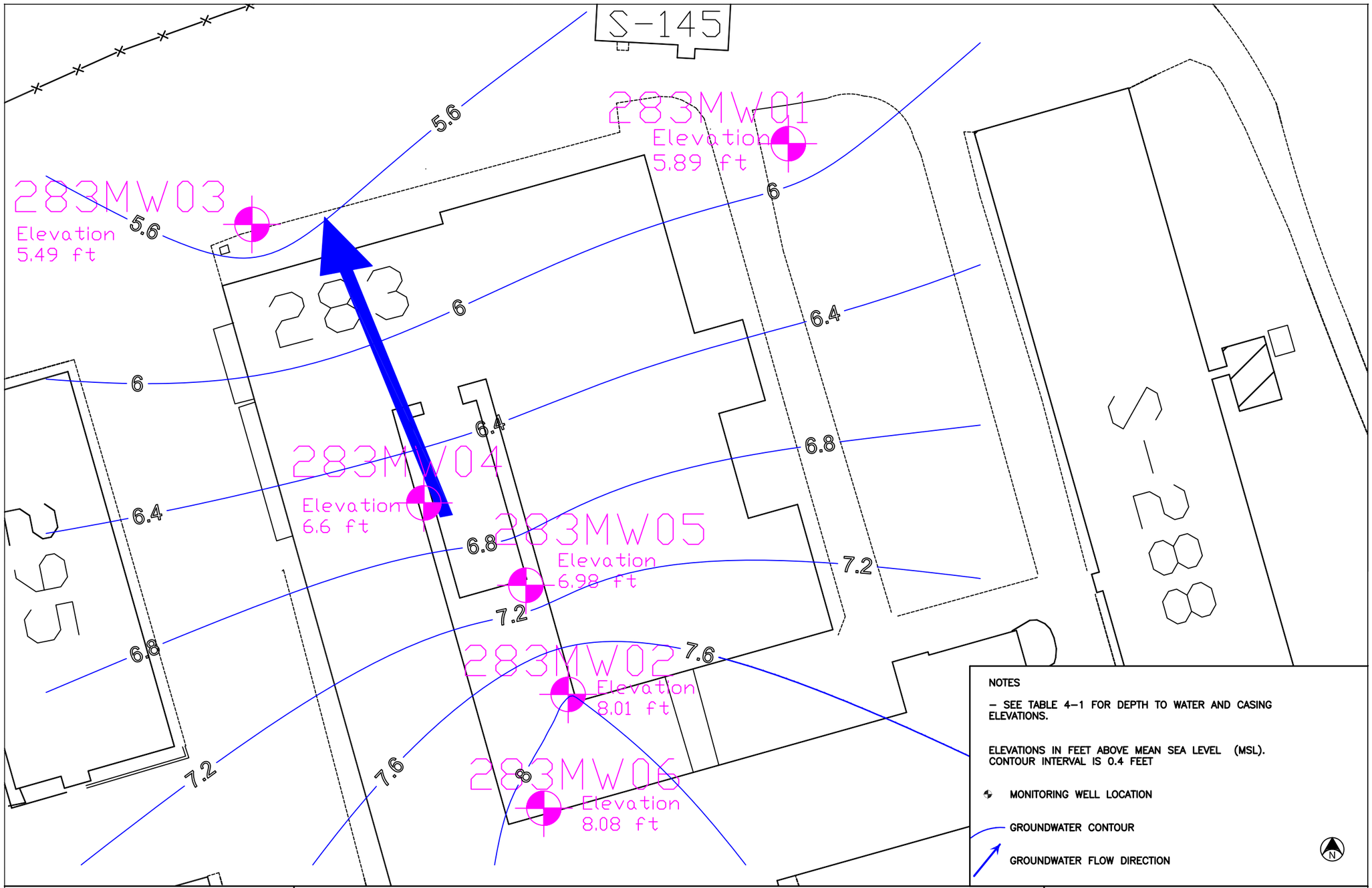

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GROUND WATER CONTOUR MAP (APR 20, 2005)

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

REVISION

FIGURE NO.
4-5

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-6 (August 9, 2005)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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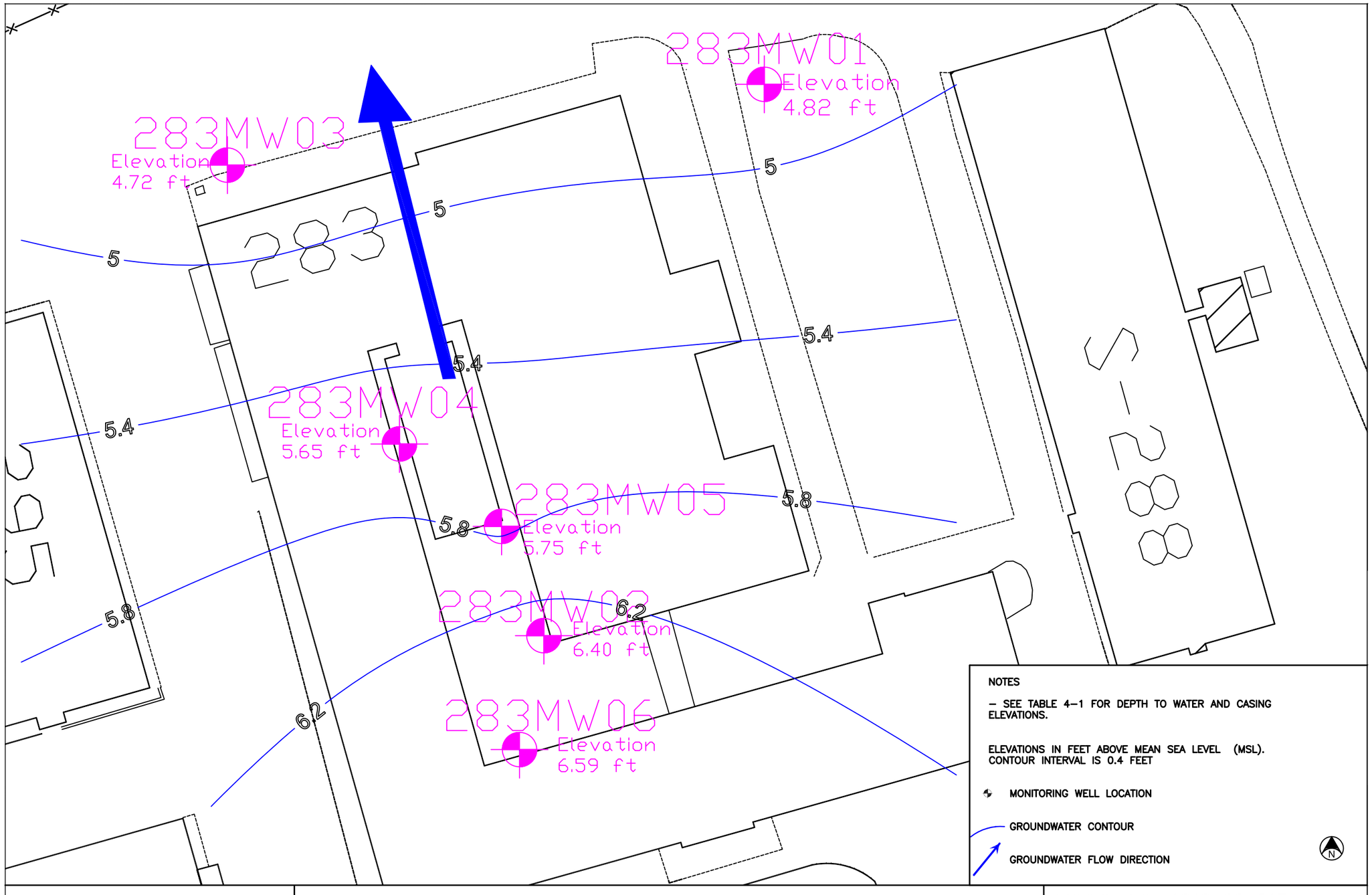

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GROUND WATER CONTOUR MAP (AUG 09, 2005)

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

REVISION

FIGURE NO.
4-6

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-7 (November 2, 2005)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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8. Were the ground water contours computer generated_X_, computer aided___, or hand-drawn___? If computer aided or generated, identify the interpolation method(s) used.

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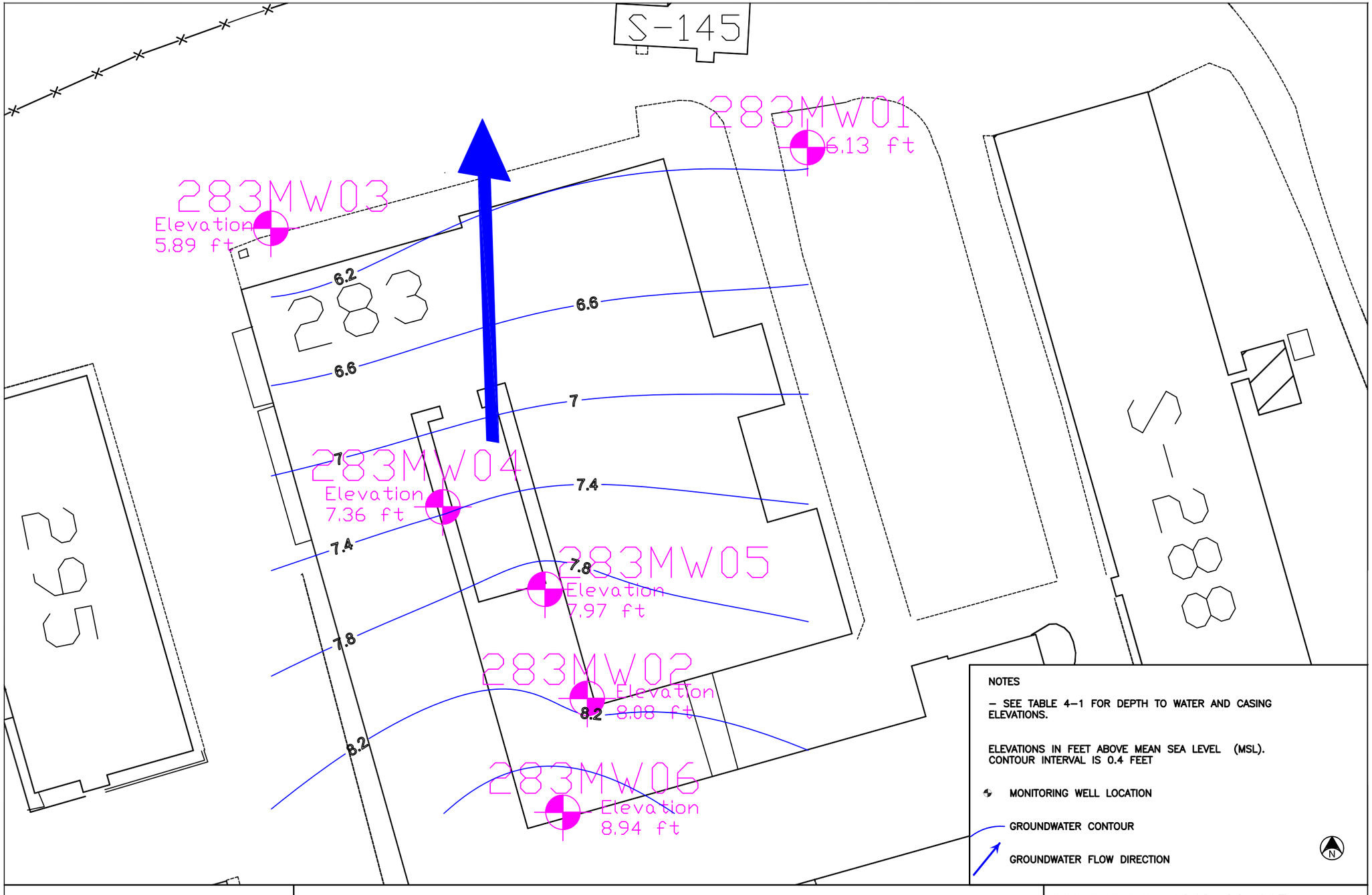

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GROUND WATER CONTOUR MAP (NOV 02, 2005)

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

SITE 283
FORT MONMOUTH, NEW JERSEY

REVISION

FIGURE NO.
4-7

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-8 (January 13, 2006)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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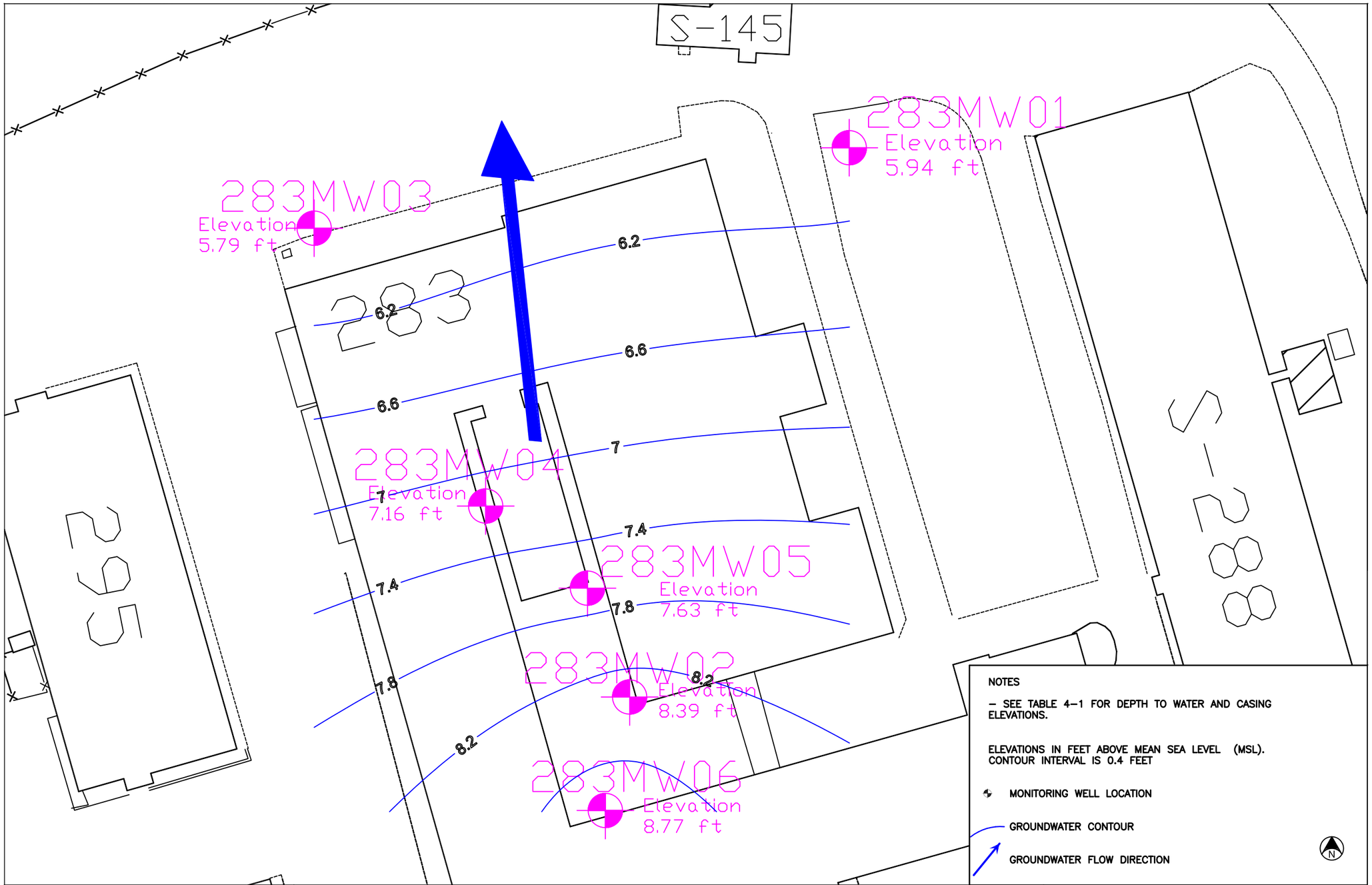

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GROUND WATER CONTOUR MAP (JAN 13, 2006)

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

REVISION

FIGURE NO.
4-8

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-9 (April 18, 2006)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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5. Has the ground water flow direction changed more than 45 degrees from the previous ground water contour map? Yes___ No_X_. If yes, discuss the reasons for the change.

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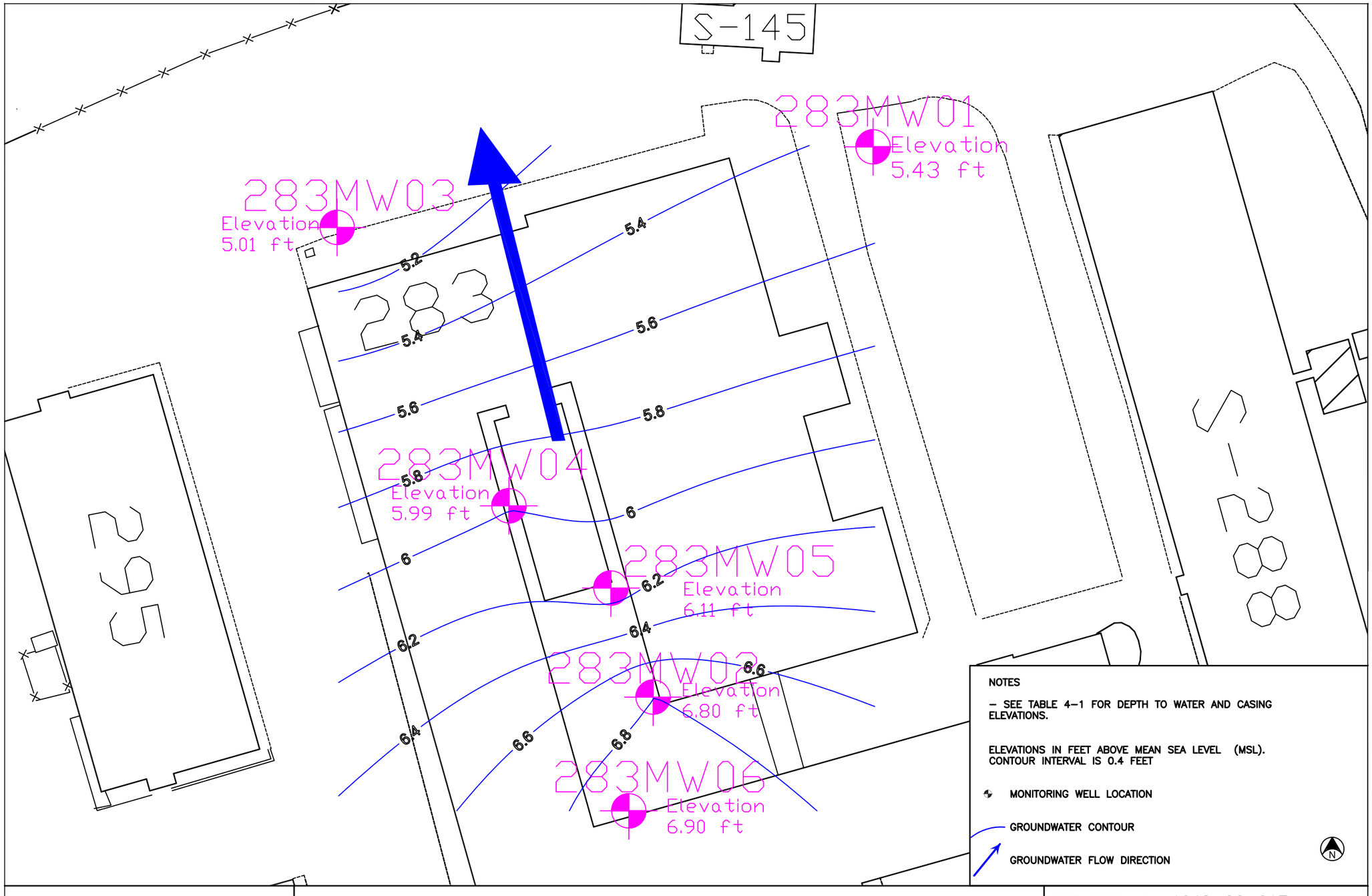
6. Has ground water mounding and/or depressions been identified in the ground water contour map? Yes___ No_X_. Unless the ground water mounds and/or depressions are caused by the ground water remediation system, discuss the reasons for this occurrence.

N/A

7. Are all the wells used in the contour map screened in the same water-bearing zone? Yes_X_ No___. If no, justify inclusion of those wells.

8. Were the ground water contours computer generated_X_, computer aided___, or hand-drawn___? If computer aided or generated, identify the interpolation method(s) used.

Surfer Contour Mapping Software



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GROUND WATER CONTOUR MAP (APR 18, 2006)

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

REVISION

FIGURE NO.
4-9

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-10 (July 25, 2006)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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N/A

7. Are all the wells used in the contour map screened in the same water-bearing zone? Yes_X_ No___. If no, justify inclusion of those wells.

8. Were the ground water contours computer generated_X_, computer aided___, or hand-drawn___? If computer aided or generated, identify the interpolation method(s) used.

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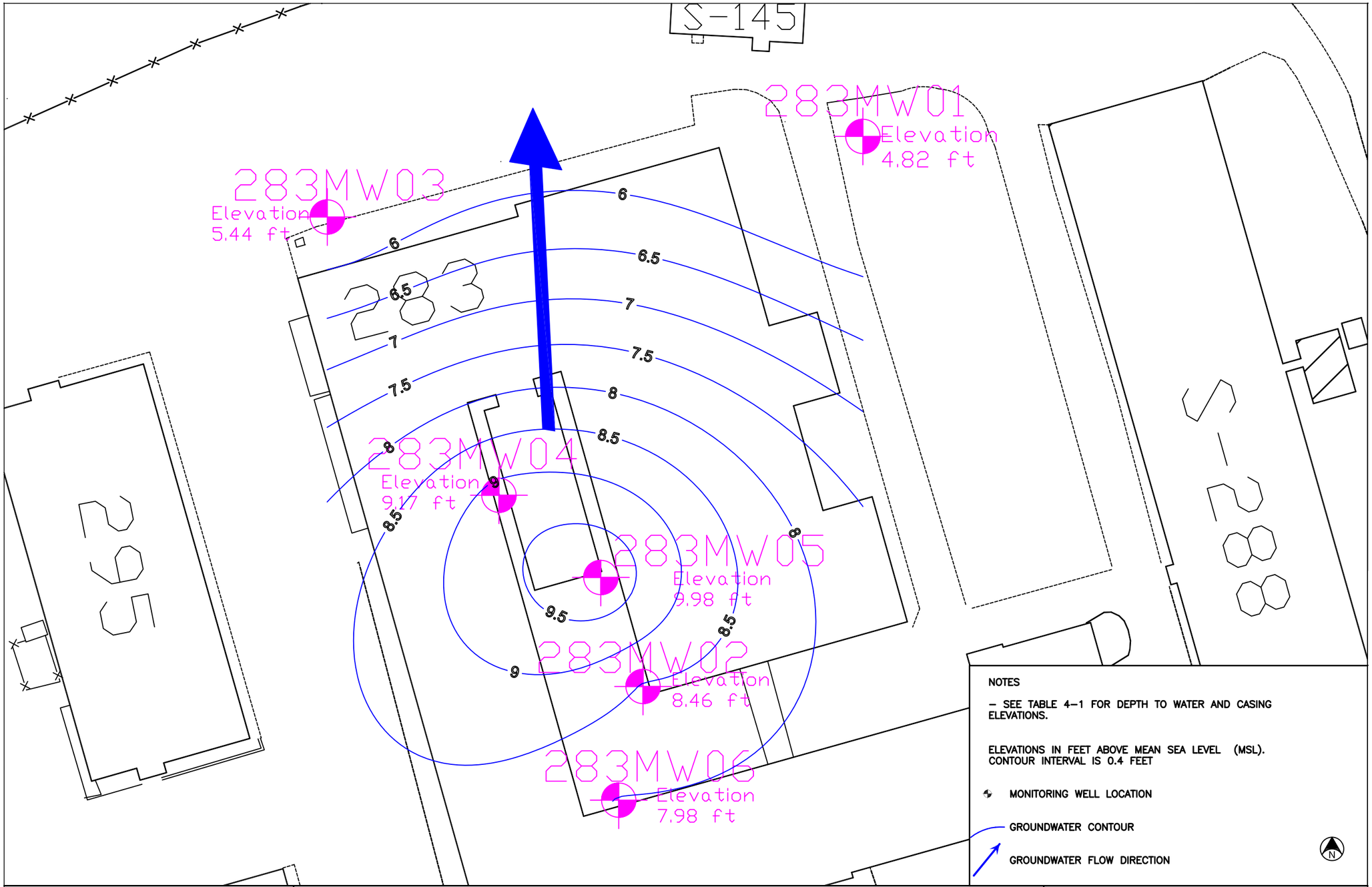

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GROUND WATER CONTOUR MAP (JULY 25, 2006)

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

REVISION

FIGURE NO.
4-10

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APPENDIX G
Contour Map Reporting Form

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Site 283 Figure 4-11 (October 30, 2006)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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5. Has the ground water flow direction changed more than 45 degrees from the previous ground water contour map? Yes___ No_X_. If yes, discuss the reasons for the change.

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N/A

7. Are all the wells used in the contour map screened in the same water-bearing zone? Yes_X_ No___. If no, justify inclusion of those wells.

8. Were the ground water contours computer generated_X_, computer aided___, or hand-drawn___? If computer aided or generated, identify the interpolation method(s) used.

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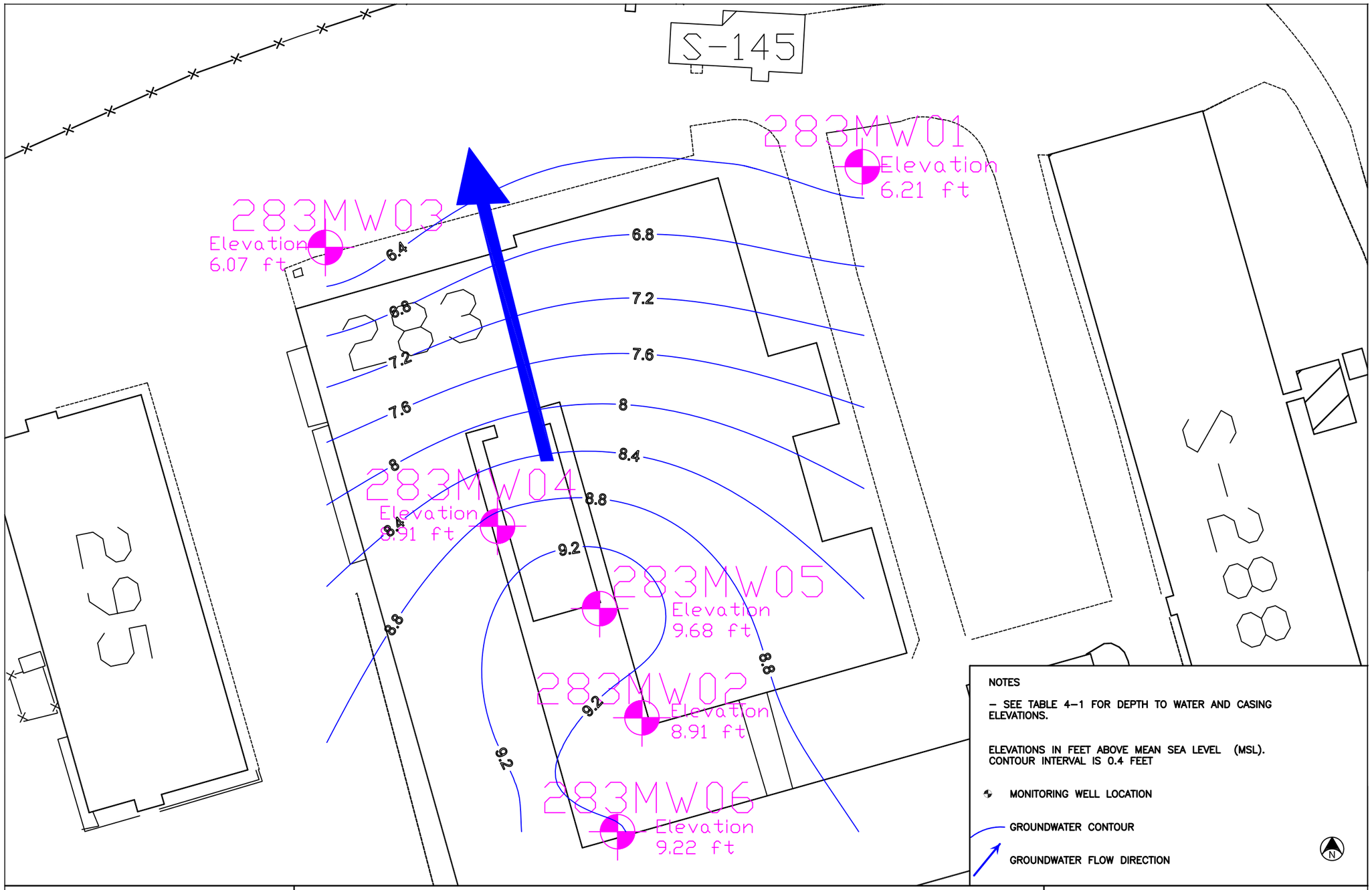

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GROUND WATER CONTOUR MAP (OCT 30, 2006)

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

SITE 283
FORT MONMOUTH, NEW JERSEY

REVISION

FIGURE NO.
4-11

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-12 (February 1, 2007)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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5. Has the ground water flow direction changed more than 45 degrees from the previous ground water contour map? Yes___ No_X_. If yes, discuss the reasons for the change.

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6. Has ground water mounding and/or depressions been identified in the ground water contour map? Yes___ No_X_. Unless the ground water mounds and/or depressions are caused by the ground water remediation system, discuss the reasons for this occurrence.

N/A

7. Are all the wells used in the contour map screened in the same water-bearing zone? Yes_X_ No___. If no, justify inclusion of those wells.

8. Were the ground water contours computer generated_X_, computer aided___, or hand-drawn___? If computer aided or generated, identify the interpolation method(s) used.

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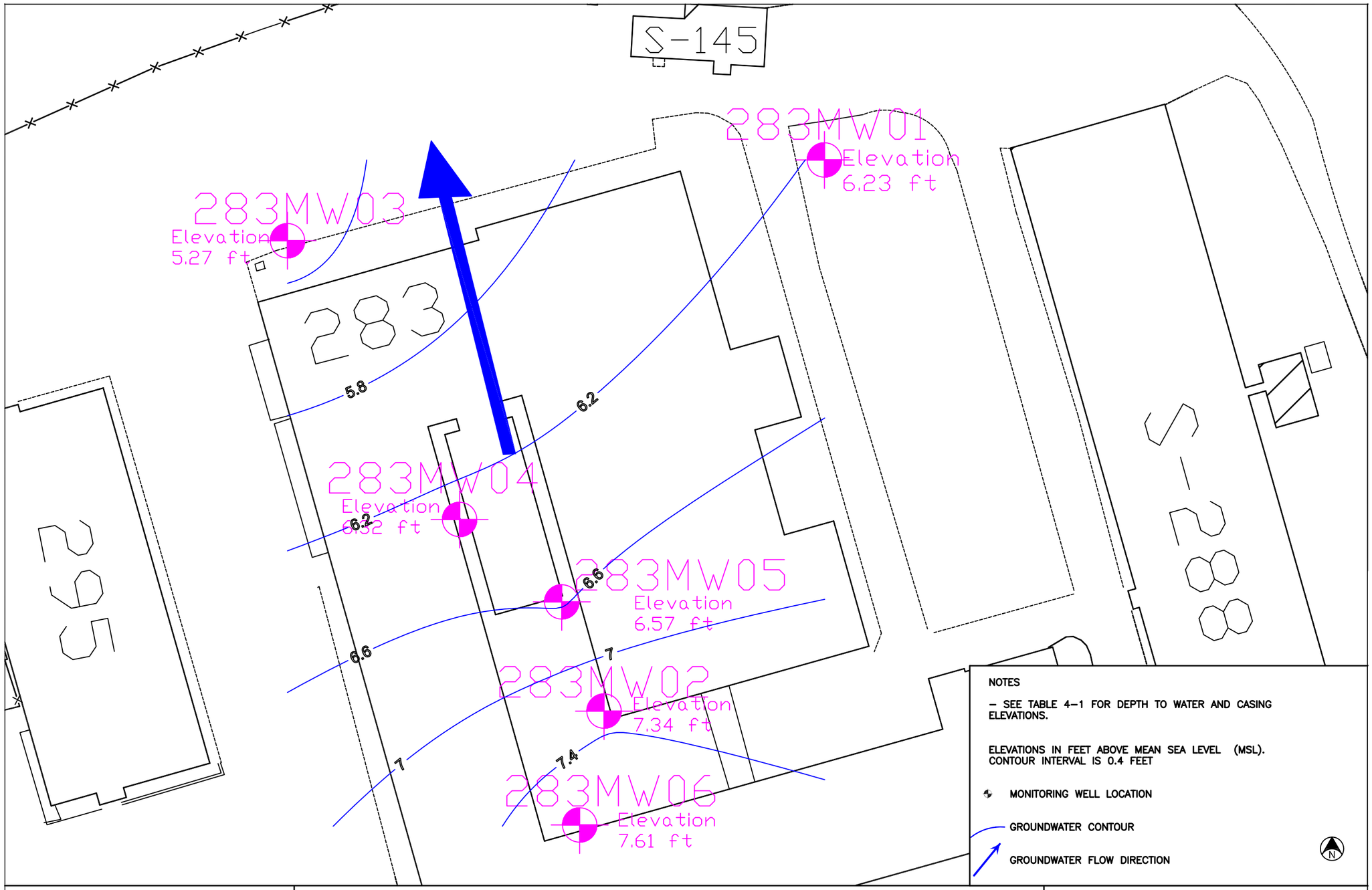

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GROUND WATER CONTOUR MAP (FEB 01, 2007)

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

REVISION

FIGURE NO.
4-12

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-13 (May 3, 2007)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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5. Has the ground water flow direction changed more than 45 degrees from the previous ground water contour map? Yes___ No_X_. If yes, discuss the reasons for the change.

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N/A

7. Are all the wells used in the contour map screened in the same water-bearing zone? Yes_X_ No___. If no, justify inclusion of those wells.

8. Were the ground water contours computer generated_X_, computer aided___, or hand-drawn___? If computer aided or generated, identify the interpolation method(s) used.

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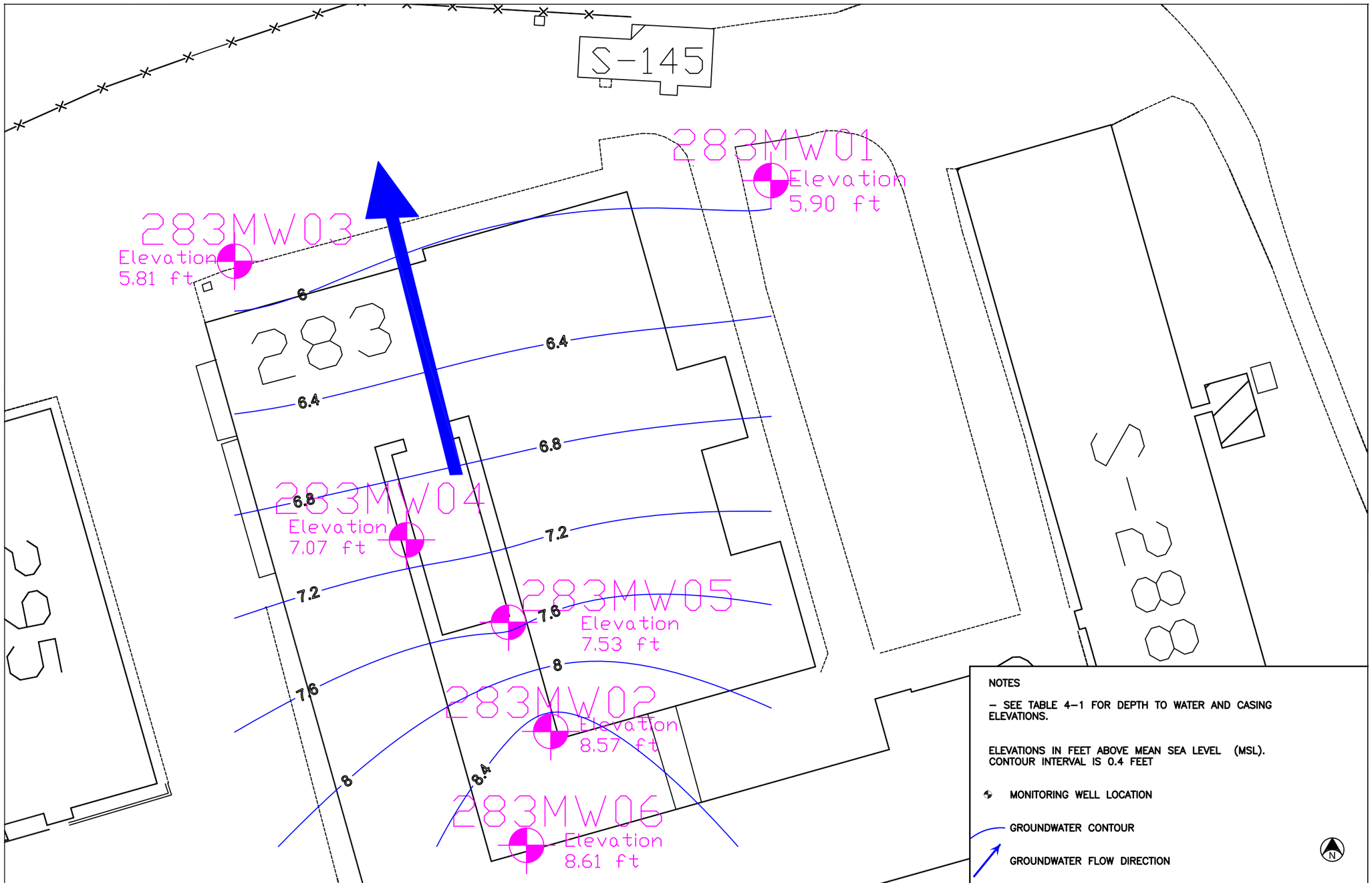

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GROUND WATER CONTOUR MAP (MAY 03, 2007)

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

REVISION

FIGURE NO.
4-13

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-14 (July 27, 2007)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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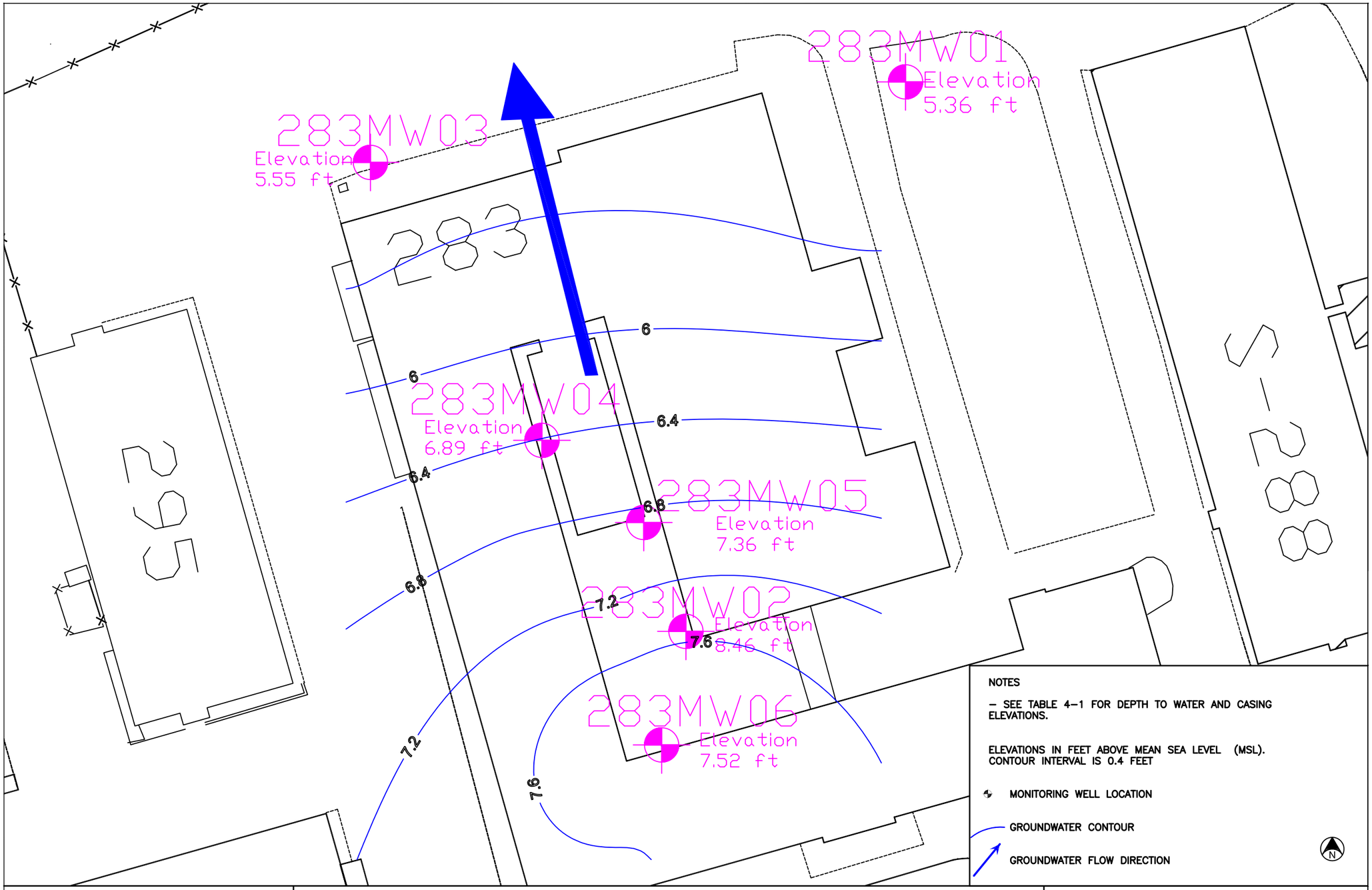

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GROUND WATER CONTOUR MAP (JULY 27, 2007)

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

REVISION

FIGURE NO.
4-14

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APPENDIX G
Contour Map Reporting Form

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Site 283 Figure 4-15 (November 20, 2007)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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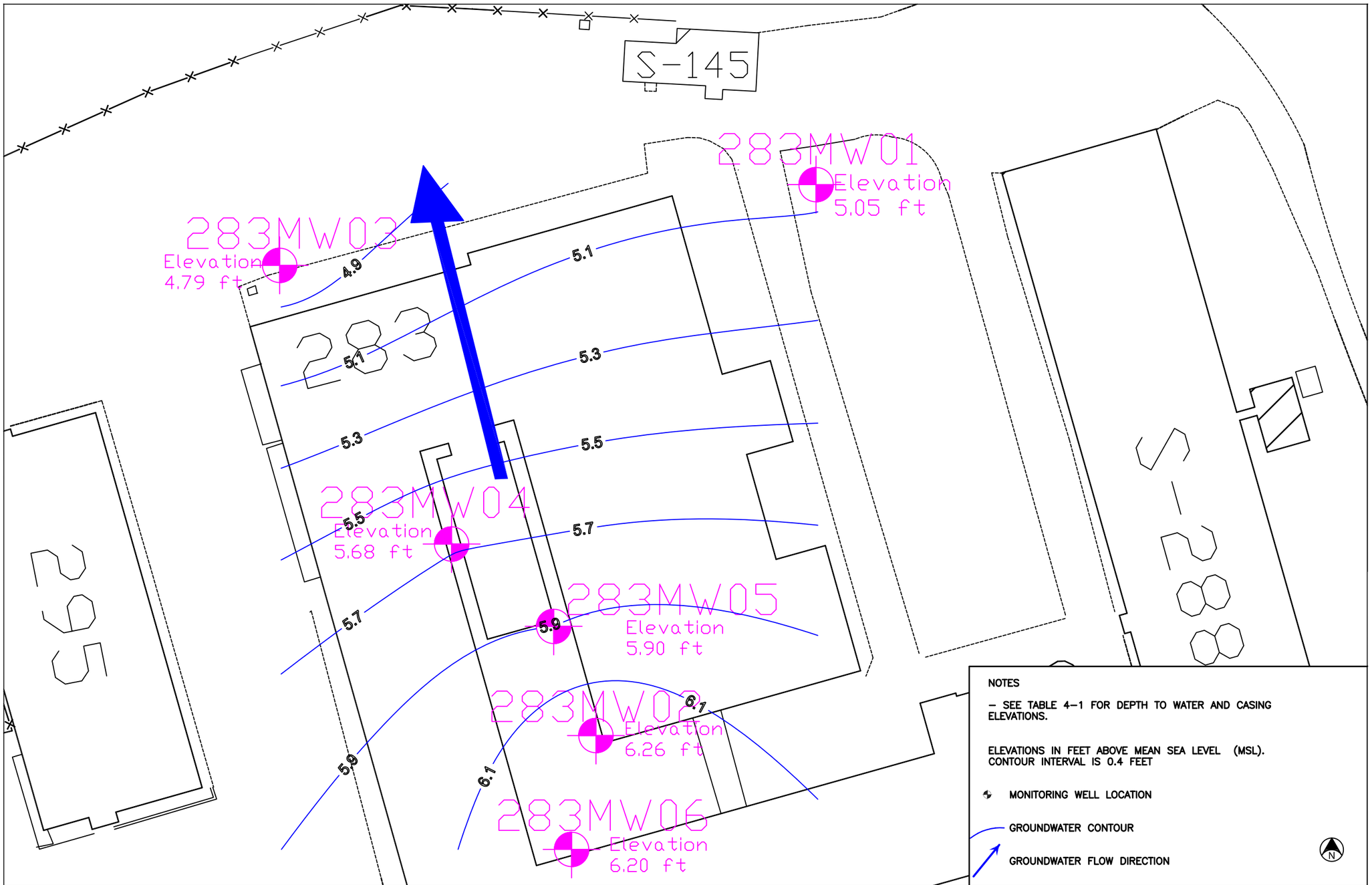

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GROUND WATER CONTOUR MAP (NOV 20, 2007)

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

REVISION

FIGURE NO.
4-15

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APPENDIX G
Contour Map Reporting Form

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Site 283 Figure 4-16 (March 6, 2008)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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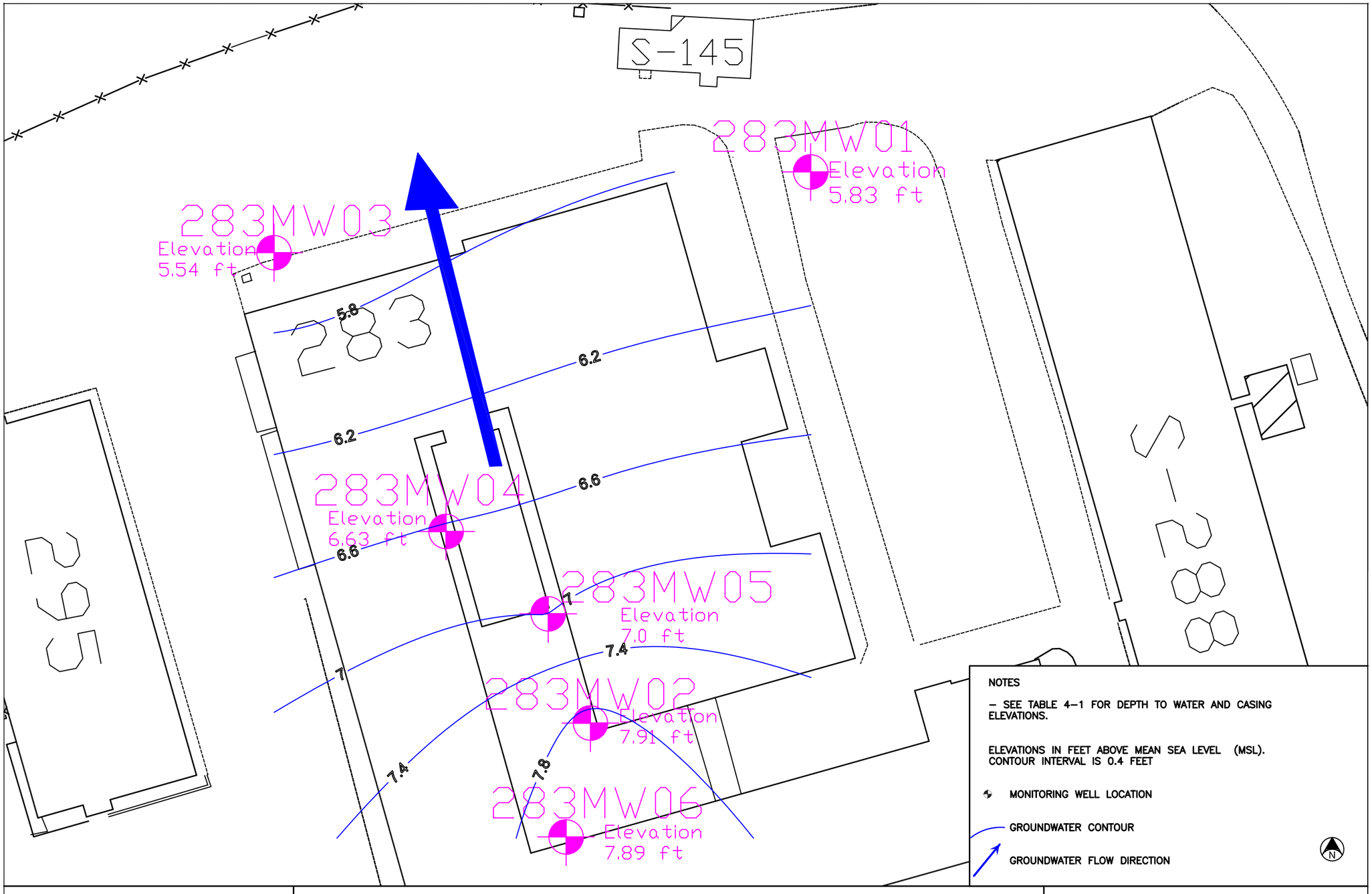

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GROUND WATER CONTOUR MAP (MARCH 06, 2008)

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

SITE 283
FORT MONMOUTH, NEW JERSEY

REVISION

FIGURE NO.
4-16

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-17 (May 2, 2008)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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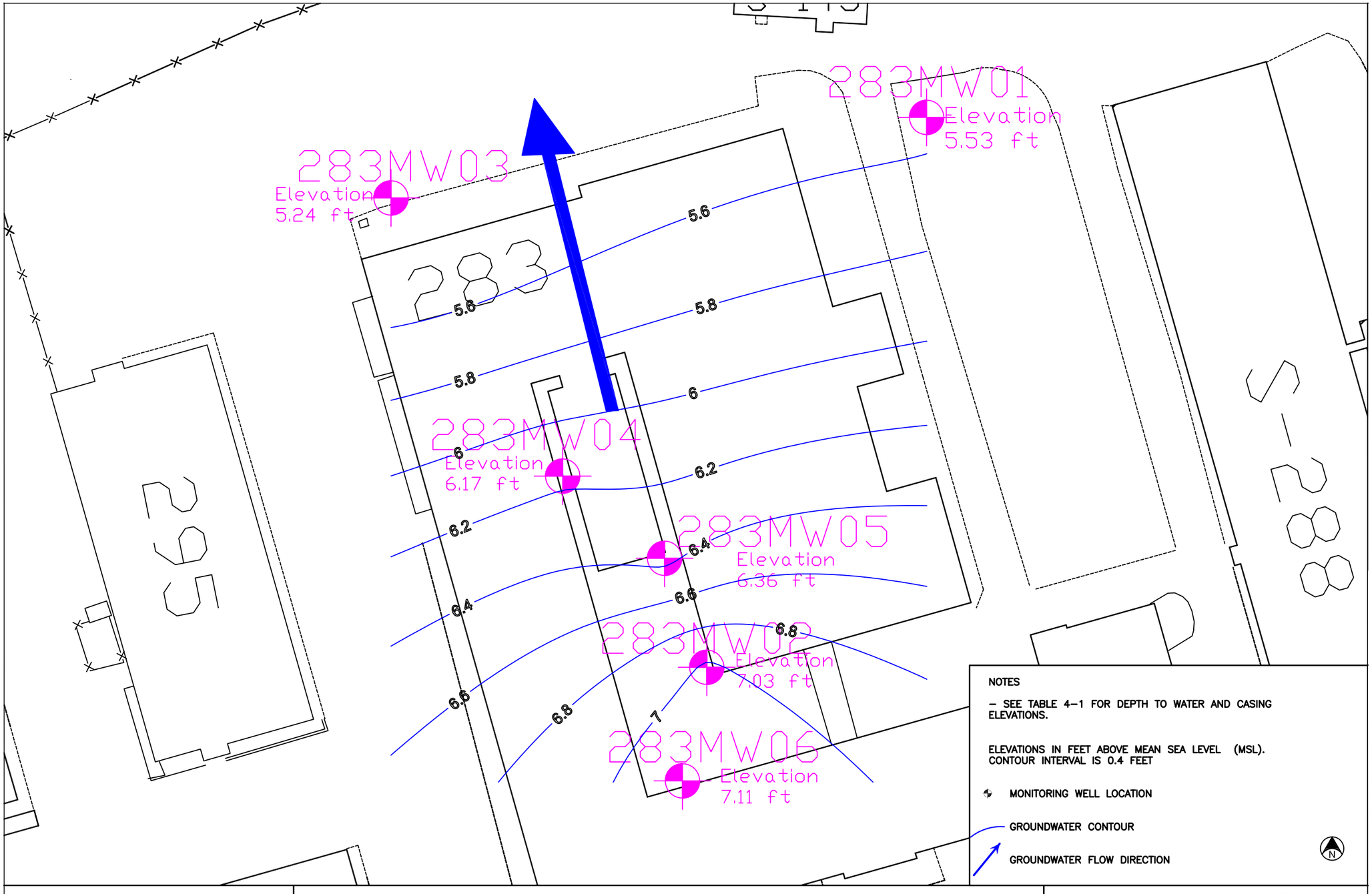

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GROUND WATER CONTOUR MAP (MAY 02, 2008)

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

REVISION

FIGURE NO.
4-17

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APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-18 (August 6, 2008)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

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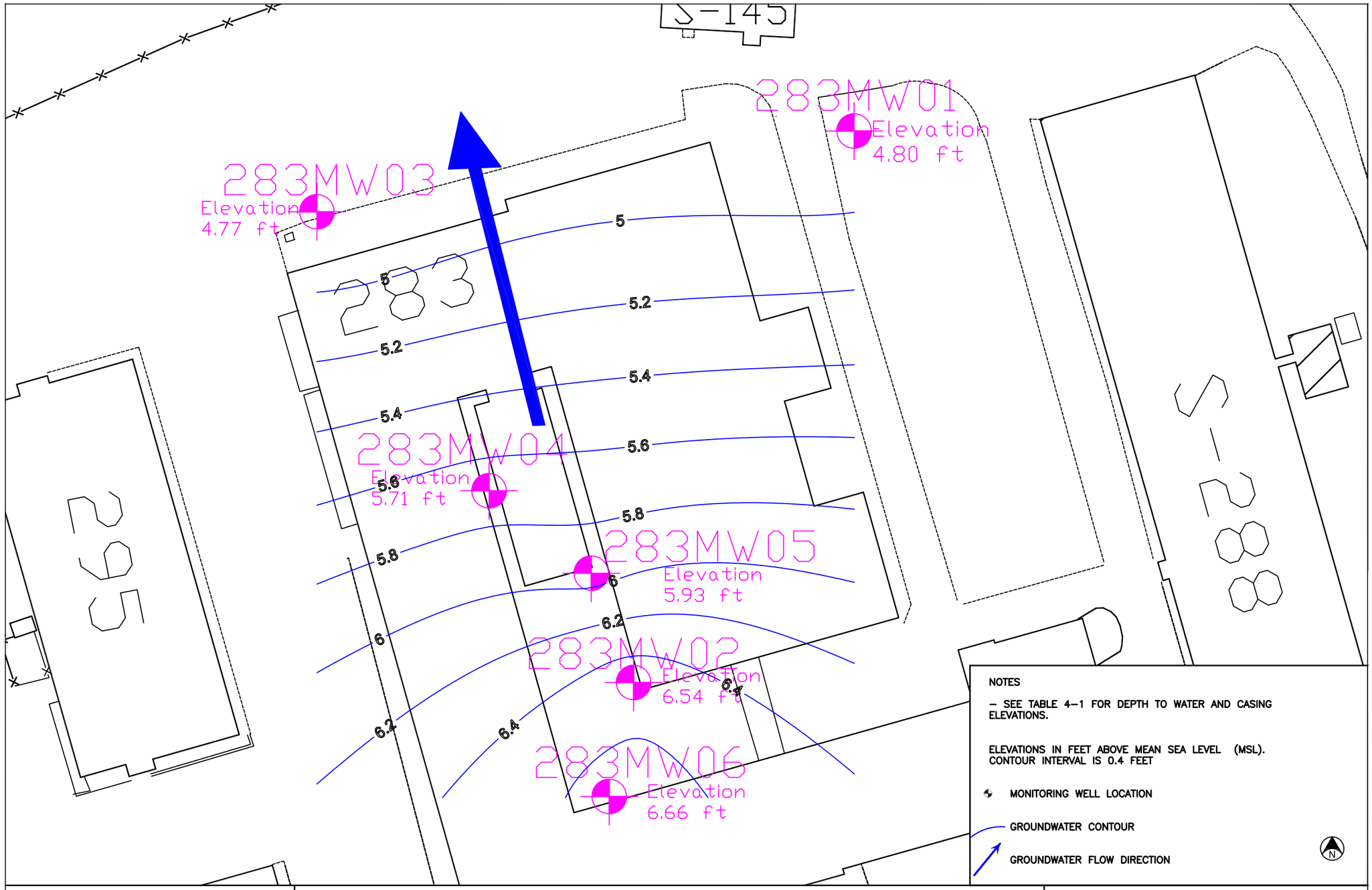
7. Are all the wells used in the contour map screened in the same water-bearing zone? Yes_X_ No___. If no, justify inclusion of those wells.

8. Were the ground water contours computer generated_X_, computer aided___, or hand-drawn___? If computer aided or generated, identify the interpolation method(s) used.

Surfer Contour Mapping Software



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Technologists, Engineers and Designers For a Cleaner Environment

GROUND WATER CONTOUR MAP (AUG 06, 2008)

SITE 283
FORT MONMOUTH, NEW JERSEY

PROJECT NO.: 1042–06–017

SCALE: 1"=40' | DATE: 30–NOV–09

REVISION

FIGURE NO.
4-18

NOTE: THIS IS A COURTESY COPY OF THIS RULE. ALL OF THE DEPARTMENT'S RULES ALL COMPILED IN TITLE 7 OF THE NJ ADMINISTRATIVE CODE.

APPENDIX G
Contour Map Reporting Form

This reporting form shall accompany each ground water contour map submittal. Use additional sheets as necessary.

Site 283 Figure 4-19 (October 23, 2008)

1. Did any surveyed well casing elevations change from the previous sampling event? Yes___ No_X_. If yes, attach new "Well Certification - Form B – Location Certification" as found in the "Guide for the Submission of Remedial Action Workplans" (NJDEP, March 1995) and identify the reason for the elevation change (damage to casing, installation of recovery system in monitoring well, etc.).

2. Are there any monitor wells in unconfined aquifers in which the water table elevation is higher than the top of the well screen? Yes___ No_X_. If yes, identify these wells.

3. Are there any monitor wells present at the site but omitted from the contour map? Yes___ No_X_. Unless the omission of the well(s) has been previously approved by the Department, justify the omissions.

4. Are there any monitor wells containing separate phase product during this measuring event? Yes___ No_X_. Were any of the monitor wells with separate phase product included in the ground water contour map? Yes___ No___. If yes, show the formula used to correct the water table elevation.

5. Has the ground water flow direction changed more than 45 degrees from the previous ground water contour map? Yes___ No_X_. If yes, discuss the reasons for the change.

NOTE: THIS IS A COURTESY COPY OF THIS RULE. ALL OF THE DEPARTMENT'S RULES ALL COMPILED IN TITLE 7 OF THE NJ ADMINISTRATIVE CODE.

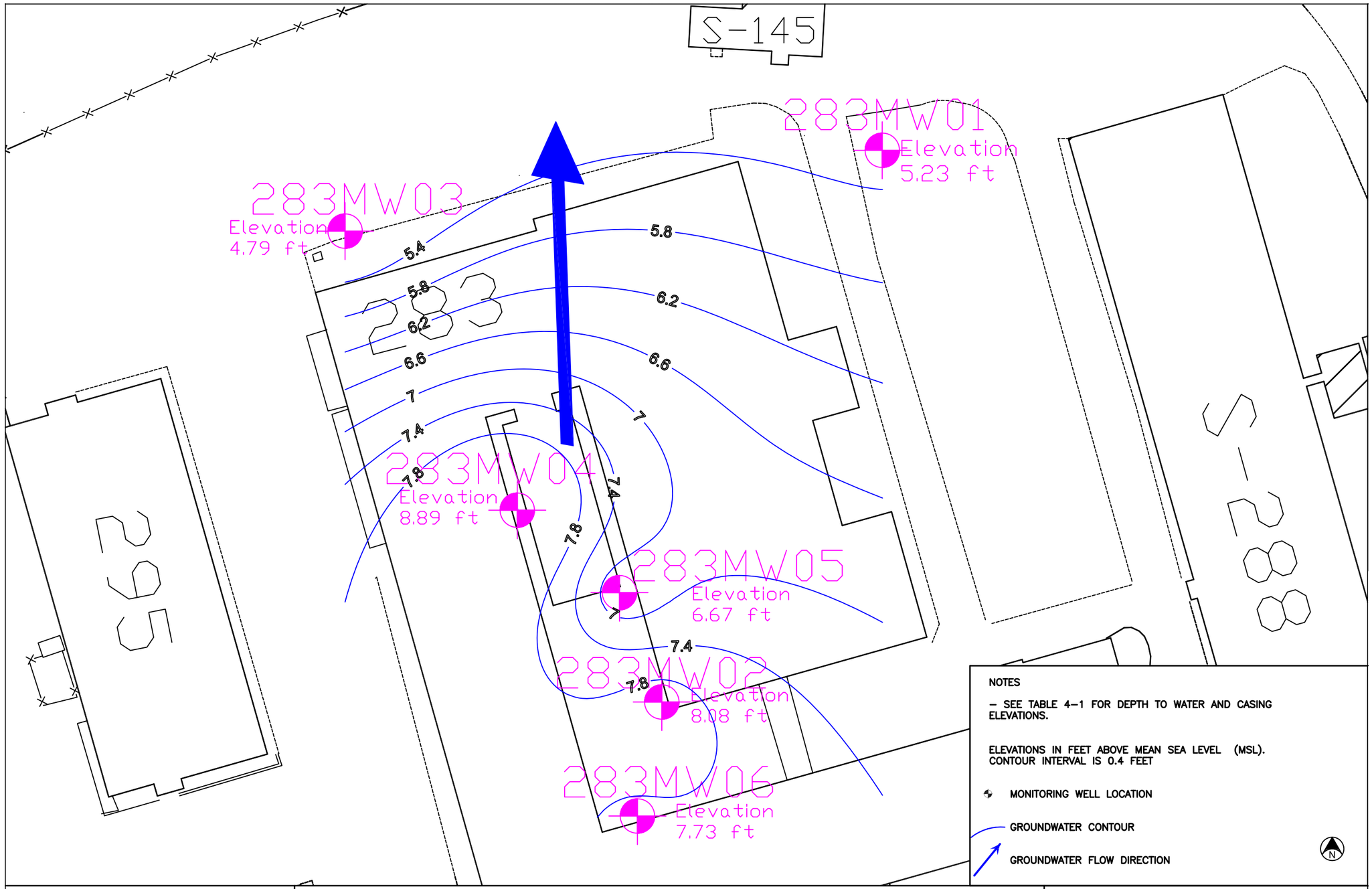
6. Has ground water mounding and/or depressions been identified in the ground water contour map? Yes___ No_X_. Unless the ground water mounds and/or depressions are caused by the ground water remediation system, discuss the reasons for this occurrence.

N/A

7. Are all the wells used in the contour map screened in the same water-bearing zone? Yes_X_ No___. If no, justify inclusion of those wells.

8. Were the ground water contours computer generated_X_, computer aided___, or hand-drawn___? If computer aided or generated, identify the interpolation method(s) used.

Surfer Contour Mapping Software



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GROUND WATER CONTOUR MAP (OCT 23, 2008)

PROJECT NO.: 1042–06–017

SCALE: 1"=40'

DATE: 30–NOV–09

SITE 283
FORT MONMOUTH, NEW JERSEY

REVISION

FIGURE NO.
4-19

Site: 283 Well #: MW03

Date Collected	Benzene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Lead (µg/L)
NJDEP Criteria	1	700	1000	10
5/29/2000	9.26	ND	ND	ND
8/1/2000	11.79	0.325	0.86	NA
8/31/2000	NA	NA	NA	ND
10/13/2000	NA	NA	NA	ND
10/17/2000	3.86	ND	ND	2.17
1/5/2001	5.3	ND	ND	21.1
4/4/2001	2.08	ND	ND	2
7/24/2001	10.2	ND	ND	2.8
12/11/2001	9.03	ND	ND	ND
3/8/2002	8.38	ND	ND	ND
5/16/2002	8.31	ND	ND	ND
9/10/2002	ND	ND	ND	ND
12/3/2002	3.45	ND	ND	9.11
2/27/2003	9.24	ND	3.14 J	ND
5/19/2003	1.47 J	ND	15.94	1.16 ER
8/4/2003	ND	ND	ND	ND
11/13/2003	ND	ND	ND	ND
2/5/2004	5.11	ND	ND	ND
5/11/2004	2.03	0.99 J	2.24 J	ND
7/21/2004	ND	ND	ND	ND
11/3/2004	ND	0.83 J	2.07 J	18
1/20/2005	ND	ND	ND	ND
4/20/2005	ND	ND	ND	ND
8/9/2005	ND	ND	ND	ND
11/2/2005	ND	ND	ND	ND
Criteria Changed 11/05	1	700	1000	5
1/13/2006	ND	ND	ND	ND
4/18/2006	ND	1.06 J	0.74 J	ND
7/25/2006	ND	ND	ND	ND
10/30/2006	ND	ND	ND	ND
2/1/2007	ND	ND	ND	ND
5/3/2007	ND	ND	ND	ND
7/27/2007	ND	ND	ND	ND
11/20/2007	ND	ND	ND	1.06 ER
3/6/2008	ND	ND	ND	ND
5/2/2008	ND	ND	ND	1.43 ER
8/6/2008	ND	ND	ND	ND
10/23/2008	ND	ND	ND	ND

Site: 283 Well #: MW01

Date Collected	Benzene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Lead (µg/L)
NJDEP Criteria	1	700	1000	10
5/29/2000	ND	ND	ND	ND
8/10/2000	0.115	0.525	0.68	NA
8/31/2000	NA	NA	NA	2.38
10/13/2000	NA	NA	NA	30.1
10/17/2000	ND	ND	ND	1.85
1/5/2001	ND	ND	ND	ND
4/4/2001	ND	ND	ND	3
7/24/2001	ND	ND	ND	3.03
12/11/2001	ND	ND	ND	7.83
3/8/2002	ND	ND	ND	1.36
5/16/2002	ND	ND	ND	ND
9/10/2002	ND	ND	ND	ND
12/3/2002	ND	ND	ND	ND
2/27/2003	ND	ND	ND	ND
5/19/2003	ND	ND	ND	ND
8/4/2003	ND	ND	ND	ND
11/13/2003	ND	ND	ND	ND
2/5/2004	ND	ND	ND	ND
5/11/2004	ND	ND	ND	ND
7/21/2004	ND	ND	ND	ND
11/3/2004	ND	0.72 J	1.61 J	ND
1/20/2005	ND	ND	ND	ND
4/20/2005	ND	1.25 J	2.22 J	ND
8/9/2005	ND	ND	ND	ND
11/2/2005	ND	ND	ND	ND
Criteria Changed 11/05	1	700	1000	5
1/13/2006	ND	1.5 J	5.64 J	ND
4/18/2006	ND	0.85	1.06	ND
7/25/2006	ND	ND	ND	ND
10/30/2006	ND	ND	ND	ND
2/1/2007	ND	ND	ND	ND
5/3/2007	ND	ND	ND	ND
7/27/2007	ND	ND	ND	ND
11/20/2007	ND	ND	ND	1.72 ER
3/6/2008	ND	ND	ND	ND
5/2/2008	ND	ND	ND	ND
8/6/2008	ND	ND	ND	ND
10/23/2008	ND	ND	ND	ND

Site: 283 Well #: MW05

Date Collected	Benzene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Lead (µg/L)
NJDEP Criteria	1	700	1000	10
11/3/2004	ND	ND	ND	ND
1/20/2005	ND	ND	ND	5.63
4/20/2005	ND	0.29 J	ND	ND
8/9/2005	ND	ND	ND	ND
11/2/2005	ND	ND	ND	ND
Criteria Changed 11/05	1	700	1000	5
1/13/2006	ND	ND	ND	ND
4/18/2006	ND	ND	ND	ND
7/25/2006	ND	ND	ND	ND
10/30/2006	ND	ND	ND	ND
2/1/2007	ND	ND	ND	ND
5/3/2007	ND	ND	ND	0.929 ER
7/27/2007	ND	ND	ND	1.37 ER
11/20/2007	ND	ND	ND	0.90 ER
3/6/2008	ND	ND	ND	ND
5/2/2008	ND	ND	ND	ND
8/6/2008	ND	ND	ND	ND
10/23/2008	ND	ND	ND	2.13 ER

Site: 283 Well #: MW02

Date Collected	Benzene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Lead (µg/L)
NJDEP Criteria	1	700	1000	10
5/20/1999	536.85	797.4	3831.36	22
12/27/1999	720.56	422.5	2125.86	6.92
3/23/2000	827.72	725.71	4295.69	15.3
6/28/2000	908.16	1129.23	5560.7	11.5
8/10/2000	152	717.5	4009.44	NA
8/31/2000	NA	NA	NA	33.1
10/13/2000	NA	NA	NA	25.7
10/17/2000	670.35	810.07	3829.91	14.5
1/5/2001	1009.73	1160.40	5143.75	25.3
4/4/2001	264	502.14	3221.45	23
7/24/2001	502.2	604.67	2797.88	12.3
12/11/2001	1065.06	711.17	1524.1	11.8
3/8/2002	710.22	605.08	3744.16	9.02
5/16/2002	395.91	659.8	2192.94	7.47
9/10/2002	222.8	476.21	1919.78	9.58
12/3/2002	119.4	349.06	670.36	5.84
2/27/2003	123.79	580.9	3067.89	17.1
5/19/2003	112.54	215.6	2499.45	11.8
8/4/2003	239.49	485.84	1995.34	9.71
11/13/2003	290.54	899.91	3648.84	13.3
2/5/2004	156.93	672.01	1427.1	21.5
5/11/2004	76.99	690.36	1903.9	32.5
7/21/2004	196.78	555.2	1158.42	30.3
11/3/2004	189.73	1006.91	2630.01	18.2
1/20/2005	172.92	789.72	2196.53	17.7
4/20/2005	45.96	256.2	535.76	18.4
8/9/2005	167.54	811.58	1268.37	17.1
11/2/2005	113.35	530.24	3022.82	12.1
Criteria Changed 11/05	1	700	1000	5
1/13/2006	188.42	691.12	2276.27	9.2
4/18/2006	94.62	655.14	610.92	7.72
7/25/2006	27.04	553.81	666	10.4
10/30/2006	5.34	186.28	351.66	6.12
2/1/2007	16.03	132.7	315.02	8.78
5/3/2007	14.5	333.76	655.6	11.8
7/27/2007	8.45	54	237.22	5.54
11/20/2007	53.29	ND	307.16	4.13 ER
3/6/2008	27.91	374.24	454.87	7.96
5/2/2008	26.57	322.16	305.66	9.08
8/6/2008	76.07	317.43	645.78	4.73 ER
10/23/2008	48.45	358.5	454.3	7.34

Site: 283 Well #: MW04

Date Collected	Benzene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Lead (µg/L)
NJDEP Criteria	1	700	1000	10
11/3/2004	ND	ND	ND	24.3
1/20/2005	ND	ND	ND	35
4/20/2005	ND	6.42 J	ND	5.78
8/9/2005	ND	ND	ND	9
11/2/2005	ND	ND	ND	ND
Criteria Changed 11/05	1	700	1000	5
1/13/2006	ND	ND	ND	ND
4/18/2006	ND	ND	ND	ND
7/25/2006	ND	ND	ND	ND
10/30/2006	ND	ND	ND	ND
2/1/2007	ND	ND	ND	ND
5/3/2007	ND	ND	8.94	ND
7/27/2007	ND	ND	ND	ND
11/20/2007	ND	ND	ND	1.85 ER
3/6/2008	ND	ND	ND	ND
5/2/2008	ND	ND	ND	ND
8/6/2008	ND	ND	ND	ND
10/23/2008	ND	ND	ND	2.37 ER

Site: 283 Well #: MW06

Date Collected	Benzene (µg/L)	Ethylbenzene (µg/L)	Xylenes (µg/L)	Lead (µg/L)
NJDEP Criteria	1	700	1000	10
11/3/2004	ND	ND	ND	5.87
1/20/2005	ND	ND	ND	ND
4/20/2005	ND	ND	ND	ND
8/9/2005	ND	ND	ND	6.32
11/2/2005	ND	ND	ND	ND
Criteria Changed 11/05	1	700	1000	5
1/13/2006	ND	ND	ND	ND
4/18/2006	ND	ND	ND	1.74 ER
7/25/2006	ND	ND	ND	ND
10/30/2006	ND	ND	ND	ND
2/1/2007	ND	ND	ND	ND
5/3/2007	ND	ND	ND	ND
7/27/2007	ND	ND	ND	ND
11/20/2007	ND	ND	ND	0.786 ER
3/6/2008	ND	ND	ND	ND
5/2/2008	ND	ND	ND	ND
8/6/2008	ND	ND	ND	ND
10/23/2008	ND	ND	ND	1.80 ER

Parkers Creek

MP18MW24

MP18MW25

FTMM-18

B4MW04B

145

283MW01

283MW03

283MW04

283MW05

283MW02

283MW06

293

295

290MW02

296MW08

292

290MW01

296MW02

296

296MW01

291

288

283

555

Approximate Groundwater Flow Direction

Russel Avenue

Sherrill Avenue

Malterer Avenue

Irwin Avenue

Brewer Avenue

Harmon Avenue

Sherrill Avenue

Legend

- Monitoring Well
- Existing Building
- Landfill Area
- Roadway & Parking
- Water Body
- Post Boundary
- 0.00 - Ground Water Quality Standard (GWQS) Exceedance
- MM/DD/YYYY - Low Flow Sampling Event
- - Approximate Groundwater Flow Direction

N W E S

Figure 5-1A
Ground Water Contaminants of Concern Distribution Map
Site 283 (FTMM-61) - Main Post
Fort Monmouth, New Jersey
FOUO

30 Feet

Notes:

Exceedances of NJDEP GWQS are shaded and bolded.
ER - Estimated Result
J - Estimated concentration observed greater than the Method Detection Limit and less than the Reportable Limit.
NA - Not Analyzed
ND - Not Detected

Map created by:
Fort Monmouth Installation GIO,
Environmental Division
Fort Monmouth, New Jersey
Date: September 27, 2010
New Jersey State Plane Feet, NAD83

September 27, 2010 H:\GIS\GIS\Maps\1AFGroundwater Contaminant Maps\Groundwater Historic\283\Site 283 Groundwater Contamination Distribution.mxd

SS14 Date Collected	Arsenic	Tetrachloroethene	Thallium	Trichloroethene
NJDEP Criteria	8	1	10	1
10/8/1996	NA	ND	NA	ND
11/25/1996	NA	ND	NA	ND
12/12/1996	NA	ND	NA	ND
1/29/1997	NA	ND	NA	ND
2/26/1997	NA	ND	NA	ND
3/10/1997	NA	ND	NA	ND
4/8/1997	NA	ND	NA	ND
7/17/1997	NA	ND	NA	ND
10/30/1997	NA	ND	NA	1.71
2/10/1998	NA	ND	NA	ND
4/21/1998	NA	ND	NA	ND
8/19/1998	NA	ND	NA	ND
11/18/1998	NA	ND	NA	ND
2/25/1999	NA	ND	NA	ND
6/29/1999	NA	ND	NA	ND
6/29/1999	NA	ND	NA	ND
9/22/1999	NA	ND	NA	ND
12/8/1999	NA	ND	NA	ND
3/1/2000	NA	ND	NA	ND
6/12/2000	NA	ND	NA	ND
8/24/2000	NA	ND	NA	ND
11/20/2000	NA	ND	NA	ND
11/20/2000	NA	4.99	NA	ND
3/8/2001	NA	ND	NA	ND
3/8/2001	NA	ND	NA	ND
5/16/2001	NA	ND	NA	ND
9/25/2001	NA	ND	NA	ND
11/14/2001	NA	ND	NA	ND
2/11/2002	NA	ND	NA	ND
6/18/2002	NA	ND	NA	ND
9/18/2002	NA	ND	NA	ND
11/5/2002	NA	ND	NA	ND
3/24/2003	NA	ND	NA	ND
5/21/2003	NA	ND	NA	ND
9/17/2003	NA	ND	NA	ND
11/4/2003	NA	ND	NA	ND
3/17/2004	NA	ND	NA	ND
3/17/2004	NA	ND	NA	ND
6/29/2004	NA	ND	NA	ND
8/26/2004	NA	ND	NA	ND
11/23/2004	NO	ND	NO	NO
3/3/2005	NO	ND	NO	NO
6/14/2005	NO	ND	ND	ND
9/12/2005	NO	ND	ND	ND
Criteria Changed 11/05	3	1	2	1
11/30/2005	NO	ND	ND	NO
2/22/2006	NO	ND	ND	NO
5/30/2006	NO	ND	ND	NO
9/19/2006	2.23 ER	ND	ND	NO
12/11/2006	2.94 ER	ND	ND	NO
3/13/2007	NO	ND	ND	NO
6/26/2007	4.07 ER	ND	ND	NO
6/26/2007	2.94 ER	ND	ND	NO
9/13/2007	56.3	ND	ND	NO
9/13/2007	NO	ND	ND	NO
12/19/2007	NO	ND	ND	NO
12/31/2007	NO	ND	ND	NO
3/25/2008	NO	ND	ND	NO
3/25/2008	NO	ND	ND	NO
6/26/2008	2.54 ER	ND	ND	NO
6/26/2008	3.63 ER	ND	ND	NO
9/30/2008	1.47 ER	ND	ND	NO
9/30/2008	NO	ND	ND	NO
12/29/2008	2.72 ER	ND	2.56 ER	NO
12/29/2008	NO	ND	3.07 ER	NO
2/22/2006 D	NO	ND	ND	NO
5/30/2006 D	2.54	ND	ND	NO
9/19/2006 D	3.06 ER	ND	ND	NO
12/11/2006 D	2.23 ER	ND	ND	NO
3/13/2007 D	NO	ND	ND	NO

SS27 Date Collected	Arsenic	Beryllium	Tetrachloroethene
NJDEP Criteria	8	20	1
6/12/2000	NA	NA	ND
8/24/2000	NA	NA	1.72
11/20/2000	NA	NA	1.87
3/8/2001	NA	NA	ND
5/16/2001	NA	NA	ND
9/25/2001	NA	NA	ND
11/14/2001	NA	NA	ND
2/11/2002	NA	NA	ND
6/18/2002	NA	NA	ND
9/18/2002	NA	NA	ND
11/4/2002	NA	NA	ND
3/13/2003	NA	NA	1.71 J
5/21/2003	NA	NA	2.68
9/17/2003	NA	NA	1.16 J
11/4/2003	NA	NA	1.06 J
3/17/2004	NA	NA	0.85 J
6/29/2004	NA	NA	ND
8/26/2004	NA	NA	0.56 J
11/23/2004	ND	ND	ND
3/3/2005	ND	ND	1.06 J
6/14/2005	5.33	ND	0.58 J
9/13/2005	ND	ND	ND
Criteria Changed 11/05	3	1	1
12/1/2005	ND	ND	ND
2/22/2006	ND	ND	1.04 J
5/31/2006	ND	ND	ND
9/20/2006	ND	ND	ND
12/12/2006	ND	ND	0.44 J
3/13/2007	ND	ND	1.07 J
6/26/2007	3.05 ER	0.129 ER	ND
6/26/2007	ND	0.116 ER	ND
9/13/2007	ND	ND	ND
12/19/2007	ND	ND	ND
3/26/2008	ND	ND	1.01 J
6/26/2008	ND	39.4	0.69 J
9/30/2008	ND	0.164 ER	ND
12/29/2008	ND	0.203 ER	0.68 J

SS15 Date Collected	Arsenic	Lead	Tetrachloroethene	Trichloroethene
NJDEP Criteria	8	10	1	1
10/8/1996	NA	NA	8.41	2.58
11/25/1996	NA	NA	10.38	2.54
12/12/1996	NA	NA	5.63	1.31
1/29/1997	NA	NA	5.68	1.33
2/26/1997	NA	NA	7.84	ND
3/10/1997	NA	NA	3.39	ND
4/8/1997	NA	NA	6.00	1.6
7/17/1997	NA	NA	7.12	2.5
10/30/1997	NA	NA	2.72	ND
2/10/1998	NA	NA	6.90	1.63
4/21/1998	NA	NA	5.72	1.21
8/19/1998	NA	NA	5.39	2.06
11/18/1998	NA	NA	ND	ND
2/25/1999	NA	NA	7.33	ND
6/29/1999	NA	NA	7.86	2.4
9/22/1999	NA	NA	2.61	1.37
12/8/1999	NA	NA	4.08	ND
3/1/2000	NA	NA	6.95	1.39
6/12/2000	NA	NA	5.94	ND
8/24/2000	NA	NA	5.2	1.58
11/20/2000	NA	NA	6.29	ND
2/22/2001	NA	NA	7.19	ND
5/16/2001	NA	NA	6.64	ND
9/25/2001	NA	NA	ND	ND
11/14/2001	NA	NA	3.49	ND
2/11/2002	NA	NA	2.65	ND
6/18/2002	NA	NA	2.67	ND
9/18/2002	NA	NA	2.53	ND
11/5/2002	NA	NA	1.52	ND
3/24/2003	NA	NA	3.96	1.11 J
5/21/2003	NA	NA	3.24	ND
9/17/2003	NA	NA	1.60 J	ND
11/4/2003	NA	NA	1.49 J	0.53 J
3/17/2004	NA	NA	2.26	0.55 J
6/29/2004	NA	NA	1.28 J	ND
8/26/2004	NA	NA	1.25 J	0.78 J
11/23/2004	ND	ND	2.00	ND
3/3/2005	ND	ND	2.92	ND
6/14/2005	ND	ND	2.34	1.24 J
9/12/2005	ND	ND	1.25 J	0.91 J
Criteria Changed 11/05	3	5	1	1
11/30/2005	ND	ND	ND	ND
2/22/2006	ND	ND	2.34	0.85 J
5/30/2006	ND	ND	ND	ND
9/19/2006	ND	ND	ND	ND
12/11/2006	ND	ND	ND	ND
3/13/2007	ND	ND	2.21	0.65 J
6/26/2007	5.13 ER	ND	ND	ND
9/13/2007	ND	ND	1.56 J	ND
12/19/2007	ND	ND	0.93 J	ND
3/25/2008	ND	ND	2.42	1.02 J
6/26/2008	3.37 ER	1.43 ER	2.28	1.01 J
9/30/2008	3.50 ER	ND	ND	ND
12/29/2008	ND	3.74	1.53 J	ND

Legend

Sample Points
- Active
- Inactive
- Existing Building
- Roadway & Parking
- Water Body
- Post Boundary

N W E S

Figure 5-1B
Surface Water Contaminants of Concern Distribution Map
Site 283 (FTMM-61) - Main Post
Fort Monmouth, New Jersey
FOUO

300 Feet

Notes:

Exceedances of NJDEP GWQS are shaded and bolded.
J - Estimated concentration observed greater than the Method Detection Limit and less than the Reportable Limit.
NA - Not Analyzed
ND - Not Detected
ER - Estimated Result

Map created by:
Fort Monmouth Installation GIO,
Environmental Division
Fort Monmouth, New Jersey
Date: October 13, 2010
New Jersey State Plane Feet, NAD83

October 13, 2010 H:\GIS\GIS Maps\JT\Groundwater Contaminant Maps\Groundwater Historic\283\Site 283 Surface Water Sample Location Map.mxd

FIGURE 5-2A
Benzene Concentrations vs Time at 283MW02
2nd Quarter 1999 through 4th Quarter 2008
Site 886
Fort Monmouth, New Jersey

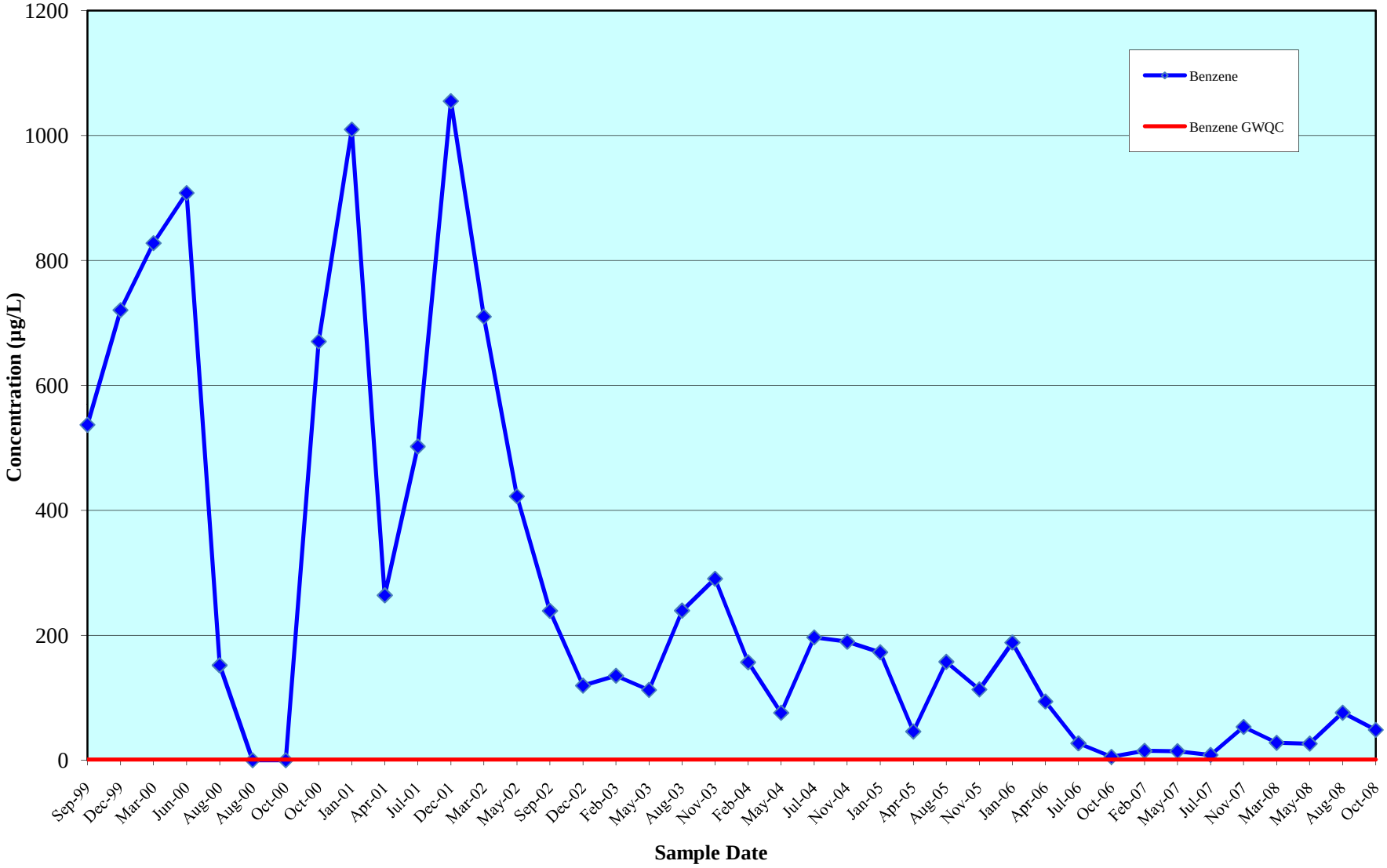


FIGURE 5-2B
Ethylbenzene Concentrations vs Time at 283MW02
2nd Quarter 1999 through 4th Quarter 2008
Site 886
Fort Monmouth, New Jersey

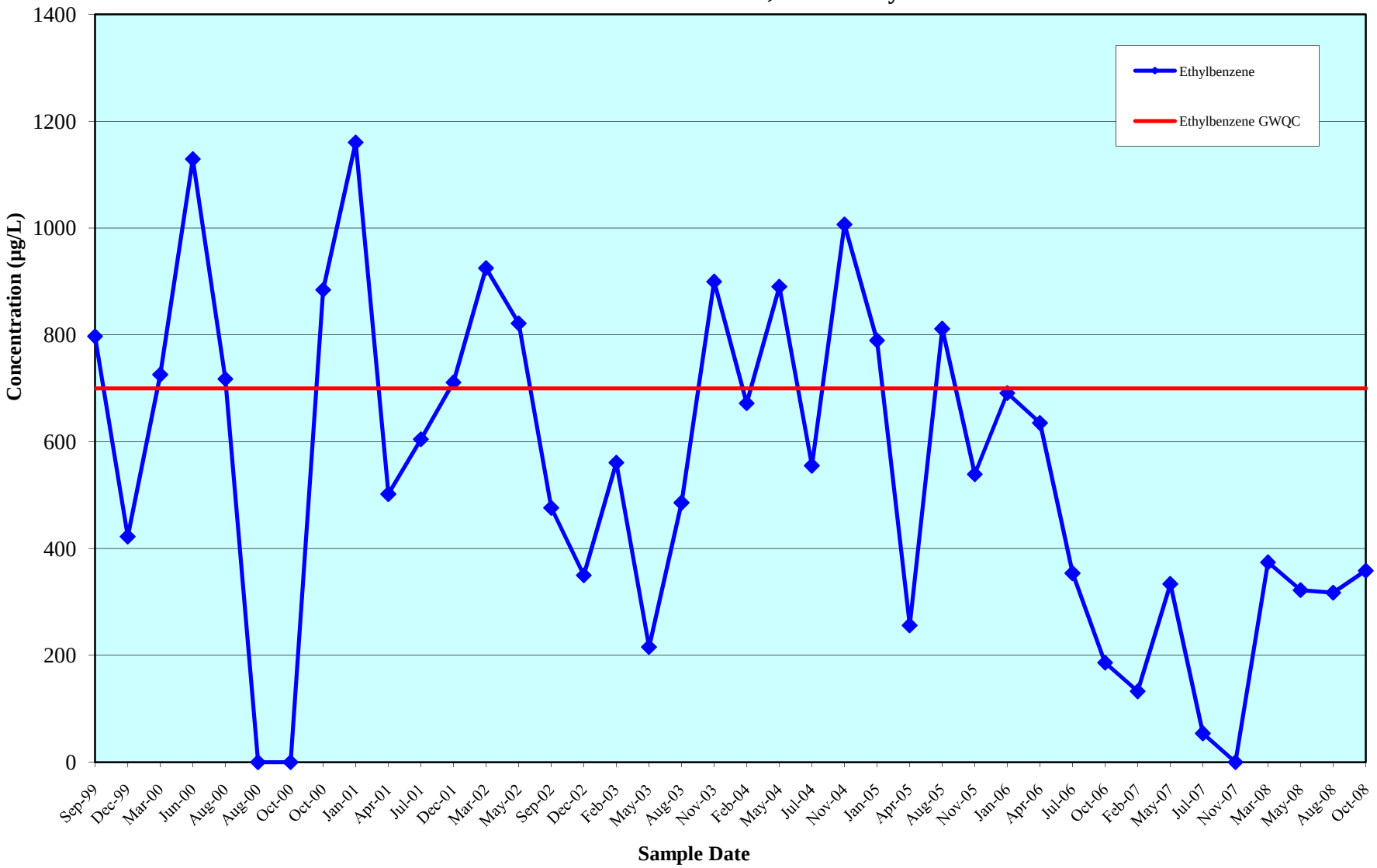


FIGURE 5-2C
Total Xylenes Concentrations vs Time at 283MW02
2nd Quarter 1999 through 4th Quarter 2008
Site 886
Fort Monmouth, New Jersey

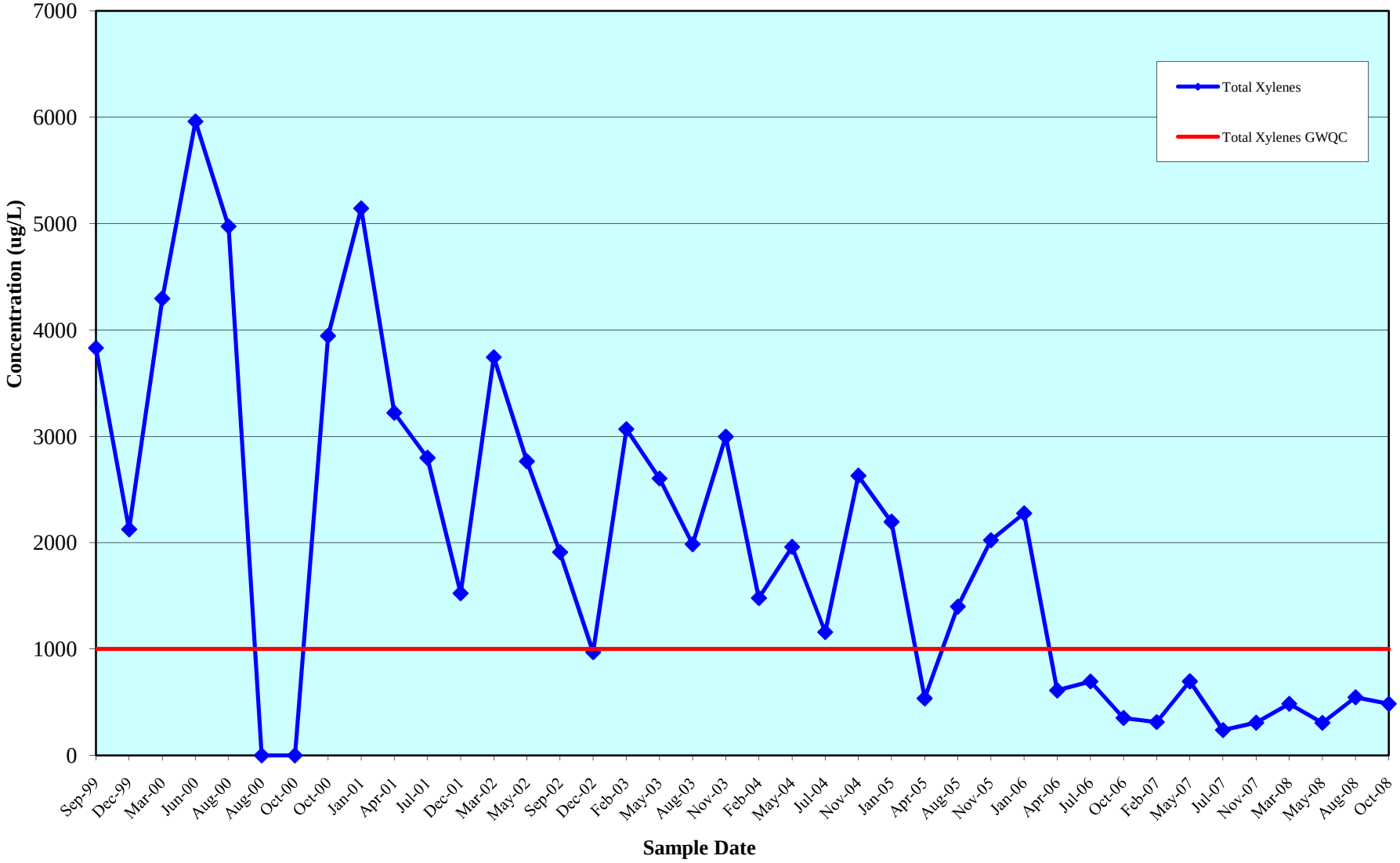


FIGURE 5-2D
Lead Concentrations vs Time at 283MW02
2nd Quarter 1999 through 4th Quarter 2008
Site 886
Fort Monmouth, New Jersey

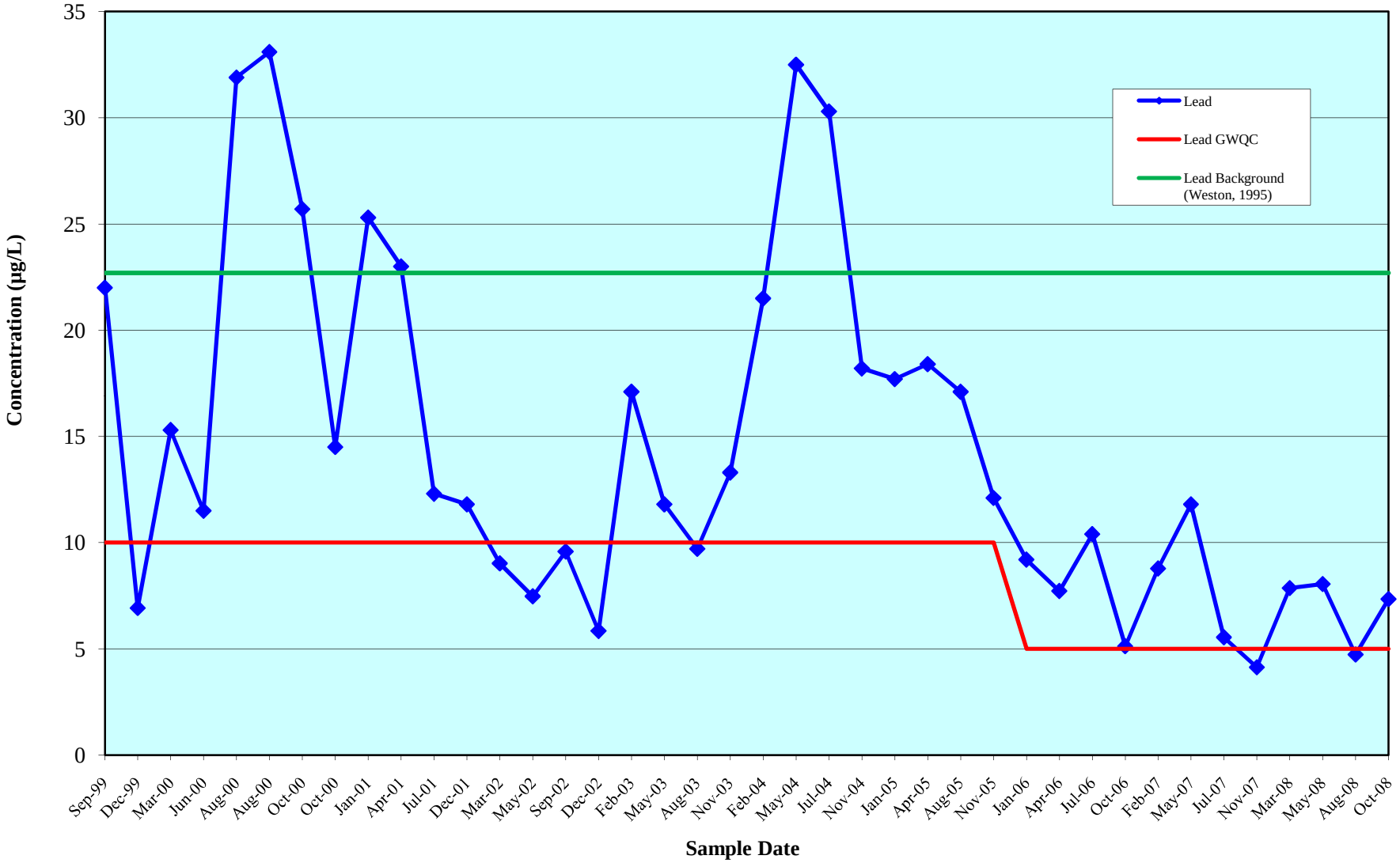


FIGURE 5-3A
Benzene Concentrations vs Time at 283MW03
2nd Quarter 2000 through 4th Quarter 2008
Site 886
Fort Monmouth, New Jersey

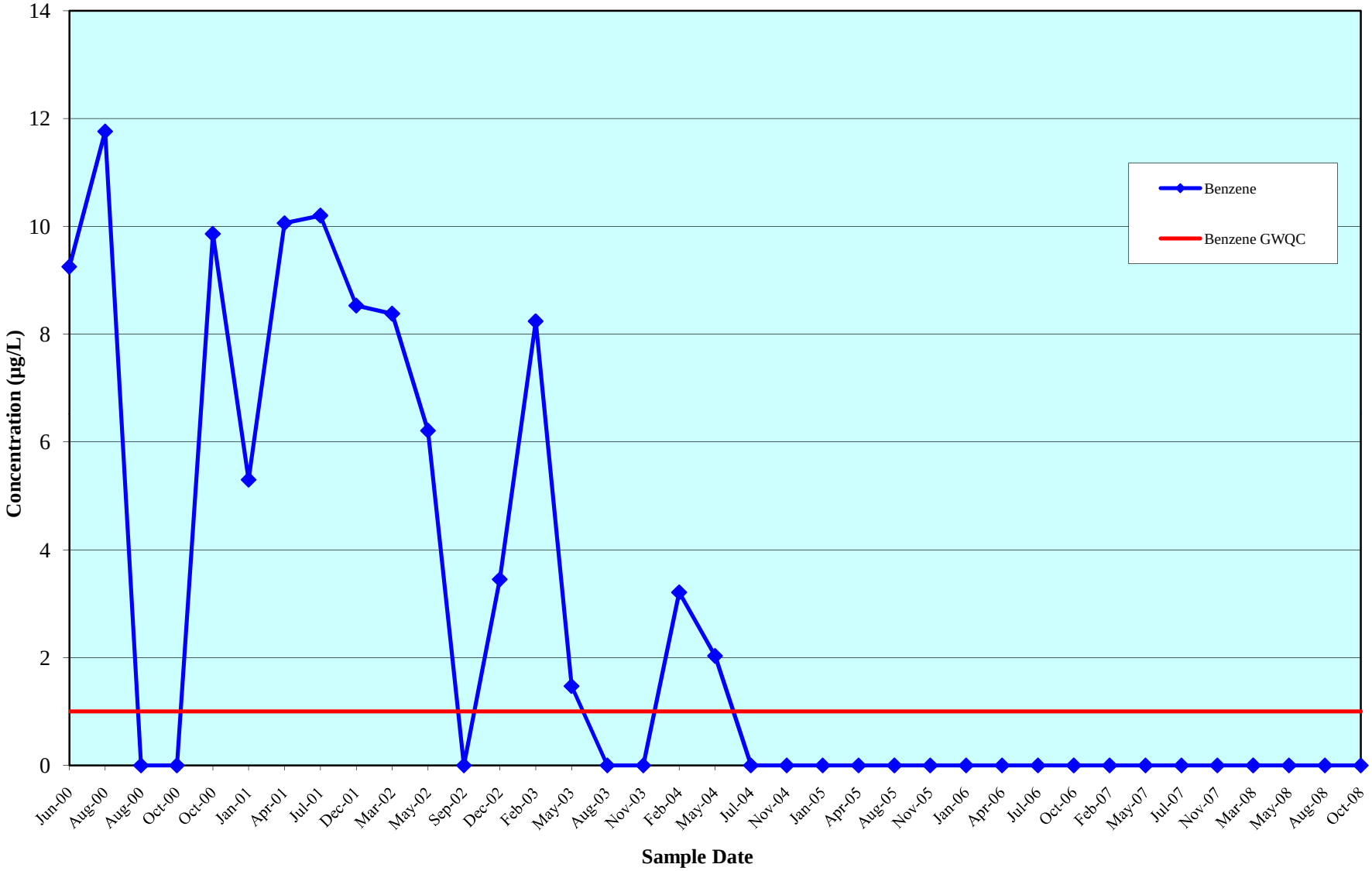


FIGURE 5-3B
Lead Concentrations vs Time at 283MW03
2nd Quarter 2000 through 4th Quarter 2008
Site 886
Fort Monmouth, New Jersey

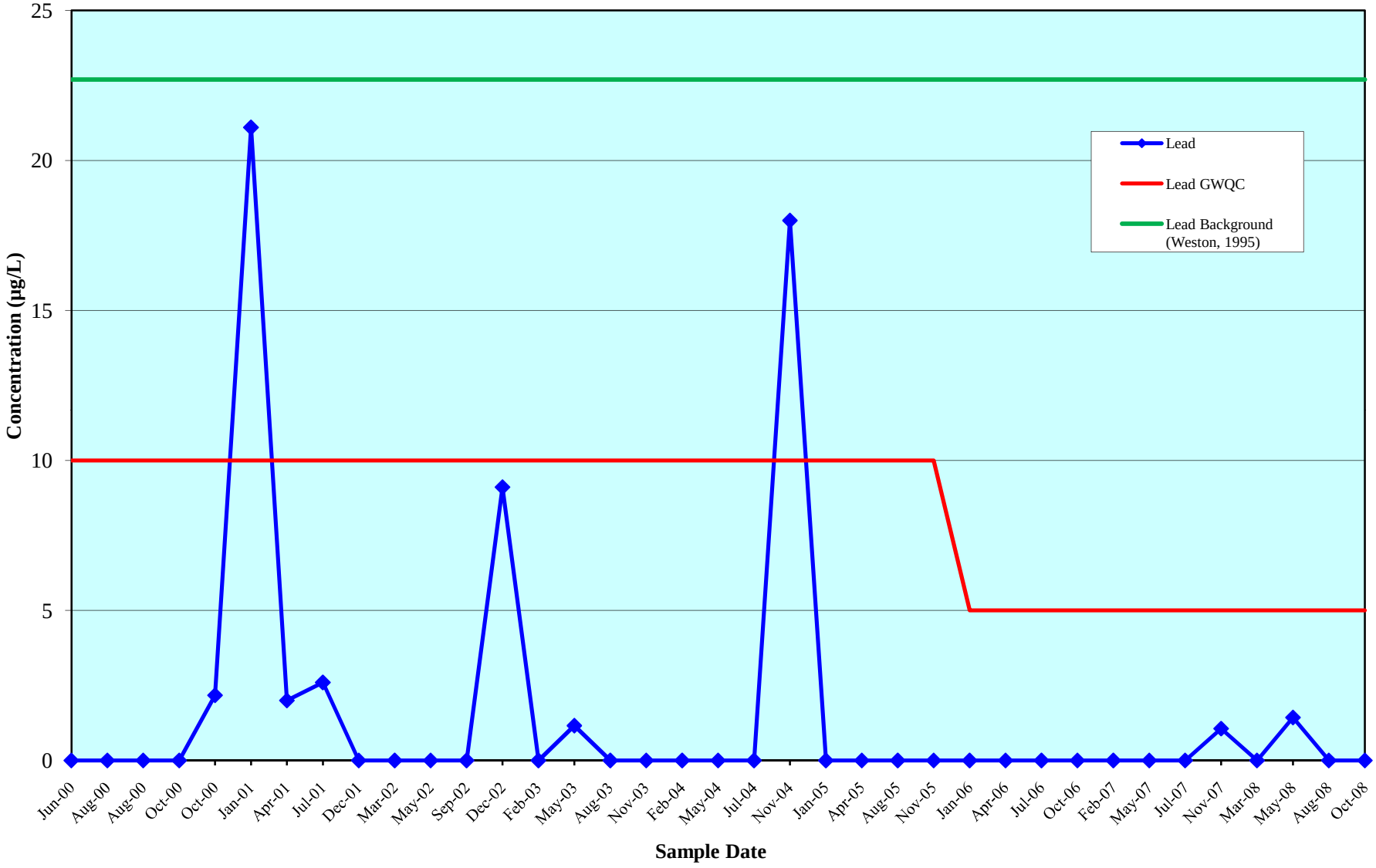
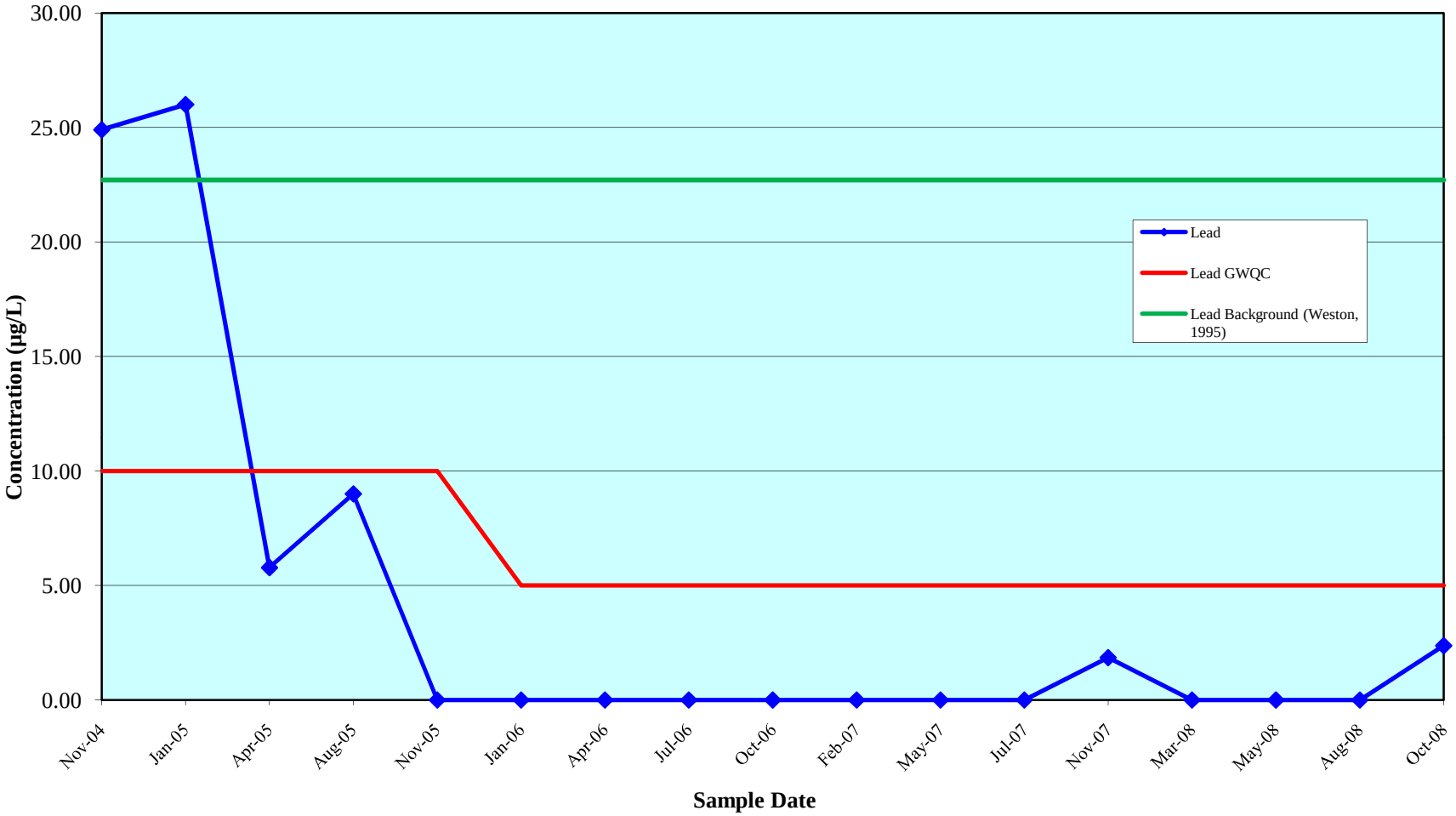


Figure 5-4
Lead Concentrations vs Time in 283MW04
3rd Quarter 1999 through 4th Quarter 2008
Site 886
Fort Monmouth, New Jersey



TABLES

Table 3-1
283MW02 Mann-Whitney U-Test
VOCs - Benzene
1st Quarter 2007 - 4th Quarter 2008
Site 283
Fort Monmouth, New Jersey

H_o: $O_1 \leq O_2$ (null)

H_1: $O_1 > O_2$ (alternate)

Year	2007 (O_1)				2008 (O_2)			
Sampling Round	1	2	3	4	5	6	7	8
Sampling Result	8.46a	6.53a	53.29a	68.9a	27.91b	26.57b	76.07b	48.45b

a. 6.53a
8.46a
26.57b
27.91b
48.45b
53.29a
68.9a
76.07b

a. 6.53a=4, 8.46a=4, 53.29a=1, 68.90a=1 "U"=10

Conclusion: "U" is 10, therefore the null hypothesis is accepted, and it cannot be concluded, with 90 percent or greater confidence, that the concentration for Benzene has decreased with time at 283MW02.

Table 3-2
283MW02 Mann-Whitney U-Test
VOCs - Ethylbenzene
1st Quarter 2007 - 4th Quarter 2008
Site 283
Fort Monmouth, New Jersey

H_o: $O_1 \leq O_2$ (null)

H_1: $O_1 > O_2$ (alternate)

Year	2007 (O_1)				2008 (O_2)			
Sampling Round	1	2	3	4	5	6	7	8
Sampling Result	132.7a	333.76a	54a	NDa	374.24b	322.15b	317.43b	358.5b

a. NDa
54a
132.7a
317.43b
322.15b
333.76a
358.5b
374.24b

a. NDa=4 54a=4 132.7a=4 333.76a=2 "U"=14

Conclusion: "U" is 14, therefore the null hypothesis is accepted and it cannot be concluded, with 90 percent or greater confidence, that the concentration for Ethylbenzene has decreased with time at 283MW02.

Table 3-3
283MW02 Mann-Whitney U-Test
VOCs - Total Xylenes
1st Quarter 2007 - 4th Quarter 2008
Site 283
Fort Monmouth, New Jersey

H_o: $O_1 \leq O_2$ (null)

H_1: $O_1 > O_2$ (alternate)

Year	2007 (O_1)				2008 (O_2)			
Sampling Round	1	2	3	4	5	6	7	8
Sampling Result	313.02a	695.9a	237.22a	307.19a	484.87b	305.69b	545.78b	484.3b

a. 237.22a
305.69b
307.19a
313.02a
484.3b
484.87b
545.78b
695.9a

a. 237.22a=4 307.19a=3 313.02a=3 695.9a=0 "U"=10

Conclusion: "U" is 10, therefore the null hypothesis is accepted and it cannot be concluded, with 90 percent or greater confidence, that the concentration for Total Xylenes has decreased with time at 283MW02.

Table 3-4
283MW02 Mann-Whitney U-Test
Lead
1st Quarter 2007 - 4th Quarter 2008
Site 283
Fort Monmouth, New Jersey

H_o: $O_1 \leq O_2$ (null)

H_1: $O_1 > O_2$ (alternate)

Year	2007 (O_1)				2008 (O_2)			
Sampling Round	1	2	3	4	5	6	7	8
Sampling Result	5.54a	6.68a	4.13a	4.05a	7.86b	8.05b	4.73b	7.34b

a. 4.05a
4.13a
4.73b
5.54a
6.68a
7.34b
7.86b
8.05b

a. 4.05a=4, 4.13a=4, 5.54a=3, 6.68a=3 "U"=14

Conclusion: "U" is 14, therefore the null hypothesis is accepted, and it cannot be concluded, with 90 percent or greater confidence, that the concentration for Lead has decreased with time at 283MW02.

Table 4-1
Ground Water Elevation Summary
Site 283 (FTMM-61)
Fort Monmouth, New Jersey

Ground Water Sampling Round			#20			#21			#22			#23			#24		
Well ID	Total Depth of Well (ft)	TOC[1]	Date	Depth to Water[2]	Ground Water Elevation(3)	Date	Depth to Water[2]	Ground Water Elevation(3)	Date	Depth to Water[2]	Ground Water Elevation(3)	Date	Depth to Water[2]	Ground Water Elevation(3)	Date	Depth to Water[2]	Ground Water Elevation(3)
283MW01	19.75	11.34	05/11/04	5.52	5.82	07/21/04	6.31	5.03	11/03/04	6.22	5.12	01/20/05	5.19	6.15	04/20/05	5.45	5.89
283MW02	19.69	13.52	05/11/04	5.57	7.95	07/21/04	6.91	6.61	11/03/04	6.97	6.55	01/20/05	5.13	8.39	04/20/05	5.51	8.01
283MW03	24.05	11.86	05/11/04	6.37	5.49	07/21/04	6.98	4.88	11/03/04	8.97	2.89	01/20/05	6.17	5.69	04/20/05	6.37	5.49
283MW04	18.34	13.93	NS	NS	NS	NS	NS	NS	11/03/04	8.14	5.79	01/20/05	6.95	6.98	04/20/05	7.33	6.60
283MW05	18.37	13.82	NS	NS	NS	NS	NS	NS	11/03/04	7.92	5.90	01/20/05	6.47	7.35	04/20/05	6.84	6.98
283MW06	18.37	13.56	NS	NS	NS	NS	NS	NS	11/03/04	7.05	6.51	01/20/05	5.10	8.46	04/20/05	5.48	8.08

Notes:
(1) Elevation of survey mark at top of casing (TOC).
(2) Depth to water in feet from TOC.
(3) Ground water elevation in feet above mean sea level (msl).

Table 4-1
Ground Water Elevation Summary
Site 283 (FTMM-61)
Fort Monmouth, New Jersey

Ground Water Sampling Round			#25			#26			#27			#28			#29		
Well ID	Total Depth of Well (ft)	TOC[1]	Date	Depth to Water[2]	Ground Water Elevation(3)	Date	Depth to Water[2]	Ground Water Elevation(3)	Date	Depth to Water[2]	Ground Water Elevation(3)	Date	Depth to Water[2]	Ground Water Elevation(3)	Date	Depth to Water[2]	Ground Water Elevation(3)
283MW01	19.75	11.34	08/09/05	6.52	4.82	11/02/05	5.21	6.13	01/13/06	5.40	5.94	04/18/06	5.91	5.43	07/25/06	6.52	4.82
283MW02	19.69	13.52	08/09/05	7.12	6.40	11/02/05	5.44	8.08	01/13/06	5.13	8.39	04/18/06	6.72	6.80	07/25/06	5.06	8.46
283MW03	24.05	11.86	08/09/05	7.14	4.72	11/02/05	5.97	5.89	01/13/06	6.07	5.79	04/18/06	6.85	5.01	07/25/06	6.42	5.44
283MW04	18.34	13.93	08/09/05	8.28	5.65	11/02/05	6.57	7.36	01/13/06	6.77	7.16	04/18/06	7.94	5.99	07/25/06	4.76	9.17
283MW05	18.37	13.82	08/09/05	8.07	5.75	11/02/05	5.85	7.97	01/13/06	6.19	7.63	04/18/06	7.71	6.11	07/25/06	3.84	9.98
283MW06	18.37	13.56	08/09/05	6.97	6.59	11/02/05	4.62	8.94	01/13/06	4.79	8.77	04/18/06	6.66	6.90	07/25/06	5.58	7.98

Notes:
(1) Elevation of survey mark at top of casing (TOC).
(2) Depth to water in feet from TOC.
(3) Ground water elevation in feet above mean sea level (msl).

Table 4-1
Ground Water Elevation Summary
Site 283 (FTMM-61)
Fort Monmouth, New Jersey

Ground Water Sampling Round			#30			#31			#32			#33			#34		
Well ID	Total Depth of Well (ft)	TOC[1]	Date	Depth to Water[2]	Ground Water Elevation(3)	Date	Depth to Water[2]	Ground Water Elevation(3)	Date	Depth to Water[2]	Ground Water Elevation(3)	Date	Depth to Water[2]	Ground Water Elevation(3)	Date	Depth to Water[2]	Ground Water Elevation(3)
283MW01	19.75	11.34	10/30/06	5.13	6.21	02/01/07	5.11	6.23	05/03/07	5.44	5.90	07/27/07	5.98	5.36	11/20/07	6.29	5.05
283MW02	19.69	13.52	10/30/06	4.61	8.91	02/01/07	6.18	7.34	05/03/07	4.95	8.57	07/27/07	5.06	8.46	11/20/07	7.26	6.26
283MW03	24.05	11.86	10/30/06	5.79	6.07	02/01/07	6.59	5.27	05/03/07	6.05	5.81	07/27/07	6.31	5.55	11/20/07	7.07	4.79
283MW04	18.34	13.93	10/30/06	5.02	8.91	02/01/07	7.61	6.32	05/03/07	6.86	7.07	07/27/07	7.04	6.89	11/20/07	8.25	5.68
283MW05	18.37	13.82	10/30/06	4.14	9.68	02/01/07	7.25	6.57	05/03/07	6.29	7.53	07/27/07	6.46	7.36	11/20/07	7.92	5.90
283MW06	18.37	13.56	10/30/06	4.34	9.22	02/01/07	5.95	7.61	05/03/07	4.95	8.61	07/27/07	6.04	7.52	11/20/07	7.36	6.20

Notes:
(1) Elevation of survey mark at top of casing (TOC).
(2) Depth to water in feet from TOC.
(3) Ground water elevation in feet above mean sea level (msl).

Table 4-1
Ground Water Elevation Summary
Site 283 (FTMM-61)
Fort Monmouth, New Jersey

Ground Water Sampling Round			#35			#36			#37			#38		
Well ID	Total Depth of Well (ft)	TOC[(1)]	Date	Depth to Water[(2)]	Ground Water Elevation(3)	Date	Depth to Water[(2)]	Ground Water Elevation(3)	Date	Depth to Water[(2)]	Ground Water Elevation(3)	Date	Depth to Water[(2)]	Ground Water Elevation(3)
283MW01	19.75	11.34	03/06/08	5.51	5.83	05/02/08	5.81	5.53	08/06/08	6.54	4.80	10/23/08	6.11	5.23
283MW02	19.69	13.52	03/06/08	5.61	7.91	05/02/08	6.49	7.03	08/06/08	6.98	6.54	10/23/08	5.44	8.08
283MW03	24.05	11.86	03/06/08	6.32	5.54	05/02/08	6.62	5.24	08/06/08	7.09	4.77	10/23/08	7.07	4.79
283MW04	18.34	13.93	03/06/08	7.30	6.63	05/02/08	7.76	6.17	08/06/08	8.22	5.71	10/23/08	5.04	8.89
283MW05	18.37	13.82	03/06/08	6.82	7.00	05/02/08	7.46	6.36	08/06/08	7.89	5.93	10/23/08	7.15	6.67
283MW06	18.37	13.56	03/06/08	5.67	7.89	05/02/08	6.45	7.11	08/06/08	6.90	6.66	10/23/08	5.83	7.73

Notes:
(1) Elevation of survey mark at top of casing (TOC).
(2) Depth to water in feet from TOC.
(3) Ground water elevation in feet above mean sea level (msl).

Table 4-2
Ground Water Sampling Summary
Site 283
Fort Monmouth, New Jersey

Round	Field Sample ID	Lab Sample ID	Date Collected	Matrix	Analytical Parameters	Analytical Methods
#20	283MW01	4034804	5/11/2004	Aqueous	VOCs, SVOCs, Pest/PCBs, Metals	Methods 624, 625, 608, 3120 & 3112 (mercury)
	283MW02	4034805	5/11/2004	Aqueous	VOCs, SVOCs, Pest/PCBs, Metals	Methods 624, 625, 608, 3120 & 3112 (mercury)
	283MW03	4034806	5/11/2004	Aqueous	VOCs, SVOCs, Pest/PCBs, Metals	Methods 624, 625, 608, 3120 & 3112 (mercury)
#21	283MW01	4054204	7/21/2004	Aqueous	VOCs, SVOCs, Pest/PCBs, Metals	Methods 624, 625, 608, 3120 & 3112 (mercury)
	283MW02	4054205	7/21/2004	Aqueous	VOCs, SVOCs, Pest/PCBs, Metals	Methods 624, 625, 608, 3120 & 3112 (mercury)
	283MW03	4054206	7/21/2004	Aqueous	VOCs, SVOCs, Pest/PCBs, Metals	Methods 624, 625, 608, 3120 & 3112 (mercury)
#22	283MW01	4076404	11/3/2004	Aqueous	VOCs, SVOCs, Pest/PCBs, Metals	Methods 624, 625, 608, 3120 & 3112 (mercury)
	283MW02	4076405	11/3/2004	Aqueous	VOCs, SVOCs, Pest/PCBs, Metals	Methods 624, 625, 608, 3120 & 3112 (mercury)
	283MW03	4076406	11/3/2004	Aqueous	VOCs, SVOCs, Pest/PCBs, Metals	Methods 624, 625, 608, 3120 & 3112 (mercury)
	283MW04	4076407	11/3/2004	Aqueous	VOCs, SVOCs, Pest/PCBs, Metals	Methods 624, 625, 608, 3120 & 3112 (mercury)
	283MW05	4076408	11/3/2004	Aqueous	VOCs, SVOCs, Pest/PCBs, Metals	Methods 624, 625, 608, 3120 & 3112 (mercury)
	283MW06	4076409	11/3/2004	Aqueous	VOCs, SVOCs, Pest/PCBs, Metals	Methods 624, 625, 608, 3120 & 3112 (mercury)
#23	283MW01	5004104	1/20/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	5004105	1/20/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	5004106	1/20/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	5004107	1/20/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	5004108	1/20/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	5004109	1/20/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
#24	283MW01	5021004	4/20/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	5021005	4/20/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	5021006	4/20/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	5021007	4/20/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	5021008	4/20/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	5021009	4/20/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
#25	283MW01	5038804	8/9/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	5038805	8/9/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	5038806	8/9/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	5038807	8/9/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	5038808	8/9/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	5038809	8/9/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)

Notes:
VOCs = Volatile Organic Compounds
SVOCs = Semi-Volatile Organic Compounds
Pest/PCB = Pesticides/Polychlorinated Biphenyls
Metals = Target Analyte List Metals

Table 4-2
Ground Water Sampling Summary
Site 283
Fort Monmouth, New Jersey

Round	Field Sample ID	Lab Sample ID	Date Collected	Matrix	Analytical Parameters	Analytical Methods
#26	283MW01	5057304	11/2/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	5057305	11/2/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	5057306	11/2/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	5057307	11/2/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	5057308	11/2/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	5057309	11/2/2005	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
#27	283MW01	6006004	1/13/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	6006005	1/13/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	6006006	1/13/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	6006007	1/13/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	6006008	1/13/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	6006009	1/13/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
#28	283MW01	6016104	4/18/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	6016105	4/18/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	6016106	4/18/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	6016107	4/18/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	6016108	4/18/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	6016109	4/18/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
#29	283MW01	6033504	7/25/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	6033505	7/25/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	6033506	7/25/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	6033507	7/25/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	6033508	7/25/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	6033509	7/25/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
#30	283MW01	6047004	10/30/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	6047005	10/30/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	6047006	10/30/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	6047007	10/30/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	6047008	10/30/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	6047009	10/30/2006	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)

Notes:
VOCs = Volatile Organic Compounds
SVOCs = Semi-Volatile Organic Compounds
Pest/PCB = Pesticides/Polychlorinated Biphenyls
Metals = Target Analyte List Metals

Table 4-2
Ground Water Sampling Summary
Site 283
Fort Monmouth, New Jersey

Round	Field Sample ID	Lab Sample ID	Date Collected	Matrix	Analytical Parameters	Analytical Methods
#31	283MW01	7004204	2/1/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	7004205	2/1/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	7004206	2/1/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	7004207	2/1/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	7004208	2/1/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	7004209	2/1/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
#32	283MW01	7016104	5/3/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	7016105	5/3/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	7016106	5/3/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	7016107	5/3/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	7016108	5/3/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	7016109	5/3/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
#33	283MW01	7028304	7/27/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	7028305	7/27/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	7028306	7/27/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	7028307	7/27/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	7028308	7/27/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	7028309	7/27/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
#34	283MW01	7047704	11/20/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	7047705	11/20/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	7047706	11/20/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	7047707	11/20/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	7047708	11/20/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	7047709	11/20/2007	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
#35	283MW01	8006904	3/6/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	8006905	3/6/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	8006906	3/6/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	8006907	3/6/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	8006908	3/6/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	8006909	3/6/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)

Notes:
VOCs = Volatile Organic Compounds
SVOCs = Semi-Volatile Organic Compounds
Pest/PCB = Pesticides/Polychlorinated Biphenyls
Metals = Target Analyte List Metals

Table 4-2
Ground Water Sampling Summary
Site 283
Fort Monmouth, New Jersey

Round	Field Sample ID	Lab Sample ID	Date Collected	Matrix	Analytical Parameters	Analytical Methods
#36	283MW01	8015004	5/2/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	8015005	5/2/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	8015006	5/2/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	8015007	5/2/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	8015008	5/2/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	8015009	5/2/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
#37	283MW01	8028004	8/6/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	8028005	8/6/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	8028006	8/6/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	8028007	8/6/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	8028008	8/6/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	8028009	8/6/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
#38	283MW01	8038504	10/23/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW02	8038505	10/23/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW03	8038506	10/23/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW04	8038507	10/23/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW05	8038508	10/23/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)
	283MW06	8038509	10/23/2008	Aqueous	VOCs, Metals	Methods 624, 3120 & 3112 (mercury)

Notes:
VOCs = Volatile Organic Compounds
SVOCs = Semi-Volatile Organic Compounds
Pest/PCB = Pesticides/Polychlorinated Biphenyls
Metals = Target Analyte List Metals

Table 4-3
Surface Water Sampling Summary
Site 283
Fort Monmouth, New Jersey

Round	Field Sample ID	Lab Sample ID	Date Collected	Matrix	Analytical Parameters	Analytical Methods
#31	SS-14	4050025	6/29/2004	Aqueous	VOCs, PCBs, Wet Chemistry	Methods 624, 608
	SS-15	4050020	6/29/2004	Aqueous	VOCs, PCBs, Wet Chemistry	Methods 624, 608
	SS-27	4050012	6/29/2004	Aqueous	VOCs, PCBs, Wet Chemistry	Methods 624, 608
#32	SS-14	4063225	8/26/2004	Aqueous	VOCs, PCBs, Wet Chemistry	Methods 624, 608
	SS-15	4063220	8/26/2004	Aqueous	VOCs, PCBs, Wet Chemistry	Methods 624, 608
	SS-27	4063212	8/26/2004	Aqueous	VOCs, PCBs, Wet Chemistry	Methods 624, 608
#33	SS-14	4080411	11/23/2004	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-15	4080412	11/23/2004	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-27	4080417	11/23/2004	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
#34	SS-14	5011711	3/3/2005	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-15	5011712	3/3/2005	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-27	5011717	3/3/2005	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
#35	SS-14	5031204	6/14/2005	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-15	5031206	6/14/2005	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-27	5031209	6/14/2005	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
#36	SS-14	5046004	9/12/2005	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-15	5046006	9/12/2005	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-27	5046009	9/13/2005	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
#37	SS-14	5062304	11/30/2005	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-15	5062306	11/30/2005	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-27	5062309	12/1/2005	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
#38	SS-14	6008704	2/22/2006	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-15	6008706	2/22/2006	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-27	6008717	2/22/2006	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
#39	SS-14	6024904	5/30/2006	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-15	6024906	5/30/2006	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-27	6025108	5/31/2006	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)

Notes:
VOCs = Volatile Organic Compounds
SVOCs = Semi-Volatile Organic Compounds
Pest/PCB = Pesticides/Polychlorinated Biphenyls
Metals = Target Analyte List Metals

Table 4-3
Surface Water Sampling Summary
Site 283
Fort Monmouth, New Jersey

Round	Field Sample ID	Lab Sample ID	Date Collected	Matrix	Analytical Parameters	Analytical Methods
#40	SS-14	6040004	9/19/2006	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-15	6040006	9/19/2006	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-27	6040406	9/20/2006	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
#41	SS-14	6052304	12/11/2006	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-15	6052306	12/11/2006	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-27	6052317	12/11/2006	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
#42	SS-14	7009304	3/13/2007	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-15	7009306	3/13/2007	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-27	7009317	3/13/2007	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
#43	SS-14	7023004	6/26/2007	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-15	7023006	6/26/2007	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-27	7023406	6/26/2007	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
#44	SS-14	7033904	9/13/2007	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-15	7033906	9/13/2007	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
	SS-27	7033917	9/13/2007	Aqueous	VOCs, PCBs, Metals, Wet Chemistry	Methods 624, 608, 3120 & 3112 (mercury)
#45	SS-14	7054104	12/19/2007	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)
	SS-15	7054106	12/19/2007	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)
	SS-27	7054117	12/19/2007	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)
#46	SS-14	8009410	3/25/2008	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)
	SS-15	8009411	3/25/2008	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)
	SS-27	8009508	3/26/2008	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)
#47	SS-14	8021304	6/26/2008	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)
	SS-15	8021306	6/26/2008	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)
	SS-27	8021317	6/26/2008	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)
#48	SS-14	8034611	9/30/2008	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)
	SS-15	8034612	9/30/2008	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)
	SS-27	8034617	9/30/2008	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)

Notes:
VOCs = Volatile Organic Compounds
SVOCs = Semi-Volatile Organic Compounds
Pest/PCB = Pesticides/Polychlorinated Biphenyls
Metals = Target Analyte List Metals

Table 4-3
Surface Water Sampling Summary
Site 283
Fort Monmouth, New Jersey

Round	Field Sample ID	Lab Sample ID	Date Collected	Matrix	Analytical Parameters	Analytical Methods
#49	SS-14	8047811	12/29/2008	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)
	SS-15	8047812	12/29/2008	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)
	SS-27	8047817	12/29/2008	Aqueous	VOCs, Metals, Wet Chemistry	Methods 624, 3120 & 3112 (mercury)

Notes:
VOCs = Volatile Organic Compounds
SVOCs = Semi-Volatile Organic Compounds
Pest/PCB = Pesticides/Polychlorinated Biphenyls
Metals = Target Analyte List Metals

Table 5-1
Ground Water Sampling Results
Site 283 MW01 (Jun00-Nov05)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	4	5	5	6	6	7	8	9	9
WELL ID			283-MW01	283-MW01	LF1 (1)	LF2 (1)	283-MW01	283-MW01	283-MW01	283-MW01	MW01 Duplicate
Date Collected			06/28/00	08/10/00	08/31/00	10/13/00	10/17/00	01/05/01	04/04/01	07/24/01	07/24/01
ANALYTE / Lab ID			5505.02	5619.01	5681.03	5788.03	5797.04	31	16029.04	16285.04	16285.03
VOCs											
Benzene	1	µg/L	ND	0.12	NA	NA	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	ND	0.33	NA	NA	ND	ND	ND	ND	ND
Total Xylenes	1000	µg/L	ND	0.88	NA	NA	ND	ND	ND	ND	ND
TICs*	500	µg/L	ND	NA	NA	NA	ND	ND	ND	ND	ND
SVOCs											
TICs*	500	µg/L	40.0	NA	NA	NA	48.0	5.0	ND	ND	ND
METALS											
Antimony	20	µg/L	ND	NA	ND	ND	3.97	ND	ND	ND	ND
Arsenic	8	µg/L	ND	NA	ND	ND	ND	ND	ND	ND	ND
Barium	2000	µg/L	71.1	NA	68.8	73.1	80.7	78.2	78.7	102.0	103.0
Beryllium	20	µg/L	0.68	NA	0.76	0.62	0.71	0.63	0.6	0.99	0.81
Cadmium	4	µg/L	ND	NA	ND	ND	ND	ND	ND	1.67	1.09
Chromium	100	µg/L	9.79	NA	ND	3.13	1.1	0.88	1.0	3.98	3.63
Copper	1000	µg/L	16.9	NA	ND	66.5	ND	ND	17.0	6.44	2.70
Lead	10	µg/L	ND	NA	2.38	**20.1**	1.85	ND	3.0	3.03	1.18
Mercury	2	µg/L	ND	NA	ND	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	10.4	NA	5.06	13.3	5.56	4.89	12.0	20.4	10.4
Selenium	50	µg/L	ND	NA	ND	ND	ND	ND	ND	7.93	12.5
Thallium	10	µg/L	ND	NA	ND	ND	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (January 7, 1993)

(1)Low Flow Sampling Method used to collect sampl

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

Total Xylenes= ∑ of *o* -Xylene and *m,p* -Xylene.

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in

1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-1
Ground Water Sampling Results
Site 283 MW01 (Jun00-Nov05)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	10	11	12	12	13	14	15	16	17	18
WELL ID			283-MW01	283-MW01	283-MW01	MW01 Duplicate	283-MW01	283-MW01	283-MW01	283-MW01	283-MW01	283-MW01
Date Collected			12/11/01	03/08/02	05/16/02	05/16/02	09/10/02	12/03/02	02/27/03	05/19/03	08/04/03	11/13/03
ANALYTE / Lab ID			16638.01	20145.01	20292.04	20292.04	20647.01	20864.01	30086.04	30236.01	30469.01	30731.04
VOCs												
Benzene	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	1000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs*	500	µg/L	ND	ND	ND	ND	ND	130.0	ND	ND	ND	ND
SVOCs												
TICs*	500	µg/L	5.0	17.0	5.0	6.0	59.0	27.0	99.0	12.0	20.0	11.0
METALS												
Antimony	20	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**83.60**	ND
Arsenic	8	µg/L	ND	ND	**27.7**	**25.9**	3.16	ND	ND	ND	ND	ND
Barium	2000	µg/L	92.7	96.0	94.4	99.3	110.0	108.0	87.9	95.6	96.0	118.0
Beryllium	20	µg/L	1.04	1.05	0.78	0.80	1.11	0.91	0.70	0.82	0.90	1.19
Cadmium	4	µg/L	ND	ND	ND	ND	ND	0.89	0.84	ND	0.719 ER	0.436 ER
Chromium	100	µg/L	19.1	4.99	3.03	4.05	3.31	1.39	1.62	1.77 ER	ND	2.73 ER
Copper	1000	µg/L	39.8	9.42	4.35	6.06	8.24	22.1	7.22	3.24 ER	3.45 ER	3.76 ER
Lead	10	µg/L	7.83	1.36	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	2	µg/L	ND	ND	0.11	0.12	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	12.5	11.9	10.9	11.3	11.9	13.4	11.2	11.1	10.4	13.9
Selenium	50	µg/L	ND	10.4	13.7	12.7	8.98	10.6	ND	0.378 ER	ND	ND
Thallium	10	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

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**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (January 7, 1993)

(1)Low Flow Sampling Method used to collect sampl

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

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NA-Not Analyzed

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in

1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-1
Ground Water Sampling Results
Site 283 MW01 (Jun00-Nov05)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	19	20	21	22	23	24	25	26
WELL ID			283-MW01	283-MW01	283-MW01	283-MW01	283-MW01	283-MW01	283-MW01	283-MW01
Date Collected			2/5/2004	5/11/2004	7/21/2004	11/3/2004	1/20/2005	4/20/2005	8/9/2005	11/2/2005
ANALYTE / Lab ID			40102.04	40348.04	40542.02	40764.04	50041.04	50210.04	50388.04	50573.04
VOCs										
Benzene	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	ND	ND	ND	0.72 J	ND	1.25 J	ND	ND
Total Xylenes	1000	µg/L	ND	ND	ND	1.61 J	ND	2.22 J	ND	ND
TICs*	500	µg/L	30.0	ND	ND	8.0	ND	14.0	ND	ND
SVOCs										
TICs*	500	µg/L	4.0	5.0	22.0	ND	NA	NA	NA	NA
METALS										
Antimony	20	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	8	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Barium	2000	µg/L	121.0	146.0	159.0	196.0	170.0	141.0	234.0	143.0
Beryllium	20	µg/L	1.01	1.36	1.61	1.79	1.39	1.23	2.17	1.11
Cadmium	4	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Copper	1000	µg/L	5.33	ND	ND	9.39	ND	ND	8.93	ND
Lead	10	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	13.5	17.9	18.3	20.4	20.7	17.1	23.2	13.9
Selenium	50	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	10	µg/L	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (January 7, 1993)

(1)Low Flow Sampling Method used to collect sampl

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

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ER-Estimated Result

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NA-Not Analyzed

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in

1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-1
Ground Water Sampling Results
Site 283 MW01 (Jan06-May07)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	27	28	29	30	31	32
WELL ID			283-MW01	283-MW01	283-MW01	283-MW01	283-MW01	283-MW01
Date Collected			1/13/2006	4/18/2006	7/25/2006	10/30/2006	2/1/2007	5/3/2007
ANALYTE / Lab ID			60030.04	60161.04	60335.04	60470.04	70042.04	70161.04
VOCs								
Benzene	1	µg/L	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	1.5 J	0.93	ND	ND	ND	ND
Total Xylenes	1000	µg/L	5.64 J	1.08	ND	ND	ND	ND
TICs*	500	µg/L	44.0	23.0	13.0	ND	ND	ND
METALS								
Antimony	6	µg/L	ND	3.13 ER	3.83 ER	ND	ND	ND
Arsenic	3	µg/L	ND	ND	ND	ND	ND	ND
Barium	2000	µg/L	205	181	173	144	114	106
Beryllium	1	µg/L	**1.96**	**1.59**	**1.66 ER**	**1.71**	**1.10**	0.897 ER
Cadmium	4	µg/L	ND	0.93 ER	0.647 ER	0.412 ER	ND	0.206 ER
Chromium	70	µg/L	ND	1.46 ER	1.99 ER	0.956 ER	0.94 ER	0.609 ER
Copper	1300	µg/L	6.81	3.33 ER	6.83	1.39 ER	2.58	2.77 ER
Lead	5	µg/L	ND	ND	ND	ND	ND	ND
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	24.4	22.2	17.9	14.5	13.1	12.7
Selenium	40	µg/L	ND	3.78 ER	ND	ND	ND	5.59 ER
Thallium	2	µg/L	ND	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (November 7, 2005)

(1)Low Flow Sampling Method used to collect sampl

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

Total Xylenes= ∑ of *o* -Xylene and *m,p* -Xylene.

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-1
Ground Water Sampling Results
Site 283 MW01 (July07-Oct08)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	33	34	35	35	36	36	37	37	38	38
WELL ID			283-MW01	283-MW01	283-MW01	MW01 Duplicate	283-MW01	MW01 Duplicate	283-MW01	MW01 Duplicate	283-MW01	MW01 Duplicate
Date Collected			7/27/2007	11/20/2007	3/6/2008	3/6/2008	5/2/2008	5/2/2008	8/6/2008	8/6/2008	10/23/2008	10/23/2008
ANALYTE / Lab ID			70283.04	70477.04	80069.04	80069.03	80150.04	80150.03	80280.04	80280.03	80385.04	80385.02
VOCs												
Benzene	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	1000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs*	500	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
METALS												
Antimony	6	µg/L	ND	3.08 ER	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	3	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	**3.95 ER**
Barium	6000	µg/L	117.0	138.0	133.0	134.0	112.0	110.0	118.0	117.0	111.0	113.0
Beryllium	1	µg/L	**1.15 ER**	**1.52 ER**	**1.14 ER**	**1.16 ER**	**1.23 ER**	**1.15 ER**	**1.28 ER**	**1.27 ER**	**1.20 ER**	**1.21 ER**
Cadmium	4	µg/L	ND	0.927 ER	0.624 ER	0.581 ER	ND	0.287 ER	0.476 ER	0.357 ER	0.866 ER	0.838 ER
Chromium	70	µg/L	1.02 ER	1.16 ER	0.949 ER	1.10 ER	0.532 ER	0.802 ER	1.26 ER	1.23 ER	1.05 ER	1.08 ER
Copper	1300	µg/L	3.39	2.84 ER	5.77	4.08 ER	1.53 ER	2.01 ER	2.14 ER	2.39 ER	1.98 ER	2.16 ER
Lead	5	µg/L	ND	1.72 ER	ND	ND	ND	ND	ND	ND	ND	2.48 ER
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	12.4	15.5	21.4	20.0	14.9	15.1	13.4	12.9	12.9	13.0
Selenium	40	µg/L	4.07 ER	4.86 ER	ND	4.20 ER	5.65 ER	6.32 ER	8.88 ER	3.90 ER	6.58 ER	6.52 ER
Thallium	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.60 ER

Notes:

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Sampling for Semivolatiles and PCBs/Pesticides were discontinued in

1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-2
Ground Water Sampling Results
Site 283 MW02 (Sep99-Nov05)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	1	2	3	4	5	5	6	6	6	7	8
WELL ID			283-MW02	283-MW02	283-MW02	283-MW02	283-MW02	LF1 (1)	LF2 (1)	283-MW02	MW02 Duplicate	283-MW02	283-MW02
Date Collected			09/20/99	12/27/99	03/23/00	06/28/00	08/10/00	08/31/00	10/13/00	10/17/00	10/17/00	01/05/01	04/04/01
ANALYTE / Lab ID			4798.01	5046.01	5280.01	5505.01	5619.02	5681.04	5788.04	5797.05	5797.03	32	16029.05
VOCs													
4-Methyl-2-pentanone	400	µg/L	ND	ND	ND	ND	NA	NA	NA	ND	ND	ND	ND
Acetone	700	µg/L	ND	ND	ND	7.16	NA	NA	NA	ND	ND	23.44	ND
Benzene	1	µg/L	**536.85**	**720.56**	**827.72**	**908.16**	**152.0**	NA	NA	**670.35**	**621.26**	**1009.73**	**264.00**
Bromodichloromethane	1	µg/L	ND	ND	ND	ND	NA	NA	NA	ND	ND	ND	ND
Carbon disulfide	NLE	µg/L	ND	ND	ND	ND	NA	NA	NA	ND	ND	ND	ND
Chloroform	6	µg/L	ND	ND	ND	ND	NA	NA	NA	ND	ND	ND	ND
Chloromethane	30	µg/L	15.51	ND	ND	ND	NA	NA	NA	ND	ND	ND	18.56
Ethylbenzene	700	µg/L	**797.4**	422.5	**725.71**	**1129.23**	**717.5**	NA	NA	**810.07**	**791.70**	**1160.45**	502.14
Styrene	100	µg/L	ND	ND	ND	ND	NA	NA	NA	ND	ND	ND	ND
Toluene	1000	µg/L	598.45	413.22	511.78	663.58	NA	NA	NA	303.92	254.97	320.72	235.04
Total Xylenes	1000	µg/L	**3831.36**	**2125.86**	**4295.69**	**5960.7**	**4009.44**	NA	NA	**3829.91**	**3577.78**	**5143.75**	**3221.45**
TICs*	500	µg/L	**8400.0**	**3669.0**	**4102.0**	**3851.0**	NA	NA	NA	**13500.0**	**13700.0**	**377.0**	331.0
SVOCs													
2-Methylnaphthalene	NLE	µg/L	25.25	24.16	7.43	25.1	NA	NA	NA	24.87	20.73	28.12	6.10
2,4-Dimethylphenol	100	µg/L	3.88	3.57	3.90	ND	NA	NA	NA	ND	ND	ND	ND
4-Methylphenol	NLE	µg/L	ND	ND	ND	ND	NA	NA	NA	ND	ND	ND	ND
Bis(2-ethylhexyl) phthalate	30	µg/L	ND	ND	ND	ND	NA	NA	NA	ND	ND	ND	ND
Butyl benzyl phthalate	100	µg/L	ND	ND	ND	ND	NA	NA	NA	ND	ND	ND	ND
Diethyl phthalate	5000	µg/L	ND	ND	ND	ND	NA	NA	NA	ND	ND	ND	ND
Naphthalene	NLE	µg/L	119.16	167.93	82.44	174.92	NA	NA	NA	149.09	126.93	223.45	65.12
Phenol	4000	µg/L	ND	ND	5.11	ND	NA	NA	NA	ND	ND	ND	8.32
TICs*	500	µg/L	**3225.0**	**2698.0**	**2892.0**	**3675.0**	NA	NA	NA	**3685.0**	**3344.0**	**4912.0**	**2070.0**
METALS													
Antimony	20	µg/L	ND	ND	ND	ND	NA	ND	ND	4.10	4.05	ND	ND
Arsenic	8	µg/L	4.74	ND	ND	ND	NA	6.6	5.36	2.38	4.89	3.72	3.0
Barium	2000	µg/L	39.9	40.30	38.5	45.9	NA	27.2	25.3	38.9	45.8	34.6	30.5
Beryllium	20	µg/L	ND	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND
Cadmium	4	µg/L	1.05	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND
Chromium	100	µg/L	5.05	ND	1.51	1.38	NA	ND	0.87	8.60	7.93	2.60	12.7
Copper	1000	µg/L	41.2	ND	ND	41.10	NA	ND	14.10	ND	10.9	80.5	19.0
Lead	10	µg/L	**22.0**	6.92	**15.3**	**11.5**	NA	**33.1**	**25.7**	**14.5**	**15.9**	**25.3**	**23.0**
Mercury	2	µg/L	ND	0.3	0.2	ND	NA	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	4.11	3.62	6.43	6.01	NA	ND	1.40	ND	ND	2.85	5.0
Selenium	50	µg/L	6.49	4.73	7.29	4.36	NA	5.70	4.09	6.69	6.23	6.22	5.0
Thallium	10	µg/L	8.76	ND	ND	ND	NA	ND	ND	ND	ND	ND	ND

Notes:

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NA-Not Analyzed

NLE-No Limit Established

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1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-2
Ground Water Sampling Results
Site 283 MW02 (Sep99-Nov05)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	9	10	11	12	13	14	15	16	17	18	19
WELL ID			283-MW02	283-MW02	283-MW02	283-MW02	283-MW02	283-MW02	283-MW02	283-MW02	283-MW02	283-MW02	283-MW02
Date Collected			07/24/01	12/11/01	03/08/02	05/16/02	09/10/02	12/03/02	02/27/03	05/19/03	08/04/03	11/13/03	2/5/2004
ANALYTE / Lab ID			16285.05	16638.02	20145.02	20292.05	20647.02	20864.02	30086.05	30236.02	30469.02	30731.05	40102.05
VOCs													
4-Methyl-2-pentanone	400	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	700	µg/L	ND	ND	ND	ND	ND	ND	5.23	ND	ND	ND	2.78
Benzene	1	µg/L	**502.20**	**1055.06**	**710.22**	**395.51**	**223.80**	**119.40**	**123.79**	**112.54**	**239.49**	**290.54**	**156.83**
Bromodichloromethane	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	6	µg/L	ND	ND	ND	ND	ND	ND	3.46	ND	ND	2.59	ND
Chloromethane	30	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	604.67	**711.17**	**925.08**	659.80	476.21	349.99	560.90	215.60	485.84	**899.91**	672.01
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0 J
Toluene	1000	µg/L	241.61	24.78	172.69	99.10	94.08	39.32	122.91	27.19	108.66	175.50	47.53
Total Xylenes	1000	µg/L	**2797.88**	**1524.10**	**3744.16**	**2192.84**	**1910.78**	970.36	**3067.89**	**2499.45**	**1985.34**	**2648.84**	**1427.1**
TICs*	500	µg/L	323.0	327.0	**8250.0**	298.0	338.0	**5720.0**	**4270.0**	**4932.0**	232.0	**5280.0**	**1890.0**
SVOCs													
2-Methylnaphthalene	NLE	µg/L	18.69	13.36	13.24	16.78	30.03	11.88	ND	6.73 J	9.03 J	20.23	10.16
2,4-Dimethylphenol	100	µg/L	ND	ND	ND	1.75	ND	ND	7.37 J	ND	4.34 J	1.80 J	ND
4-Methylphenol	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.72 J
Bis(2-ethylhexyl) phthalate	30	µg/L	ND	ND	ND	ND	1.09	ND	ND	ND	ND	ND	ND
Butyl benzyl phthalate	100	µg/L	9.83	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethyl phthalate	5000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.01 J
Naphthalene	NLE	µg/L	150.61	89.93	80.67	101.90	135.69	76.68	21.97	51.41	80.88	108.81	62.19
Phenol	4000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs*	500	µg/L	**3061.0**	**2419.0**	**1717.0**	**2777.0**	**2979.0**	**1695.0**	**2410.0**	**1555.0**	**2379.0**	**2569.0**	**1987.0**
METALS													
Antimony	20	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	8	µg/L	6.78	3.09	ND	**24.20**	7.95	6.04	2.59	6.64	4.95 ER	**10.70**	**10.1**
Barium	2000	µg/L	43.1	47.6	43.5	34.0	24.4	23.2	54.8	39.0	34.5	37.6	48.4
Beryllium	20	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	0.136 ER	0.157 ER	ND
Cadmium	4	µg/L	0.74	ND	ND	ND	ND	0.78	ND	ND	ND	ND	ND
Chromium	100	µg/L	13.60	21.50	3.24	11.40	2.58	0.70	3.15	33.30	11.30	8.95	46.3
Copper	1000	µg/L	8.26	79.30	11.50	8.35	2.36	4.13	7.25	7.46 ER	3.22 ER	4.92 ER	30.4
Lead	10	µg/L	**12.3**	**11.8**	9.02	7.47	9.58	5.84	**17.10**	**11.80**	9.71	**13.30**	**21.5**
Mercury	2	µg/L	ND	ND	ND	0.11	ND	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	12.2	8.52	4.99	3.7	2.12	1.56	3.06	5.59	2.76 ER	2.91 ER	6.53
Selenium	50	µg/L	30.0	ND	13.4	15.7	11.1	6.81	6.98	6.97 ER	ND	9.53 ER	ND
Thallium	10	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

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Ground Water Sampling Results
Site 283 MW02 (Sep99-Nov05)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	20	21	22	22	23	24	24	25	25	26	26
WELL ID			283-MW02	283-MW02	283-MW02	MW02-Duplicate	283-MW02	283-MW02	MW02-Duplicate	283-MW02	MW02-Duplicate	283-MW02	MW02-Duplicate
Date Collected			5/11/2004	7/21/2004	11/3/2004	11/3/2004	1/20/2005	4/20/2005	4/20/2005	8/9/2005	8/9/2005	11/2/2005	11/2/2005
ANALYTE / Lab ID			40348.05	40452.02	40764.05	40764.03	50041.05	50210.05	50210.03	50388.05	50388.03	50573.05	50573.03
VOCs													
4-Methyl-2-pentanone	400	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	1	µg/L	**75.99**	**196.78**	**189.73**	**184.15**	**172.82**	**45.96**	**63.83**	**157.54**	**181.44**	**113.35**	**120.22**
Bromodichloromethane	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	6	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	30	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	**890.38**	555.2	**1006.91**	**954.58**	**789.72**	256.2	436.95	**811.58**	**885.06**	539.24	368.03
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	1000	µg/L	71.79	58.63	131.10	128.86	175.37	45.31	44.13	57.99	65.92	125.07	135.3
Total Xylenes	1000	µg/L	**1960.9**	**1158.42**	**2630.01**	**2453.82**	**2196.53**	535.76	**1078.16**	**1398.37**	**1429.19**	**2022.82**	**1388.56**
TICs*	500	µg/L	**2574.0**	**2265.0**	**2380.0**	**2770.0**	**1758.0**	**2136.0**	**2610.0**	**4370.0**	**5000.0**	**2010.0**	**1892.0**
SVOCs													
2-Methylnaphthalene	NLE	µg/L	9.76 J	ND	19.40	20.27	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	100	µg/L	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
4-Methylphenol	NLE	µg/L	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	30	µg/L	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Butyl benzyl phthalate	100	µg/L	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Diethyl phthalate	5000	µg/L	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
Naphthalene	NLE	µg/L	66.03	ND	97.45	99.39	NA	NA	NA	NA	NA	NA	NA
Phenol	4000	µg/L	ND	ND	ND	ND	NA	NA	NA	NA	NA	NA	NA
TICs*	500	µg/L	**1496.0**	**2693.0**	**2547.0**	**2519.0**	NA	NA	NA	NA	NA	NA	NA
METALS													
Antimony	20	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	8	µg/L	**10.2**	**20.0**	**9.27**	**8.12**	6.91	**13.5**	**13.9**	**15.3**	**19.5**	6.82	6.04
Barium	2000	µg/L	35.7	81.3	32.8	27.7	32.0	34.8	34.9	40.3	41.1	34.5	37.7
Beryllium	20	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	4	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	100	µg/L	28.2	56.4	20.4	17.9	ND	21.3	16.4	15.2	17.1	9.73	11.8
Copper	1000	µg/L	10.3	30.7	8.07	6.48	ND	ND	ND	ND	5.06	ND	ND
Lead	10	µg/L	**32.5**	**30.3**	**18.2**	**14.9**	**17.7**	**18.4**	**19.5**	**17.1**	**17.1**	**12.1**	**12.3**
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	ND	11.3	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	50	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	10	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

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NA-Not Analyzed

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Sampling for Semivolatiles and PCBs/Pesticides were discontinued in

1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-2
Ground Water Sampling Results
Site 283 MW-2 (Jan06-May07)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	27	27	28	28	29	29	30	30	31	31	32
WELL ID			283-MW02	MW02-Duplicate	283-MW02	MW02-Duplicate	283-MW02	MW02-Duplicate	283-MW02	MW02-Duplicate	283-MW02	MW02 Duplicate	283-MW02
Date Collected			1/13/2006	1/13/2006	4/18/2006	4/18/2006	7/25/2006	7/25/2006	10/30/2006	10/30/2006	2/1/2007	2/1/2007	5/3/2007
ANALYTE / Lab ID			60030.05	60030.03	60161.05	60161.03	60335.05	60335.03	60470.05	60470.03	70042.05	70042.03	70161.05
VOCs													
4-Methyl-2-pentanone	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	6000	µg/L	ND	ND	ND	ND	ND	ND	52.94	59.26	ND	ND	ND
Benzene	1	µg/L	**188.42**	**205.30**	**94.02**	**102.2**	**27.04**	**17.59**	**5.34**	**5.39**	**15.03**	**15.55**	**14.5**
Bromodichloromethane	1	µg/L	ND	ND	ND	ND	ND	ND	0.57 J	ND	ND	ND	ND
Carbon disulfide	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	70	µg/L	ND	ND	ND	ND	ND	ND	ND	2.85	ND	ND	ND
Chloromethane	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	691.12	**714.36**	635.14	635.97	353.81	454.16	186.28	210.94	132.70	188.97	333.76
Styrene	100	µg/L	ND	ND	ND	ND	ND	ND	1.64 J	ND	ND	ND	ND
Toluene	1000	µg/L	217.27	248.10	27.31	30.28	26.66	21.96	10.56	10.56	30.96	33.00	22.28
Total Xylenes	1000	µg/L	**2276.27**	**2364.28**	610.92	862.18	695.0	919.67	351.65	401.68	313.02	457.94	695.90
TICs*	500	µg/L	**1422.0**	**1454.0**	**893.0**	**1148.0**	**1946.0**	**2223.0**	**902.0**	**931.0**	**1688.0**	**1521.0**	**2046.0**
METALS													
Antimony	6	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	3	µg/L	**5.97**	**5.34**	**13.2**	**12.6**	**16.2**	**13.1**	**14.4**	**13.9**	**26.9**	**29.5**	**12.4**
Barium	2000	µg/L	34.3	35.5	38.6	39.2	36.6	30.2	31.4	30.4	35.7	37.2	45.7
Beryllium	1	µg/L	ND	ND	0.228 ER	0.237 ER	0.202 ER	0.144 ER	0.302 ER	0.377 ER	0.133 ER	0.133 ER	ND
Cadmium	4	µg/L	ND	ND	ND	0.377 ER	0.863 ER	0.574 ER	0.931 ER	0.532 ER	1.54 ER	2.18	0.562 ER
Chromium	70	µg/L	ND	6.58	27.9	30.8	27.7	13.2	6.99	5.26	1.87 ER	2.16 ER	1.91 ER
Copper	1300	µg/L	ND	ND	3.94 ER	3.86 ER	7.94	4.47 ER	0.663 ER	ND	ND	0.813 ER	2.07 ER
Lead	5	µg/L	**9.2**	**9.76**	**7.72**	**7.49**	**10.4**	**7.84**	**5.12**	**5.57**	**8.78**	**9.79**	**11.8**
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	ND	ND	3.53 ER	4.56 ER	5.48	3.0 ER	1.59 ER	1.05 ER	ND	1.45 ER	1.21 ER
Selenium	40	µg/L	ND	ND	4.76 ER	4.39 ER	5.91 ER	4.47 ER	7.04 ER	7.92 ER	7.82 ER	6.05 ER	8.04 ER
Thallium	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (November 7, 2005)

(1)Low Flow Sampling Method used to collect sampl

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

Total Xylenes= ∑ of *o* -Xylene and *m,p* -Xylene.

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

NLE-No Limit Established

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-2
Ground Water Sampling Results
Site 283 MW-2 (Jan06-May07)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	32
WELL ID			MW02 Duplicate
Date Collected			5/3/2007
ANALYTE / Lab ID			70161.03
VOCs			
4-Methyl-2-pentanone	NLE	µg/L	ND
Acetone	6000	µg/L	ND
Benzene	1	µg/L	**14.85**
Bromodichloromethane	1	µg/L	ND
Carbon disulfide	700	µg/L	ND
Chloroform	70	µg/L	ND
Chloromethane	NLE	µg/L	ND
Ethylbenzene	700	µg/L	223.42
Styrene	100	µg/L	ND
Toluene	1000	µg/L	22.38
Total Xylenes	1000	µg/L	466.9
TICs*	500	µg/L	**2053.0**
METALS			
Antimony	6	µg/L	ND
Arsenic	3	µg/L	**11.8**
Barium	2000	µg/L	44.0
Beryllium	1	µg/L	ND
Cadmium	4	µg/L	0.712 ER
Chromium	70	µg/L	1.63 ER
Copper	1300	µg/L	2.26 ER
Lead	5	µg/L	**11.3**
Mercury	2	µg/L	ND
Nickel	100	µg/L	1.41 ER
Selenium	40	µg/L	9.44 ER
Thallium	2	µg/L	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (November 7, 2005)

(1)Low Flow Sampling Method used to collect samp

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

Total Xylenes= ∑ of *o* -Xylene and *m,p* -Xylene.

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

NLE-No Limit Established

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-2
Ground Water Sampling Results
Site 283 MW02 (July07-Oct08)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	33	33	34	34	35	36	37	38
WELL ID			283-MW02	MW02 Duplicate	283-MW02	MW02 Duplicate	283-MW02	283-MW02	283-MW02	283-MW02
Date Collected			7/27/2007	7/27/2007	11/20/2007	11/20/2007	3/6/2008	5/2/2008	8/6/2008	10/23/2008
ANALYTE / Lab ID			70283.05	70283.03	70477.05	70477.03	80069.05	80150.05	80280.05	80385.05
VOCs										
4-Methyl-2-pentanone	NLE	µg/L	ND	ND	ND	ND	1.04	ND	ND	ND
Acetone	6000	µg/L	ND	ND	3.45 B	3.87 B	ND	ND	ND	ND
Benzene	1	µg/L	**8.46**	**6.53**	**53.29**	**68.9**	**27.91**	**26.57**	**76.07**	**48.45**
Bromodichloromethane	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	54.0	41.77	ND	322.53	374.24	322.15	317.43	358.50
Styrene	100	µg/L	ND	ND	0.31	0.32	0.90	0.97	ND	ND
Toluene	600	µg/L	7.64	6.06	26.42	26.68	27.72	21.68	35.37	28.06
Total Xylenes	1000	µg/L	237.22	303.82	307.19	383.63	484.87	305.69	545.78	484.30
TICs*	500	µg/L	295.0	309.0	181.0	182.0	184.0	185.0	229.0	252.0
METALS										
Antimony	6	µg/L	3.13 ER	ND	1.37 ER	ND	ND	ND	ND	ND
Arsenic	3	µg/L	**9.41**	**9.31**	**4.80 ER**	**6.2**	**7.67**	**23.2**	**8.48**	**13.3**
Barium	6000	µg/L	29.8	29.9	40.2	39.6	41.3	38.7	48.9	29.7
Beryllium	1	µg/L	ND	ND	0.176 ER	0.131 ER	ND	0.205 ER	ND	0.203 ER
Cadmium	4	µg/L	0.373 ER	0.392 ER	ND	ND	ND	0.304 ER	0.644 ER	0.280 ER
Chromium	70	µg/L	8.61	6.16	1.87 ER	2.32 ER	4.89 ER	2.98 ER	2.57 ER	1.80 ER
Copper	1300	µg/L	4.23 ER	4.03 ER	ND	ND	2.04 ER	ND	ND	ND
Lead	5	µg/L	**5.54**	**6.68**	4.13 ER	4.05 ER	**7.86**	**8.05**	4.73 ER	**7.34**
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	1.70 ER	1.31 ER	1.26 ER	0.734 ER	5.16	2.18 ER	1.95 ER	2.45 ER
Selenium	40	µg/L	5.84 ER	4.10 ER	7.61 ER	8.27 ER	9.64 ER	9.33 ER	9.83 ER	8.33 ER
Thallium	2	µg/L	ND	ND	ND	ND	ND	ND	ND	1.48 ER

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (July 27, 2007)

(1)Low Flow Sampling Method used to collect sampl

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

Total Xylenes= ∑ of *o* -Xylene and *m,p* -Xylene.

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

NLE-No Limit Established

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in

1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-3
Ground Water Sampling Results
Site 283 MW03 (Jun00-Nov05)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	4	5	5	6	6	7	7	8	8	9	10
WELL ID			283-MW03	283-MW03	LF1 (1)	LF2 (1)	283-MW03	283-MW03	MW03 Duplicate	283-MW03	MW03 Duplicate	283-MW03	283-MW03
Date Collected			06/28/00	08/10/00	08/31/00	10/13/00	10/17/00	01/05/01	01/05/01	04/04/01	04/04/01	07/24/01	12/11/01
ANALYTE / Lab ID			5505.03	5619.03	5681.02	5788.05	5797.06	33	30	16029.06	16029.06	16285.06	16638.03
VOCs													
Benzene	1	µg/L	**9.25**	**11.76**	NA	NA	**9.86**	**5.30**	**4.97**	**10.06**	**9.08**	**10.20**	**8.53**
Bromodichloromethane	1	µg/L	ND	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND
Chloroform	6	µg/L	ND	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	ND	0.33	NA	NA	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	1	µg/L	ND	NA	NA	NA	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	1000	µg/L	ND	0.88	NA	NA	ND	ND	ND	ND	ND	ND	ND
TICs*	500	µg/L	ND	NA	NA	NA	ND	ND	ND	ND	ND	238.0	ND
SVOCs													
Bis(2-ethylhexyl) phthalate	30	µg/L	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND
Diethyl phthalate	5000	µg/L	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND
TICs*	500	µg/L	ND	ND	NA	NA	48.0	ND	ND	ND	ND	ND	6.0
METALS													
Antimony	20	µg/L	ND	NA	ND	ND	3.90	ND	ND	ND	ND	ND	ND
Arsenic	8	µg/L	ND	NA	ND	ND	2.32	6.40	**9.03**	5.00	4.00	3.30	7.27
Barium	2000	µg/L	99.5	NA	59.2	66.5	66.6	284.0	371.0	534.0	566.0	178.0	193.0
Beryllium	20	µg/L	0.57	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	4	µg/L	ND	NA	ND	ND	ND	ND	ND	**5.10**	**5.00**	1.48	0.75
Chromium	100	µg/L	50.7	NA	ND	0.66	1.56	18.0	52.90	4.50	ND	2.31	14.0
Copper	1000	µg/L	ND	NA	ND	24.60	ND	105.0	ND	ND	ND	5.78	ND
Lead	10	µg/L	ND	NA	ND	ND	2.17	**21.10**	ND	2.00	3.00	2.60	ND
Mercury	2	µg/L	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	9.39	NA	ND	3.87	1.96	8.53	16.1	6.0	7.0	14.9	5.8
Selenium	50	µg/L	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	10	µg/L	ND	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (January 7, 1993)

(1)Low Flow Sampling Method used to collect sampl

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

Total Xylenes= ∑ of *o* -Xylene and *m,p* -Xylene.

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in

1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-3
Ground Water Sampling Results
Site 283 MW03 (Jun00-Nov05)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	11	12	13	14	15	15	16	17	18	18	19
WELL ID			283-MW03	283-MW03	283-MW03	283-MW03	283-MW03	MW03 Duplicate	283-MW03	283-MW03	283-MW03	MW03 Duplicate	283-MW03
Date Collected			3/8/2002	05/16/02	09/10/02	12/03/02	02/27/03	02/27/03	05/19/03	08/04/03	11/13/03	11/13/03	2/5/2004
ANALYTE / Lab ID			20145.03	20292.06	20647.03	20864.03	30086.06	30086.03	30236.03	30469.03	30731.06	30731.03	40102.06
VOCs													
Benzene	1	µg/L	**8.38**	**6.21**	ND	**3.45**	**8.24**	**7.81**	**1.47 J**	ND	ND	ND	**3.21**
Bromodichloromethane	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	6	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethylene	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	1000	µg/L	ND	ND	ND	ND	3.14 J	ND	15.94	ND	ND	ND	ND
TICs*	500	µg/L	ND	71.0	ND	10.0	123.0	ND	9.0	ND	ND	ND	21.0
SVOCs													
Bis(2-ethylhexyl) phthalate	30	µg/L	ND	ND	1.33	ND	ND	ND	ND	ND	ND	ND	ND
Diethyl phthalate	5000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs*	500	µg/L	10.0	6.0	55.0	20.0	67.0	9.0	12.0	17.0	ND	11.0	5.0
METALS													
Antimony	20	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	8	µg/L	3.25	**29.9**	6.61	4.18	2.74	ND	7.68	3.10 ER	**8.10**	**9.41**	ND
Barium	2000	µg/L	197.0	150.0	135.0	20.7	76.7	59.6	336.0	173.0	131.0	208.0	282.0
Beryllium	20	µg/L	ND	ND	ND	ND	ND	ND	ND	0.0682 ER	0.128 ER	0.194 ER	ND
Cadmium	4	µg/L	ND	0.60	ND	0.56	ND	0.87	0.899 ER	0.660 ER	0.463 ER	0.679 ER	ND
Chromium	100	µg/L	4.81	2.29	1.50	ND	0.91	2.59	3.55 ER	ND	1.93 ER	2.38 ER	ND
Copper	1000	µg/L	ND	14.1	13.1	53.6	3.33	10.50	ND	ND	ND	ND	ND
Lead	10	µg/L	ND	ND	ND	9.11	ND	ND	1.16 ER	ND	ND	ND	ND
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	5.3	10.2	5.55	3.96	4.68	4.54	5.78	5.13	5.40 ER	5.66	6.0
Selenium	50	µg/L	7.75	7.31	5.54	5.69	ND	ND	ND	ND	ND	ND	ND
Thallium	10	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (January 7, 1993)

(1)Low Flow Sampling Method used to collect sampl

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

Total Xylenes= ∑ of *o* -Xylene and *m,p* -Xylene.

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in

1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-3
Ground Water Sampling Results
Site 283 MW03 (Jun00-Nov05)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	19	20	20	21	22	23	24	25	26
WELL ID			MW03 Duplicate	283-MW03	MW03 Duplicate	283-MW03	283-MW03	283-MW03	283-MW03	283-MW03	283-MW03
Date Collected			2/5/2004	5/11/2004	5/11/2004	7/21/2004	11/3/2004	1/20/2005	4/20/2005	8/9/2005	11/2/2005
ANALYTE / Lab ID			40102.03	40348.06	40348.03	40542.01	40764.06	50041.06	50210.06	50388.06	50573.06
VOCs											
Benzene	1	µg/L	**3.12**	**2.03**	**2.24**	ND	ND	ND	ND	ND	ND
Bromodichloromethane	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	6	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	ND	0.99 J	ND	ND	0.83 J	ND	ND	ND	ND
Trichloroethylene	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	1000	µg/L	ND	2.24 J	ND	ND	2.07 J	ND	ND	ND	ND
TICs*	500	µg/L	32.0	ND	ND	ND	20.0	ND	ND	ND	ND
SVOCs											
Bis(2-ethylhexyl) phthalate	30	µg/L	ND	ND	ND	ND	1.53 J	NA	NA	NA	NA
Diethyl phthalate	5000	µg/L	5.39 J	ND	ND	ND	ND	NA	NA	NA	NA
TICs*	500	µg/L	12.0	ND	ND	22.0	ND	NA	NA	NA	NA
METALS											
Antimony	20	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	8	µg/L	5.84	ND	ND	ND	**9.0**	ND	ND	6.53	ND
Barium	2000	µg/L	353.0	729.0	1040.0	124.0	33.1	137.0	79.4	180.0	83.3
Beryllium	20	µg/L	ND	ND	0.604	ND	ND	ND	ND	ND	ND
Cadmium	4	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chromium	100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	1000	µg/L	ND	ND	ND	ND	8.0	ND	ND	ND	ND
Lead	10	µg/L	ND	ND	ND	ND	**18.0**	ND	ND	ND	ND
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	5.67	6.28	5.98	7.10	ND	7.55	7.49	8.16	7.15
Selenium	50	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	10	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND

Notes:

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**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (January 7, 1993)

(1)Low Flow Sampling Method used to collect sampl

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

Total Xylenes= ∑ of *o* -Xylene and *m,p* -Xylene.

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Table 5-3
Ground Water Sampling Results
Site 283 MW03 (Jan06-May07)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	27	28	29	30	31	32
WELL ID			283-MW03	283-MW03	283-MW03	283-MW03	283-MW03	283-MW03
Date Collected			1/13/2006	4/18/2006	7/25/2006	10/30/2006	2/1/2007	5/3/2007
ANALYTE / Lab ID			60030.06	60161.06	60335.06	60470.06	70042.06	70161.06
VOCs								
Benzene	1	µg/L	ND	ND	ND	ND	ND	ND
Bromodichloromethane	1	µg/L	ND	ND	ND	0.33 J	ND	ND
Chloroform	70	µg/L	ND	ND	ND	1.15 J	ND	ND
Ethylbenzene	700	µg/L	ND	1.06 J	ND	ND	ND	ND
Trichloroethylene	1	µg/L	ND	ND	ND	ND	ND	ND
Total Xylenes	1000	µg/L	ND	0.74 J	ND	ND	ND	ND
TICs*	500	µg/L	ND	41.0	28.0	ND	7.0	ND
METALS								
Antimony	6	µg/L	ND	2.3 ER	4.73 ER	ND	ND	ND
Arsenic	8	µg/L	ND	2.67 ER	2.49 ER	2.71 ER	6.82	5.2
Barium	2000	µg/L	107	164	150	91.8	280	139
Beryllium	20	µg/L	ND	0.13 ER	ND	0.189 ER	0.267 ER	ND
Cadmium	4	µg/L	ND	ND	ND	1.48 ER	3.87	1.52 ER
Chromium	100	µg/L	ND	1.62 ER	ND	ND	ND	1.32 ER
Copper	1000	µg/L	ND	ND	1.14 ER	ND	ND	ND
Lead	10	µg/L	ND	ND	ND	ND	ND	ND
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	7.47	7.78	6.74	6.72	7.93	7.47
Selenium	50	µg/L	ND	ND	ND	4.13 ER	ND	3.03 ER
Thallium	10	µg/L	ND	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (November 7, 2005)

(1)Low Flow Sampling Method used to collect sampl

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

Total Xylenes= ∑ of *o* -Xylene and *m,p* -Xylene.

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-3
Ground Water Sampling Results
Site 283 MW03 (July07-Oct08)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	33	34	35	36	37	38
WELL ID			283-MW03	283-MW03	283-MW03	283-MW03	283-MW03	283-MW03
Date Collected			7/27/2007	11/20/2007	3/6/2008	5/2/2008	8/6/2008	10/23/2008
ANALYTE / Lab ID			70283.06	70477.06	80096.06	80150.06	80280.06	80385.06
VOCs								
Benzene	1	µg/L	ND	ND	ND	ND	ND	ND
Bromodichloromethane	1	µg/L	ND	ND	ND	ND	ND	ND
Chloroform	70	µg/L	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND
Trichloroethylene	1	µg/L	ND	ND	ND	ND	ND	ND
Total Xylenes	1000	µg/L	ND	ND	ND	ND	ND	ND
TICs*	500	µg/L	ND	ND	ND	ND	ND	ND
METALS								
Antimony	6	µg/L	ND	ND	ND	ND	ND	ND
Arsenic	3	µg/L	**3.98 ER**	ND	**5.62**	**5.45**	**4.06 ER**	ND
Barium	6000	µg/L	166	163	227	168	231	205
Beryllium	1	µg/L	ND	0.198 ER	ND	0.238 ER	ND	0.208 ER
Cadmium	4	µg/L	2.06	ND	0.226 ER	2.87	2.47	ND
Chromium	70	µg/L	ND	ND	ND	ND	ND	ND
Copper	1300	µg/L	ND	ND	1.38 ER	ND	ND	ND
Lead	5	µg/L	ND	1.06 ER	ND	1.43 ER	ND	ND
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	7.43	7.71	12.3	10.6	11.0	9.78
Selenium	40	µg/L	ND	ND	ND	ND	ND	ND
Thallium	2	µg/L	ND	ND	ND	ND	ND	1.75 ER

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (July 27, 2007)

(1)Low Flow Sampling Method used to collect sampl

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

Total Xylenes= ∑ of *o* -Xylene and *m,p* -Xylene.

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-4
Ground Water Sampling Results
Site 283 MW04 (Nov04-Nov05)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	22	23	23	24	25	26
WELL ID			283-MW04	283-MW04	MW04 Duplicate	283-MW04	283-MW04	283-MW04
Date Collected			11/3/2004	1/20/2005	1/20/2005	4/20/2005	8/9/2005	11/2/2005
ANALYTE / Lab ID			40764.07	50041.07	50041.03	50210.07	50388.07	50573.07
VOCs								
Chloroform	6	µg/L	ND	ND	ND	ND	ND	ND
Dibromochloromethane	10	µg/L	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	ND	ND	ND	0.42 J	ND	ND
Total Xylenes	1000	µg/L	ND	ND	ND	ND	ND	ND
TICs*	500	µg/L	ND	ND	ND	ND	ND	ND
SVOCs								
2-Methylnaphthalene	NLE	µg/L	ND	NA	NA	NA	NA	NA
2,4-Dimethylphenol	100	µg/L	ND	NA	NA	NA	NA	NA
4-Methylphenol	NLE	µg/L	ND	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	30	µg/L	ND	NA	NA	NA	NA	NA
Butyl benzyl phthalate	100	µg/L	ND	NA	NA	NA	NA	NA
Diethyl phthalate	5000	µg/L	ND	NA	NA	NA	NA	NA
Naphthalene	NLE	µg/L	ND	NA	NA	NA	NA	NA
Phenol	4000	µg/L	ND	NA	NA	NA	NA	NA
TICs*	500	µg/L	ND	NA	NA	NA	NA	NA
METALS								
Antimony	20	µg/L	ND	ND	ND	ND	ND	ND
Arsenic	8	µg/L	**83.3**	**53.5**	**28.6**	**16.4**	**40.9**	ND
Barium	2000	µg/L	606	493	258	162	290	14.1
Beryllium	20	µg/L	4.34	2.71	1.40	0.934	1.49	ND
Cadmium	4	µg/L	**10.5**	ND	ND	ND	3.29	ND
Chromium	100	µg/L	**346.0**	**302.0**	**160.0**	93.0	**150.0**	ND
Copper	1000	µg/L	30.8	14.5	7.90	5.02	19.5	ND
Lead	10	µg/L	**24.9**	**26.0**	**14.0**	5.78	9.0	ND
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	**132.0**	18.2	9.87	6.13	15.0	ND
Selenium	50	µg/L	ND	ND	ND	ND	ND	ND
Thallium	10	µg/L	ND	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (January 7, 1993)

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

Total Xylenes= ∑ of *o* -Xylene and *m,p* -Xylene.

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

NLE-No Limit Established

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-4
Ground Water Sampling Results
Site 283 MW04 (Jan06-May07)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	27	28	29	30	31	32
WELL ID			283-MW04	283-MW04	283-MW04	283-MW04	283-MW04	283-MW04
Date Collected			1/13/2006	4/18/2006	7/25/2006	10/30/2006	2/1/2007	5/3/2007
ANALYTE / Lab ID			60030.07	60161.07	60335.07	60470.07	70042.07	70161.07
VOCs								
Chloroform	70	µg/L	ND	ND	35.87	22.0	16.48	9.53
Dibromochloromethane	1	µg/L	ND	ND	**2.54**	**2.44**	**1.03**	ND
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND
Total Xylenes	1000	µg/L	ND	ND	ND	ND	ND	6.94
TICs*	500	µg/L	ND	4.0	ND	ND	ND	ND
METALS								
Antimony	6	µg/L	ND	ND	ND	ND	ND	ND
Arsenic	3	µg/L	ND	**5.87**	ND	ND	ND	ND
Barium	2000	µg/L	27.5	94.3	17.8	11.3	21.1	11.5
Beryllium	1	µg/L	ND	0.493 ER	ND	0.212 ER	0.203 ER	ND
Cadmium	4	µg/L	ND	ND	ND	0.469 ER	0.958 ER	0.372 ER
Chromium	70	µg/L	13.4	42.8	1.91 ER	1.96 ER	2.32 ER	0.886 ER
Copper	1300	µg/L	ND	7.77	2.32 ER	ND	1.51 ER	2.49 ER
Lead	5	µg/L	ND	ND	ND	ND	ND	ND
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	ND	2.94 ER	1.08 ER	ND	1.27 ER	0.576 ER
Selenium	40	µg/L	ND	ND	ND	3.47 ER	5.30 ER	3.53 ER
Thallium	2	µg/L	ND	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (November 7, 2005)

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

Total Xylenes= ∑ of *o* -Xylene and *m,p* -Xylene.

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

NLE-No Limit Established

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-4
Ground Water Sampling Results
Site 283 MW04 (July07-Oct08)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	33	34	35	36	37	38
WELL ID			283-MW04	283-MW04	283-MW04	283-MW04	283-MW04	283-MW04
Date Collected			7/27/2007	11/20/2007	3/6/2008	5/2/2008	8/6/2008	10/23/2008
ANALYTE / Lab ID			70283.07	70477.07	80069.07	80150.07	80280.07	80385.07
VOCs								
Chloroform	70	µg/L	7.81	8.89	2.77	1.89	2.79	ND
Dibromochloromethane	1	µg/L	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND
Total Xylenes	1000	µg/L	ND	ND	ND	ND	ND	ND
TICs*	500	µg/L	ND	ND	ND	ND	ND	ND
METALS								
Antimony	6	µg/L	ND	1.80 ER	ND	ND	ND	ND
Arsenic	3	µg/L	ND	**3.01 ER**	ND	ND	ND	ND
Barium	6000	µg/L	10.7	54.8	21.4	11.8	37.1	6.56
Beryllium	1	µg/L	ND	0.283 ER	0.107 ER	0.214 ER	0.124 ER	0.202 ER
Cadmium	4	µg/L	0.433 ER	0.243 ER	ND	ND	0.497 ER	0.252 ER
Chromium	70	µg/L	1.60 ER	5.85	6.84	2.03 ER	3.66 ER	0.655 ER
Copper	1300	µg/L	0.905 ER	4.25 ER	3.47 ER	ND	7.02	ND
Lead	5	µg/L	ND	1.85 ER	ND	ND	ND	2.37 ER
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	0.717 ER	3.14 ER	4.98 ER	2.15 ER	2.38 ER	1.17 ER
Selenium	40	µg/L	ND	5.49 ER	ND	6.65 ER	5.98 ER	7.28 ER
Thallium	2	µg/L	ND	ND	ND	ND	ND	**2.05 ER**

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (July 27, 2007)

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

Total Xylenes= ∑ of *o* -Xylene and *m,p* -Xylene.

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

NLE-No Limit Established

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-5
Ground Water Sampling Results
Site 283 MW05 (Nov04-Nov05)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	22	23	24	25	26
WELL ID			283-MW05	283-MW05	283-MW05	283-MW05	283-MW05
Date Collected			11/3/2004	1/20/2005	4/20/2005	8/9/2005	11/2/2005
ANALYTE / Lab ID			40764.08	50041.08	50210.08	50388.08	50573.08
VOCs							
Bromodichloromethane	1	µg/L	ND	ND	ND	ND	ND
Chloroform	6	µg/L	ND	ND	ND	ND	ND
Dibromochloromethane	10	µg/L	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	ND	ND	0.29 J	ND	ND
TICs*	500	µg/L	ND	ND	ND	ND	ND
SVOCs							
TICs*	500	µg/L	ND	NA	NA	NA	NA
METALS							
Antimony	20	µg/L	ND	ND	ND	ND	ND
Arsenic	8	µg/L	**14.6**	7.36	**10.7**	**23.2**	ND
Barium	2000	µg/L	98.4	73.7	83.8	126.0	17.1
Beryllium	20	µg/L	0.615	ND	0.515	0.637	ND
Cadmium	4	µg/L	2.16	ND	ND	ND	ND
Chromium	100	µg/L	90.5	74.4	78.9	86.0	ND
Copper	1000	µg/L	9.58	ND	ND	12.7	ND
Lead	10	µg/L	ND	5.63	ND	ND	ND
Mercury	2	µg/L	ND	ND	ND	ND	ND
Nickel	100	µg/L	11.9	ND	5.52	16.5	ND
Selenium	50	µg/L	ND	ND	ND	ND	ND
Thallium	10	µg/L	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (January 7, 1993)

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

NLE-No Limit Established

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-5
Ground Water Sampling Results
Site 283 MW05 (Apr05-May07)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	27	28	29	30	31	32
WELL ID			283-MW05	283-MW05	283-MW05	283-MW05	283-MW05	283-MW05
Date Collected			1/13/2006	4/18/2006	7/25/2006	10/30/2006	2/1/2007	5/3/2007
ANALYTE / Lab ID			60030.08	60161.08	60335.08	60470.08	70042.08	70161.08
VOCs								
Bromodichloromethane	1	µg/L	ND	ND	**10.89**	**6.34**	**6.25**	**2.31**
Chloroform	70	µg/L	ND	ND	35.93	21.12	14.39	7.96
Dibromochloromethane	1	µg/L	ND	ND	**2.31**	**2.46**	**1.31**	0.28 J
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND
TICs*	500	µg/L	ND	4.0	ND	ND	ND	ND
METALS								
Antimony	6	µg/L	ND	ND	2.46 ER	ND	ND	ND
Arsenic	3	µg/L	ND	**7.29**	ND	ND	**4.06**	ND
Barium	2000	µg/L	29.9	74.9	19.6	18.2	75.1	47.1
Beryllium	1	µg/L	ND	0.279 ER	ND	0.235 ER	0.277 ER	0.159 ER
Cadmium	4	µg/L	ND	ND	ND	0.346 ER	0.827 ER	0.410 ER
Chromium	70	µg/L	10.6	29.9	1.21	1.96	2.94	9.88
Copper	1300	µg/L	ND	4.58 ER	1.67 ER	ND	3.45 ER	4.29 ER
Lead	5	µg/L	ND	ND	ND	ND	ND	0.929 ER
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	ND	4.06 ER	ND	ND	2.84 ER	1.61 ER
Selenium	40	µg/L	ND	ND	ND	4.85 ER	ND	4.74 ER
Thallium	2	µg/L	ND	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (November 7, 2005)

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

NLE-No Limit Established

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-5
Ground Water Sampling Results
Site 283 MW05 (July07-Oct08)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	33	34	35	36	37	38
WELL ID			283-MW05	283-MW05	283-MW05	283-MW05	283-MW05	283-MW05
Date Collected			7/27/2007	11/20/2007	3/6/2008	5/2/2008	8/6/2008	10/23/2008
ANALYTE / Lab ID			70283.08	70477.08	80069.08	80150.08	80280.08	80385.08
VOCs								
Bromodichloromethane	1	µg/L	ND	**2.98**	0.3 J	0.27 J	0.66 J	048 J
Chloroform	70	µg/L	5.51	10.44	1.78 J	1.8 J	3.88	2.80
Dibromochloromethane	1	µg/L	ND	ND	ND	ND	ND	ND
Ethylbenzene	700	µg/L	ND	ND	ND	ND	ND	ND
TICs*	500	µg/L	ND	ND	ND	ND	ND	ND
METALS								
Antimony	6	µg/L	ND	1.22 ER	ND	ND	ND	ND
Arsenic	3	µg/L	**4.19 ER**	**3.18 ER**	ND	2.76 ER	ND	**6.81**
Barium	6000	µg/L	45.0	94.8	54.7	41.8	84.0	20.0
Beryllium	1	µg/L	0.149 ER	0.291 ER	0.146 ER	0.224 ER	0.204 ER	0.266 ER
Cadmium	4	µg/L	0.608 ER	0.375 ER	0.294 ER	ND	0.544 ER	0.326 ER
Chromium	70	µg/L	4.68 ER	1.49 ER	8.56	1.09 ER	3.25 ER	0.720 ER
Copper	1300	µg/L	4.04 ER	3.82 ER	4.09 ER	ND	4.96 ER	ND
Lead	5	µg/L	1.37 ER	0.90 ER	ND	ND	ND	2.13 ER
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	1.98 ER	4.75 ER	6.42	3.16 ER	4.34 ER	1.34 ER
Selenium	40	µg/L	3.77 ER	5.77 ER	ND	4.24 ER	3.67 ER	4.95 ER
Thallium	2	µg/L	ND	ND	ND	ND	ND	1.40 ER

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (July 27, 2007)

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

NLE-No Limit Established

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-6
Ground Water Sampling Results
Site 283 MW06 (Nov04-Nov05)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	22	23	24	25	26
WELL ID			283-MW06	283-MW06	283-MW06	283-MW06	283-MW06
Date Collected			11/3/2004	1/20/2005	4/20/2005	8/9/2005	11/2/2005
ANALYTE / Lab ID			40764.09	50041.09	50210.09	50388.09	50573.09
VOCs							
Bromodichloromethane	1	µg/L	ND	ND	ND	ND	ND
Chloroform	6	µg/L	ND	ND	ND	ND	ND
TICs*	500	µg/L	ND	ND	ND	ND	ND
SVOCs							
TICs*	500	µg/L	ND	NA	NA	NA	NA
METALS							
Antimony	20	µg/L	ND	ND	ND	ND	ND
Arsenic	8	µg/L	**26.5**	ND	ND	**39.6**	ND
Barium	2000	µg/L	117	52.2	54.2	98.1	58.8
Beryllium	20	µg/L	1.01	ND	ND	1.15	ND
Cadmium	4	µg/L	**4.01**	ND	ND	**4.42**	ND
Chromium	100	µg/L	**147**	ND	11.8	**176**	ND
Copper	1000	µg/L	13.3	ND	ND	19.7	ND
Lead	10	µg/L	5.87	ND	ND	6.32	ND
Mercury	2	µg/L	ND	ND	ND	ND	ND
Nickel	100	µg/L	25.9	ND	ND	19.7	ND
Selenium	50	µg/L	ND	ND	ND	ND	ND
Thallium	10	µg/L	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (January 7, 1993)

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-6
Ground Water Sampling Results
Site 283 MW06 (Apr05-May07)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	27	28	29	30	31	32
WELL ID			283-MW06	283-MW06	283-MW06	283-MW06	283-MW06	283-MW06
Date Collected			1/13/2006	4/18/2006	7/25/2006	10/30/2006	2/1/2007	5/3/2007
ANALYTE / Lab ID			60030.09	60161.09	60335.09	60470.09	70042.09	70161.09
VOCs								
Bromodichloromethane	1	µg/L	ND	ND	ND	0.19	ND	ND
Chloroform	70	µg/L	ND	ND	ND	0.93 J	0.65	ND
TICs*	500	µg/L	ND	4.0	28.0	ND	ND	ND
METALS								
Antimony	6	µg/L	ND	ND	ND	ND	ND	ND
Arsenic	3	µg/L	ND	**26.0**	**14.7**	ND	**3.91**	ND
Barium	2000	µg/L	52.5	109.0	121.0	37.7	41.0	22.3
Beryllium	1	µg/L	ND	0.918	0.551	0.21 ER	0.155 ER	ND
Cadmium	4	µg/L	ND	ND	0.393 ER	0.319 ER	0.575 ER	ND
Chromium	70	µg/L	ND	**145**	**87.9**	1.77 ER	2.38 ER	1.21 ER
Copper	1300	µg/L	ND	13.2	13.1	ND	2.38 ER	1.46 ER
Lead	5	µg/L	ND	1.74 ER	ND	ND	ND	ND
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	ND	9.59	4.95 ER	ND	ND	ND
Selenium	40	µg/L	ND	ND	ND	5.98 ER	3.70 ER	4.85 ER
Thallium	2	µg/L	ND	ND	ND	ND	ND	ND

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (November 7, 2005)

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-6
Ground Water Sampling Results
Site 283 MW06 (July07-Oct08)
Fort Monmouth, New Jersey

Round No.	** NJDEP Criteria	Units	33	34	35	36	37	38
WELL ID			283-MW06	283-MW06	283-MW06	283-MW06	283-MW06	283-MW06
Date Collected			7/27/2007	11/20/2007	3/6/2008	5/2/2008	8/6/2008	10/23/2008
ANALYTE / Lab ID			70283.09	70477.09	80069.09	80150.09	80280.09	80385.09
VOCs								
Bromodichloromethane	1	µg/L	ND	ND	ND	ND	ND	ND
Chloroform	70	µg/L	ND	ND	ND	ND	ND	ND
TICs*	500	µg/L	ND	ND	ND	ND	ND	ND
METALS								
Antimony	6	µg/L	ND	ND	ND	ND	ND	ND
Arsenic	3	µg/L	ND	ND	ND	**4.45 ER**	ND	ND
Barium	6000	µg/L	21.7	42.5	49.6	46.3	48.0	24.8
Beryllium	1	µg/L	ND	0.183 ER	0.101 ER	0.222 ER	ND	0.240 ER
Cadmium	4	µg/L	ND	0.203 ER	0.249 ER	0.392 ER	0.441 ER	0.232 ER
Chromium	70	µg/L	0.387 ER	1.16 ER	6.07	2.57 ER	2.36 ER	0.659 ER
Copper	1300	µg/L	0.908 ER	ND	1.99 ER	0.733 ER	1.20 ER	ND
Lead	5	µg/L	ND	0.786 ER	ND	ND	ND	1.80 ER
Mercury	2	µg/L	ND	ND	ND	ND	ND	ND
Nickel	100	µg/L	0.323 ER	1.53 ER	4.90 ER	1.83 ER	0.874 ER	0.960 ER
Selenium	40	µg/L	ND	5.73 ER	3.65 ER	5.86 ER	4.39 ER	7.72 ER
Thallium	2	µg/L	ND	ND	ND	ND	ND	1.55 ER

Notes:

* TICs = Tentatively Identified Compounds, can not exceed 500 ppb for VOCs and SVOCs. No individual compound can exceed 100 ppb.

**NJDEP Groundwater Quality Criteria as per N.J.A.C. 7:9-6 (July 27, 2007)

Exceedances of NJDEP Groundwater Quality Criteria are shaded and bold

ER-Estimated Result

J-Estimated Concentration observed greater than the MDL and less than the RL.

NA-Not Analyzed

Sampling for Semivolatiles and PCBs/Pesticides were discontinued in 1st Quarter 2005 as per NJDEP approval dated (November 2004)

Table 5-7
Ground Water Exceedance Summary
Site 283
Fort Monmouth, New Jersey

Analyte	Criterion	Field ID	Round	Date Collected	Lab Sample ID	Result
VOCs						
Benzene	**1.0**	283MW02	#20	5/11/2004	4034805	**75.99**
			#21	7/21/2004	4045202	**196.78**
			#22	11/3/2004	4076405	**189.73**
			#22 (Duplicate)	11/3/2004	4076403	**184.15**
			#23	1/20/2005	5004105	**172.82**
			#24	4/20/2005	5021005	**45.96**
			#24 (Duplicate)	4/20/2005	5021003	**63.83**
			#25	8/9/2005	5038805	**157.54**
			#25 (Duplicate)	8/9/2005	5038803	**181.44**
			#26	11/2/2005	5057305	**113.35**
			#26 (Duplicate)	11/2/2005	5057303	**120.22**
			#27	1/13/2006	6003005	**188.42**
			#27 (Duplicate)	1/13/2006	6003003	**205.3**
			#28	4/18/2006	6016105	**94.02**
			#28 (Duplicate)	4/18/2006	6016103	**102.2**
			#29	7/25/2006	6033505	**27.04**
			#29 (Duplicate)	7/25/2006	6033503	**17.59**
			#30	10/30/2006	6047005	**5.34**
			#30 (Duplicate)	10/30/2006	6047003	**5.39**
			#31	2/1/2007	7004205	**15.03**
			#31 (Duplicate)	2/1/2007	7004203	**15.55**
			#32	5/3/2007	7016105	**14.5**
			#32 (Duplicate)	5/3/2007	7016103	**14.85**
			#33	7/27/2007	7028305	**8.46**
			#33 (Duplicate)	7/27/2007	7028303	**6.53**
			#34	11/20/2007	7047705	**53.29**
			#34 (Duplicate)	11/20/2007	7047703	**68.9**
			#35	3/6/2008	8006905	**27.91**
			#36	5/2/2008	8015005	**26.57**
			#37	8/6/2008	8028005	**76.07**
			#38	10/23/2008	8038505	**48.45**
	1.0	283MW03	#20	5/11/2004	4034806	**2.03**
			#20 (Duplicate)	5/11/2004	4045202	**2.24**
Ethylbenzene	**700**	283MW02	#20	5/11/2004	4034805	**890.38**
			#22	11/3/2004	4076405	**1006.91**
			#22 (Duplicate)	11/3/2004	4076403	**954.58**
			#23	1/20/2005	5004105	**789.72**
			#25	8/9/2005	5038805	**811.58**
			#25 (Duplicate)	8/9/2005	5038803	**885.06**
			#27 (Duplicate)	1/13/2006	6003003	**714.36**

Table 5-7
Ground Water Exceedance Summary
Site 283
Fort Monmouth, New Jersey

Analyte	Criterion	Field ID	Round	Date Collected	Lab Sample ID	Result
Total Xylenes	**1000**	283MW02	#20	5/11/2004	4034805	**1960.9**
			#21	7/21/2004	4045202	**1158.42**
			#22	11/3/2004	4076405	**2630.01**
			#22 (Duplicate)	11/3/2004	4076403	**2453.82**
			#23	1/20/2005	5004105	**2196.53**
			#24 (Duplicate)	4/20/2005	5021003	**1078.16**
			#25	8/9/2005	5038805	**1398.37**
			#25 (Duplicate)	8/9/2005	5038803	**1429.19**
			#26	11/2/2005	5057305	**2022.82**
			#26 (Duplicate)	11/2/2005	5057303	**1388.56**
			#27	1/13/2006	6003005	**2276.27**
			#27 (Duplicate)	1/13/2006	6003003	**2364.28**
Bromochloromethane	**1.0**	283MW05	#29	7/25/2006	6033505	**10.89**
			#30	10/30/2006	6047005	**6.34**
			#31	2/1/2007	7004205	**6.25**
			#32	5/3/2007	7016105	**2.31**
			#34	11/20/2007	7047705	**2.98**
Dibromochloromethane	**1.0**	283MW04	#29	7/25/2006	6033505	**2.54**
			#30	10/30/2006	6047005	**2.44**
			#31	2/1/2007	7004205	**1.03**
	1.0	283MW05	#29	7/25/2006	6033505	**2.31**
			#30	10/30/2006	6047005	**2.46**
			#31	2/1/2007	7004205	**1.31**

Table 5-7
Ground Water Exceedance Summary
Site 283
Fort Monmouth, New Jersey

Analyte	Criterion	Field ID	Round	Date Collected	Lab Sample ID	Result
Metals						
Arsenic	**8.0**	283MW01	#38 (Duplicate)	10/23/2008	8038502	**3.95 ER**
	8.0	283MW02	#20	5/11/2004	4034805	**10.2**
			#21	7/21/2004	4045202	**20.00**
			#22	11/3/2004	4076405	**9.27**
			#22 (Duplicate)	11/3/2004	4076403	**8.12**
			#24	4/20/2005	5021005	**13.5**
			#24 (Duplicate)	4/20/2005	5021003	**13.9**
			#25	8/9/2005	5038805	**15.3**
			#25 (Duplicate)	8/9/2005	5038803	**19.5**
	3.0		#27	1/13/2006	6003005	**5.97**
			#27 (Duplicate)	1/13/2006	6003003	**5.34**
			#28	4/18/2006	6016105	**13.2**
			#28 (Duplicate)	4/18/2006	6016103	**12.6**
			#29	7/25/2006	6033505	**16.2**
			#29 (Duplicate)	7/25/2006	6033503	**13.1**
			#30	10/30/2006	6047005	**14.4**
			#30 (Duplicate)	10/30/2006	6047003	**13.9**
			#31	2/1/2007	7004205	**26.9**
			#31 (Duplicate)	2/1/2007	7004203	**29.5**
			#32	5/3/2007	7016105	**12.4**
			#32 (Duplicate)	5/3/2007	7016103	**11.8**
			#33	7/27/2007	7028305	**9.41**
			#33 (Duplicate)	7/27/2007	7028303	**9.31**
			#34	11/20/2007	7047705	**4.80 ER**
			#34 (Duplicate)	11/20/2007	7047703	**6.2**
			#35	3/6/2008	8006905	**7.67**
			#36	5/2/2008	8015005	**23.2**
			#37	8/6/2008	8028005	**8.48**
			#38	10/23/2008	8038505	**13.3**
	8.0	283MW03	#22	11/3/2004	4076406	**9.0**
	3.0		#33	7/27/2007	7028306	**3.98 ER**
			#35	3/6/2008	8006906	**5.62**
			#36	5/2/2008	8015006	**5.45**
			#37	8/6/2008	8028006	**4.06 ER**
	8.0	283MW04	#22	11/3/2004	4076407	**83.3**
			#23	1/20/2005	5004107	**53.5**
			#23 (Duplicate)	1/20/2005	5004107	**28.6**
			#24	4/20/2005	5021007	**16.4**
			#25	8/9/2005	5038807	**40.9**
	3.0		#28	4/18/2006	3016107	**5.87**
			#34	11/20/2007	7047707	**3.01 ER**

Table 5-7
Ground Water Exceedance Summary
Site 283
Fort Monmouth, New Jersey

Analyte	Criterion	Field ID	Round	Date Collected	Lab Sample ID	Result
Arsenic	**8.0**	283MW05	#22	11/3/2004	4076408	**14.6**
			#24	4/20/2005	5021008	**10.7**
			#25	8/9/2005	5038808	**23.2**
	3.0		#28	4/18/2006	3016108	**7.29**
			#31	2/1/2007	7004208	**4.06**
			#33	7/27/2007	7028308	**4.19 ER**
			#34	11/20/2007	7047708	**3.18 ER**
			#38	10/23/2008	8038508	**6.81**
	8.0	283MW06	#22	11/3/2004	4076409	**26.5**
			#25	8/9/2005	5038809	**39.6**
	3.0		#28	4/18/2006	3016109	**26**
			#29	7/25/2006	6033509	**14.7**
			#31	2/1/2007	7004209	**3.91**
			#36	5/2/2008	8015009	**4.45 ER**
Beryllium	**1.0**	283MW01	#27	1/13/2006	6003004	**1.96**
			#28	4/18/2006	6016104	**1.59**
			#29	7/25/2006	6033504	**1.66 ER**
			#30	10/30/2006	6047004	**1.71**
			#31	2/1/2007	7004204	**1.10**
			#33	7/27/2007	7028304	**1.15 ER**
			#34	11/20/2007	7047704	**1.52 ER**
			#35	3/6/2008	8006904	**1.14 ER**
			#35 (Duplicate)	3/6/2008	8006903	**1.16 ER**
			#36	5/2/2008	8015004	**1.23 ER**
			#36 (Duplicate)	5/2/2008	8015003	**1.15 ER**
			#37	8/6/2008	8028004	**1.28 ER**
			#37 (Duplicate)	8/6/2008	8028003	**1.27 ER**
			#38	10/23/2008	8038504	**1.20 ER**
			#38 (Duplicate)	10/23/2008	8038502	**1.21 ER**
Cadmium	**4.0**	283MW04	#22	11/3/2004	4076407	**10.5**
		283MW06	#22	11/3/2004	4076409	**4.01**
			#25	8/9/2005	5038809	**4.42**
Chromium	**100**	283MW04	#22	11/3/2004	4076407	**346**
			#23	1/20/2005	5004107	**302**
			#24	4/20/2005	5021007	**160**
			#25	8/9/2005	5038807	**150**
	100	283MW06	#22	11/3/2004	4076409	**147**
			#25	8/9/2005	5038809	**176**
	70		#28	4/18/2006	6016109	**145**
			#29	7/25/2006	6033509	**87.9**

Table 5-7
Ground Water Exceedance Summary
Site 283
Fort Monmouth, New Jersey

Analyte	Criterion	Field ID	Round	Date Collected	Lab Sample ID	Result
Lead	**10**	283MW02	#20	5/11/2004	4034805	**32.5**
			#21	7/21/2004	4045202	**30.3**
			#22	11/3/2004	4076405	**18.2**
			#22 (Duplicate)	11/3/2004	4076403	**14.9**
			#23	1/20/2005	5004105	**17.7**
			#24	4/20/2005	5021005	**18.4**
			#24 (Duplicate)	4/20/2005	5021003	**19.5**
			#25	8/9/2005	5038805	**17.1**
			#25 (Duplicate)	8/9/2005	5038803	**17.1**
			#26	11/2/2005	5057305	**12.1**
			#26 (Duplicate)	11/2/2005	5057303	**12.3**
	5		#27	1/13/2006	6003005	**9.2**
			#27 (Duplicate)	1/13/2006	6003003	**9.76**
			#28	4/18/2006	6016105	**7.72**
			#28 (Duplicate)	4/18/2006	6016103	**7.49**
			#29	7/25/2006	6033505	**10.4**
			#29 (Duplicate)	7/25/2006	6033503	**7.84**
			#30	10/30/2006	6047005	**5.12**
			#30 (Duplicate)	10/30/2006	6047003	**5.57**
			#31	2/1/2007	7004205	**8.78**
			#31 (Duplicate)	2/1/2007	7004203	**9.79**
			#32	5/3/2007	7016105	**11.8**
			#32 (Duplicate)	5/3/2007	7016103	**11.3**
			#33	7/27/2007	7028305	**5.54**
			#33 (Duplicate)	7/27/2007	7028303	**6.68**
			#35	3/6/2008	8006905	**7.86**
			#36	5/2/2008	8015005	**8.05**
			#38	10/23/2008	8038505	**7.34**
	10	283MW03	#22	11/3/2004	4076406	**18.0**
	10	283MW04	#22	11/3/2004	4076407	**24.9**
			#23	1/20/2005	5004107	**26.0**
			#24	4/20/2005	5021007	**14.0**
Nickel	**100**	283MW04	#22	11/3/2004	4076407	**132**
Thallium	**2**	283MW04	#38	10/23/2008	8038507	**2.05 ER**

All results are in micrograms per liter (µg/l).
VOCs = Volatile Organic Compounds
ER-Estimated Result

Table 5-8
Summary of Surface Water Quality Results
SS-14 (Oct96-Dec08)
Fort Monmouth, New Jersey

Round Number	Fresh Water Criteria [1]	Units	1A	1B	1C	2A	2B	2C	3	4	5	6
Stream ID			SS-14	SS-14	SS-14	SS-14	SS-14	SS-14	SS-14	SS-14	SS-14	SS-14
Date Collected			10/8/1996	11/25/1996	12/12/1996	1/29/1997	2/26/1997	3/10/1997	4/8/1997	7/17/1997	10/30/1997	2/10/1998
Analyte/Lab ID			2178.14	2223.16	2246.16	2298.16	2361.16	2375.16	2439.16	2810.16	3121.16	3331.16
VOCs												
Acetone	NLE	µg/L	NA	NA	NA	8.06	ND	ND	3.94	ND	ND	ND
Bromomethane	47	µg/L	ND	ND	ND	2.46	ND	ND	ND	ND	ND	ND
tert-Butyl alcohol	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	NLE	µg/L	NA	NA	NA	ND	ND	ND	ND	ND	1.59	ND
Methyl *tert*-butyl ether	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	2.5	µg/L	**3.65**	**3.81**	ND	**4.22**	ND	ND	ND	ND	ND	ND
Trichloroethene	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	**1.75**	ND
TICs [2]	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals												
Antimony	5.6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	0.17	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2000	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.4	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	92	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1300	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	5	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	500	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	170	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	0.34	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry												
Temperature	NP	ºC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	6.5-8.5	NA	NA	7.42	8.05	8.38	6.96	7.42	6.98	7.57	8.37	8.20
Ammonia	NP	mg/L	NA	0.05	0.25	ND	0.73	NA	0.15	0.16	0.21	0.251
Nitrates	10000	mg/L	NA	1.4	1.3	2.3	1.7	2.7	0.5	0.9	1.4	ND
Phosphate	10	mg/L	NA	0.14	0.3	0.13	0.16	NA	0.22	0.63	0.25	0.31
Sulfate	NP	mg/L	NA	30	27	40	37	22	26	24	31	26
Dissolved Oxygen	NP	mg/L	NA	6.1	6.3	9.5	12.6	11.2	14.3	9.1	9.2	11.1
Total Coliform	NP	cfu/100ml	NA	290	TNTC	900	90	730	440	2400	3680	40
Fecal Coliform	NP	cfu/100ml	NA	100	240	50	<1	105	100	220	<1	80
% Salinity	NP	NA	NA	NA	0	0	1	0	NA	2	2	NA

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

µg/L - micrograms per liter

cfu/100 ml = colony-forming units/100 milliliters

B - Compound detected in the sample and its associated blank sample

ER - Estimated result

Exceedences of NJDEP SWQC are shaded and bold

J - Estimated concentration exceeds the MDL and is less than the RL

NA - Not analyzed, not applicable

ND - Not detected

NLE - No limit established

NP - Not provided

TNTC - Too numerous to count

Table 5-8
Summary of Surface Water Quality Results
SS-14 (Oct96-Dec08)
Fort Monmouth, New Jersey

Round Number	Fresh Water Criteria [1]	Units	7	8	9	10	11A	11B	12	13	14	15
Stream ID			SS-14	SS-14	SS-14	SS-14	SS-14	SS-14 Duplicate	SS-14	SS-14	SS-14	SS-14
Date Collected			4/21/1998	8/19/1998	11/18/1998	2/25/1999	6/29/1999	6/29/1999	9/22/1999	12/8/1999	3/1/2000	6/12/2000
Analyte/Lab ID			3499.16	3816.16	4069.10	4300.16	4579.18	4579.20	4806.09	4997.15	5211.15	5468.20
VOCs												
Acetone	NLE	µg/L	ND	ND	3.32	ND	ND	ND	ND	ND	ND	ND
Bromomethane	47	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butyl alcohol	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	11.26	ND	ND
Methyl *tert*-butyl ether	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	2.5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs [2]	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals												
Antimony	5.6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	0.17	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2000	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.4	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	92	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1300	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	5	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	500	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	170	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	0.34	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry												
Temperature	NP	ºC	NA	NA	NA	NA	23.7	NA	12.4	12.3	12.2	23.1
pH	6.5-8.5	NA	6.96	6.99	7.43	6.61	7.38	NA	7.32	7.24	7.67	6.97
Ammonia	NP	mg/L	0.234	ND	ND	ND	1.01	NA	0.816	ND	ND	ND
Nitrates	10000	mg/L	0.5	ND	1.5	0.8	0.3	NA	ND	1.7	0.5	0.6
Phosphate	10	mg/L	0.23	0.27	0.09	ND	0.1	NA	ND	ND	ND	ND
Sulfate	NP	mg/L	24	24	31	35	24	NA	40	24	38	27
Dissolved Oxygen	NP	mg/L	9.8	3.65	9.01	8.4	5.85	NA	6.83	6.93	7.89	7.21
Total Coliform	NP	cfu/100ml	160	11300	120	40	16400	NA	1820	1460	160	1720
Fecal Coliform	NP	cfu/100ml	980	260	<1	20	900	NA	820	380	40	920
% Salinity	NP	NA	NA	0	2	0	0	NA	0	0	0	0

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

µg/L - micrograms per liter

cfu/100 ml = colony-forming units/100 milliliters

B - Compound detected in the sample and its associated blank sample

ER - Estimated result

Exceedences of NJDEP SWQC are shaded and bold

J - Estimated concentration exceeds the MDL and is less than the RL

NA - Not analyzed, not applicable

ND - Not detected

NLE - No limit established

NP - Not provided

TNTC - Too numerous to count

Table 5-8
Summary of Surface Water Quality Results
SS-14 (Oct96-Dec08)
Fort Monmouth, New Jersey

Round Number	Fresh Water Criteria [1]	Units	16	17	18A	18B	19	20	21	22	23	24
Stream ID			SS-14	SS-14	SS-14	SS-14 Duplicate	SS-14	SS-14	SS-14	SS-14	SS-14	SS-14
Date Collected			8/24/2000	11/20/2000	3/8/2001	3/8/2001	5/16/2001	9/25/2001	11/14/2001	2/11/2002	6/18/2002	9/18/2002
Analyte/Lab ID			5658.20	5868.14	1314	1308	16120.20	16449.10	16579.25	20086.25	20376.25	20666.04
VOCs												
Acetone	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	47	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butyl alcohol	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl *tert*-butyl ether	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	2.5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs [2]	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals												
Antimony	5.6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	0.17	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2000	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.4	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	92	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1300	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	5	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	500	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	170	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thallium	0.34	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry												
Temperature	NP	ºC	19.5	17.3	NA	NA	NA	19.1	6.94	NA	NA	NA
pH	6.5-8.5	NA	7.37	7.40	7.08	NA	7.87	7.17	7.85	7.79	7.98	7.58
Ammonia	NP	mg/L	0.132	0.216	ND	NA	0.479	ND	ND	ND	ND	0.13
Nitrates	10000	mg/L	0.5	0.7	1.9	NA	1.8	0.8	0.7	0.7	0.82	0.62
Phosphate	10	mg/L	ND	ND	ND	NA	0.23	0.22	0.36	0.08	0.35	0.05
Sulfate	NP	mg/L	28	34	32	NA	30	13.4	16.5	61.2	16.8	21.65
Dissolved Oxygen	NP	mg/L	9.23	10.11	8.97	NA	7.64	8.91	7.82	8.07	8.11	8.91
Total Coliform	NP	cfu/100ml	9200	1080	140	NA	2120	28200	360	560	8200	2360
Fecal Coliform	NP	cfu/100ml	480	120	20	NA	1600	1040	100	960	1500	440
% Salinity	NP	NA	0	1	NA	NA	NA	0	4	3	3	0

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

µg/L - micrograms per liter

cfu/100 ml = colony-forming units/100 milliliters

B - Compound detected in the sample and its associated blank sample

ER - Estimated result

Exceedences of NJDEP SWQC are shaded and bold

J - Estimated concentration exceeds the MDL and is less than the RL

NA - Not analyzed, not applicable

ND - Not detected

NLE - No limit established

NP - Not provided

TNTC - Too numerous to count

Table 5-8
Summary of Surface Water Quality Results
SS-14 (Oct96-Dec08)
Fort Monmouth, New Jersey

Round Number	Fresh Water Criteria [1]	Units	25	26	27	28	29	30	31	32	33	34
Stream ID			SS-14	SS-14	SS-14	SS-14	SS-14	SS-14	SS-14	SS-14	SS-14	SS-14
Date Collected			11/5/2002	3/24/2003	5/21/2003	9/17/2003	11/4/2003	3/17/2004	6/29/2004	8/26/2004	11/23/2004	3/3/2005
Analyte/Lab ID			20787.12	30134.10	30247.20	30592.25	30700.25	40500.25	40500.25	40632.25	40804.11	5017.11
VOCs												
Acetone	NLE	µg/L	ND	ND	ND	ND	ND	0.98 J B	ND	ND	ND	ND
Bromomethane	47	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butyl alcohol	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl *tert*-butyl ether	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	2.5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs [2]	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals												
Antimony	5.6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Arsenic	0.17	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Barium	2000	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	32.7	82.2
Beryllium	6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Cadmium	3.4	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Chromium	92	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Copper	1300	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Lead	5	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Nickel	500	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	8.98
Selenium	170	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Thallium	0.34	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Wet Chemistry												
Temperature	NP	ºC	NA	NA	NA	NA	NA	10.37	12.63	20.9	11.38	1.26
pH	6.5-8.5	NA	7.66	6.63	7.49	7.76	7.49	7.53	7.69	7.30	6.37	6.75
Ammonia	NP	mg/L	ND	ND	0.21	ND	ND	ND	ND	ND	ND	ND
Nitrates	10000	mg/L	0.23	1.12	1.01	1.42	0.68	ND	ND	1	2.2	1.86
Phosphate	10	mg/L	0.15	0.16	0.31	0.25	0.15	0.17	0.22	0.2	0.1	0.07
Sulfate	NP	mg/L	322	25.3	23.7	19.7	23.1	26.3	18.2	17.4	19.7	27.9
Dissolved Oxygen	NP	mg/L	8.77	2.89	8.79	7.88	8.77	10	8.93	8.81	4.76	2.51
Total Coliform	NP	cfu/100ml	4500	220	2420	4520	430	350	TNTC	TNTC	1300	1140
Fecal Coliform	NP	cfu/100ml	400	40	140	ND	ND	30	TNTC	20	120	140
% Salinity	NP	NA	0	2	0	0	0	0	0	0	0	0

Notes:

[1] **Health based NDEP Surface Water Quality Criteria as per** N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

µg/L - micrograms per liter

cfu/100 ml = colony-forming units/100 milliliters

B - Compound detected in the sample and its associated blank sample

ER - Estimated result

Exceedences of NJDEP SWQC are shaded and bold

J - Estimated concentration exceeds the MDL and is less than the RL

NA - Not analyzed, not applicable

ND - Not detected

NLE - No limit established

NP - Not provided

TNTC - Too numerous to count

Table 5-8
Summary of Surface Water Quality Results
SS-14 (Oct96-Dec08)
Fort Monmouth, New Jersey

Round Number	Fresh Water Criteria [1]	Units	35	36	37	38A	38B	39A	39B	40A	40B	41A
Stream ID			SS-14	SS-14	SS-14	SS-14	SS-14 Duplicate	SS-14	SS-14 Duplicate	SS-14	SS-14 Duplicate	SS-14
Date Collected			6/14/2005	9/12/2005	11/30/2005	2/22/2006	2/22/2006	5/30/2006	5/30/2006	9/19/2006	9/19/2006	12/11/2006
Analyte/Lab ID			50312.04	50460.04	50623.04	60087.04	60087.03	60249.04	60249.03	60400.04	60400.03	60523.04
VOCs												
Acetone	NLE	µg/L	ND	ND	ND	ND	1.20 J	ND	ND	ND	ND	ND
Bromomethane	47	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butyl alcohol	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl *tert*-butyl ether	NLE	µg/L	ND	ND	ND	0.46 J	0.43 J	ND	ND	ND	ND	0.29 J
Methylene chloride	2.5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs [2]	NLE	µg/L	ND	ND	ND	4	4	ND	ND	ND	ND	ND
Metals												
Antimony	5.6	µg/L	ND	ND	ND	ND	ND	2.99	3.31	ND	ND	ND
Arsenic	0.17	µg/L	ND	ND	ND	ND	ND	ND	**2.54**	**2.21 ER**	**3.06 ER**	**2.94 ER**
Barium	2000	µg/L	41.4	40.9	25.1	38.1	36.2	40.6	40	32.8	27.3	38.4
Beryllium	6	µg/L	ND	ND	ND	ND	ND	ND	ND	0.222 ER	0.218 ER	ND
Cadmium	3.4	µg/L	ND	ND	ND	ND	ND	ND	ND	0.318 ER	0.329 ER	ND
Chromium	92	µg/L	ND	ND	13.2	ND	ND	ND	ND	ND	ND	ND
Copper	1300	µg/L	ND	ND	ND	ND	ND	1.16	0.899	ND	ND	ND
Lead	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	500	µg/L	ND	ND	ND	5.19	ND	3.48	3.42	3.46 ER	3.06 ER	4.13 ER
Selenium	170	µg/L	ND	ND	ND	ND	ND	ND	ND	12.5 ER	5.96 ER	5.78 ER
Thallium	0.34	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Wet Chemistry												
Temperature	NP	ºC	22.22	19.26	13.63	3.18	NA	21.88	NA	19.11	NA	5.22
pH	6.5-8.5	NA	6.98	6.82	6.58	7.27	NA	7.05	NA	8.11	NA	6.25
Ammonia	NP	mg/L	ND	N	ND	ND	NA	ND	NA	ND	NA	ND
Nitrates	10000	mg/L	ND	N	ND	ND	NA	ND	NA	ND	NA	ND
Phosphate	10	mg/L	ND	N	ND	ND	NA	ND	NA	ND	NA	ND
Sulfate	NP	mg/L	21.3	23.5	12.1	21.5	NA	17.7	NA	20.7	NA	46.5
Dissolved Oxygen	NP	mg/L	5.66	0.68	8.23	17.81	NA	11.46	NA	5.42	NA	6.33
Total Coliform	NP	cfu/100ml	28800	TNTC	18600	550	NA	TNTC	NA	3950	NA	1500
Fecal Coliform	NP	cfu/100ml	600	500	5100	ND	NA	1000	NA	5	NA	50
% Salinity	NP	NA	0	0	0	0	NA	0	NA	0	NA	0

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

µg/L - micrograms per liter

cfu/100 ml = colony-forming units/100 milliliters

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ND - Not detected

NLE - No limit established

NP - Not provided

TNTC - Too numerous to count

Table 5-8
Summary of Surface Water Quality Results
SS-14 (Oct96-Dec08)
Fort Monmouth, New Jersey

Round Number	Fresh Water Criteria [1]	Units	41B	42A	42B	43	44	45	45	46	46	47
Stream ID			SS-14 Duplicate	SS-14	SS-14 Duplicate	SS-14	SS-14	SS-14	SS-14 Duplicate	SS-14	SS-14 Duplicate	SS-14
Date Collected			12/11/2006	3/13/2007	3/13/2007	6/26/2007	9/13/2007	12/19/2007	12/19/2007	3/25/2008	3/25/2008	6/26/2008
Analyte/Lab ID			60523.03	70093.04	70093.03	70230.04	70339.04	70541.04	70541.03	80094.10	80094.03	80213.04
VOCs												
Acetone	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND		ND
Bromomethane	47	µg/L	ND	ND	ND	ND	ND	ND	ND	ND		ND
tert-Butyl alcohol	NLE	µg/L	ND	ND	ND	ND	9.39 J	ND	ND	ND		ND
cis-1,2-Dichloroethene	NLE	µg/L	ND	0.12	ND	ND	ND	ND	ND	ND		ND
Methyl *tert*-butyl ether	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND		ND
Methylene chloride	2.5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND		ND
Trichloroethene	1	µg/L	ND	ND	ND	ND	ND	ND	ND	ND		ND
TICs [2]	NLE	µg/L	ND	ND	ND	ND	ND	3	7	ND		ND
Metals												
Antimony	5.6	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	0.17	µg/L	**2.23 ER**	ND	ND	**3.94 ER**	**56.3**	ND	ND	ND	ND	**2.56 ER**
Barium	2000	µg/L	39.2	45	45.3	35.3	29.5	36.3	36.3	36.4	37.6	36.2
Beryllium	6	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	3.4	µg/L	ND	0.437 ER	0.578 ER	0.375 ER	0.328 ER	0.249 ER	ND	0.308 ER	0.321 ER	ND
Chromium	92	µg/L	ND	0.243 ER	ND	ND	0.296 ER	0.861 ER	0.796 ER	ND	ND	ND
Copper	1300	µg/L	ND	ND	ND	ND	ND	1.56 ER	4.67 ER	1.19 ER	0.815 ER	ND
Lead	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	500	µg/L	4.14 ER	4.66 ER	4.64 ER	3.06 ER	2.77 ER	4.02 ER	4.76 ER	4.74 ER	5.03	2.53 ER
Selenium	170	µg/L	6.80 ER	8.02 ER	7.53 ER	7.40 ER	ND	ND	4.45 ER	ND	ND	4.57 ER
Thallium	0.34	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Wet Chemistry												
Temperature	NP	ºC	NA	6.05	NA	19.9	16.7	4.22	NA	5.66	NA	20.93
pH	6.5-8.5	NA	NA	6.63	NA	7.18	7.89	6.71	NA	7.92	NA	8.34
Ammonia	NP	mg/L	NA	ND	NA	ND	ND	ND	NA	ND	NA	ND
Nitrates	10000	mg/L	NA	ND	NA	ND	ND	NA	NA	5.56	NA	4.50
Phosphate	10	mg/L	NA	ND	NA	ND	ND	NA	NA	0.03	NA	ND
Sulfate	NP	mg/L	NA	24.9	NA	21.7	15	NA	NA	18.9	NA	15.10
Dissolved Oxygen	NP	mg/L	NA	8.68	NA	7.06	7.81	3.08	NA	9.04	NA	7.41
Total Coliform	NP	cfu/100ml	NA	800	NA	1550	10600	1250	NA	100	NA	TNTC
Fecal Coliform	NP	cfu/100ml	NA	NA	NA	400	2800	450	NA	20	NA	240
% Salinity	NP	NA	NA	0	NA	0	0	0	NA	0	NA	0

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

µg/L - micrograms per liter

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J - Estimated concentration exceeds the MDL and is less than the RL

NA - Not analyzed, not applicable

ND - Not detected

NLE - No limit established

NP - Not provided

TNTC - Too numerous to count

Table 5-8
Summary of Surface Water Quality Results
SS-14 (Oct96-Dec08)
Fort Monmouth, New Jersey

Round Number	Fresh Water Criteria [1]	Units	48A	48B	49A	49B
Stream ID			SS-14	SS-14 Duplicate	SS-14	SS-14 Duplicate
Date Collected			9/30/2008	9/30/2008	12/29/2008	12/29/2008
Analyte/Lab ID			80346.11	80346.03	80478.11	80478.03
VOCs						
Acetone	NLE	µg/L	ND	ND	ND	ND
Bromomethane	47	µg/L	ND	ND	ND	ND
tert -Butyl alcohol	NLE	µg/L	ND	ND	ND	ND
cis -1,2-Dichloroethene	NLE	µg/L	ND	ND	ND	ND
Methyl *tert* -butyl ether	NLE	µg/L	ND	ND	ND	ND
Methylene chloride	2.5	µg/L	ND	ND	ND	ND
Trichloroethene	1	µg/L	ND	ND	ND	ND
TICs [2]	NLE	µg/L	ND	ND	ND	ND
Metals						
Antimony	5.6	µg/L	ND	ND	ND	ND
Arsenic	0.17	µg/L	ND	**3.47 ER**	**2.72 ER**	ND
Barium	2000	µg/L	31.6	31.8	37.7	38.7
Beryllium	6	µg/L	0.100 ER	0.178 ER	0.193 ER	0.214 ER
Cadmium	3.4	µg/L	0.360 ER	0.451 ER	0.362 ER	0.372 ER
Chromium	92	µg/L	2.03 ER	2.13 ER	ND	ND
Copper	1300	µg/L	ND	ND	ND	ND
Lead	5	µg/L	ND	ND	ND	1.30 ER
Nickel	500	µg/L	4.15 ER	4.10 ER	4.59 ER	4.69 ER
Selenium	170	µg/L	7.60 ER	5.46 ER	ND	ND
Thallium	0.34	µg/L	ND	ND	2.56 ER	3.07 ER
Wet Chemistry						
Temperature	NP	ºC	17.56	NA	6.56	NA
pH	6.5-8.5	NA	6.96	NA	6.94	NA
Ammonia	NP	mg/L	ND	NA	ND	NA
Nitrates	10000	mg/L	ND	NA	ND	NA
Phosphate	10	mg/L	ND	NA	ND	NA
Sulfate	NP	mg/L	22.4	NA	21.6	NA
Dissolved Oxygen	NP	mg/L	8.10	NA	6.52	NA
Total Coliform	NP	cfu/100ml	2200	NA	600	NA
Fecal Coliform	NP	cfu/100ml	600	NA	80	NA
% Salinity	NP	NA	0	NA	0.02	NA

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

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cfu/100 ml = colony-forming units/100 milliliters

B - Compound detected in the sample and its associated blank sample

ER - Estimated result

Exceedences of NJDEP SWQC are shaded and bold

J - Estimated concentration exceeds the MDL and is less than the RL

NA - Not analyzed, not applicable

ND - Not detected

NLE - No limit established

NP - Not provided

TNTC - Too numerous to count

Table 5-9
Summary of Surface Water Quality Results
SS-15 (Oct96-Dec08)
Fort Monmouth, New Jersey

Round Number	Fresh Water Criteria [1]	Units	1A	1B	1C	2A	2B	2C	3	4	5	6
Stream ID			SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15
Date Collected			10/8/1996	11/25/1996	12/12/1996	1/29/1997	2/26/1997	3/10/1997	4/8/1997	7/17/1997	10/30/1997	2/10/1998
Analyte/Lab ID			2178.15	2223.09	2246.09	2298.09	2361.09	2375.09	2439.09	2810.09	3121.09	3331.09
VOCs												
1,2-Dichlorobenzene	2000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	2000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	2200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	NLE	µg/L	NA	NA	NA	4.22	ND	ND	ND	ND	ND	ND
cis -1,2-Dichloroethene	NLE	µg/L	NA	NA	NA	1.57	1.46	ND	2.69	5.53	2.57	ND
Ethylbenzene	530	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl *tert* -butyl ether	70	µg/L	NA	NA	NA	NA	NA	NA	NA	ND	ND	ND
Methylene chloride	2.5	µg/L	**3.85 B**	**2.98 B**	**5.51**	**2.68**	ND	ND	ND	ND	ND	ND
tert -Butyl alcohol	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.34	µg/L	**8.41**	**10.38**	**5.63**	**5.68**	**7.84**	**3.39**	**6.00**	**7.12**	**2.72**	**6.90**
Trichloroethene	1	µg/L	**2.58**	**2.54**	**1.31**	**1.33**	ND	ND	**1.6**	**2.5**	ND	**1.03**
Total Xylenes	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs [2]	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals												
Antimony	5.6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	0.17	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2000	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.4	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	92	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1300	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	5	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	500	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	170	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry												
Temperature	NP	ºC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
pH	6.5-8.5	NA	NA	6.89	**8.53**	**8.80**	7.39	7.46	**8.6**	7.77	**8.50**	**9.28**
Ammonia	NP	mg/L	NA	1.7		ND	6.54	NA	0.38	0.31	0.66	0.444
Nitrates	NP	mg/L	NA	2.8	1.7	2.4	2	2.1	ND	1.1	0.5	ND
Phosphate	10	mg/L	NA	0.08	0.1	0.14	0.12	0.19	0.13	0.43	0.09	0.24
Sulfate	NP	mg/L	NA	28	30	36	35	26	30	24	27	28
Dissolved Oxygen	NP	mg/L	NA	6.8	3.4	9.8	12.1	12	14.1	10.8	10.8	12.5
Total Coliform	NP	cfu/100ml	NA	160	580	1300	120	20	1240	3440	960	120
Fecal Coliform	NP	cfu/100ml	NA	40	310	40	<1	15	20	220	20	40
% Salinity	NP	NA	NA	NA	1	0	1	0	NA	0	2	NA

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

µg/L - micrograms per liter

cfu/100 ml = colony-forming units/100 milliliters

B - Compound detected in the sample and its associated blank sample

ER - Estimated result

Exceedences of NJDEP SWQC are shaded and bold

J - Estimated concentration exceeds the MDL and is less than the RL

NA - Not analyzed, not applicable

ND - Not detected

NLE - No limit established

NP - Not provided

Total Xylenes= Σ of *o* -xylene and *m,p* -xylene

Table 5-9
Summary of Surface Water Quality Results
SS-15 (Oct96-Dec08)
Fort Monmouth, New Jersey

Round Number	Fresh Water Criteria [1]	Units	7	8	9	10	11	12	13	14	15	16	17	18
Stream ID			SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15
Date Collected			4/21/1998	8/19/1998	11/18/1998	2/25/1999	6/29/1999	9/21/1999	12/8/1999	3/1/2000	6/12/2000	8/24/2000	11/20/2000	2/21/2001
Analyte/Lab ID			3499.09	3816.09	4069.08	4300.09	4579.11	4802.11	4997.17	5211.17	5468.12	5658.12	5868.12	962
VOCs														
1,2-Dichlorobenzene	2000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	2000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	2200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis -1,2-Dichloroethene	NLE	µg/L	1.22	3.89	ND	ND	4.17	3.59	ND	1.39	ND	2.02	ND	ND
Ethylbenzene	530	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl *tert* -butyl ether	70	µg/L	ND	ND	ND	ND	ND	ND	ND	2.38	ND	ND	ND	ND
Methylene chloride	2.5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert -Butyl alcohol	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.34	µg/L	**5.72**	**5.39**	ND	**7.33**	**7.86**	**2.61**	**4.08**	**6.95**	**5.94**	**5.2**	**6.29**	**7.19**
Trichloroethene	1	µg/L	**1.21**	**2.06**	ND	ND	**2.4**	**1.37**	ND	**1.39**	ND	**1.58**	ND	ND
Total Xylenes	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs [2]	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals														
Antimony	5.6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	0.17	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2000	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.4	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	92	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1300	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	5	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	500	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	170	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry														
Temperature	NP	ºC	NA	NA	NA	NA	23.5	12.6	12.3	12.2	24.2	21.2	19.2	NA
pH	6.5-8.5	NA	6.88	6.84	7.30	6.75	7.73	7.34	7.29	7.70	6.84	7.28	7.31	7.19
Ammonia	NP	mg/L	0.785	0.268	0.125	0.289	1.03	0.587	2	1.12	ND	0.57	0.37	0.51
Nitrates	NP	mg/L	ND	0.6	3.1	0.8	0.7	ND	0.4	0.8	0.9	1	1.2	0.9
Phosphate	10	mg/L	0.14	5.6	0.08	ND	ND	ND	ND	ND	ND	ND	ND	ND
Sulfate	NP	mg/L	23	24	840	46	26	41	27	35	30	39	34	31
Dissolved Oxygen	NP	mg/L	10.81	3.61	10.1	8.5	6.72	7.04	7.03	7.89	7.31	8.71	9.21	8.14
Total Coliform	NP	cfu/100ml	520	1960	740	440	5600	9100	1400	180	920	3100	1420	640
Fecal Coliform	NP	cfu/100ml	1300	300	220	160	340	600	120	60	380	280	120	0
% Salinity	NP	NA	NA	0	1	0	0	0	0	0	0	0	1	NA

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

µg/L - micrograms per liter

cfu/100 ml = colony-forming units/100 milliliters

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NA - Not analyzed, not applicable

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Total Xylenes= Σ of *o* -xylene and *m,p* -xylene

Table 5-9
Summary of Surface Water Quality Results
SS-15 (Oct96-Dec08)
Fort Monmouth, New Jersey

Round Number	Fresh Water Criteria [1]	Units	19	20	21	22	23	24	25	26	27	28
Stream ID			SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15
Date Collected			5/16/2001	9/25/2001	11/14/2001	2/11/2002	6/18/2002	9/18/2002	11/5/2002	3/24/2003	5/21/2003	9/17/2003
Analyte/Lab ID			16120.12	16449.08	16579.12	20086.12	20376.11	20666.07	20787.07	30134.04	30247.12	30592.20
VOCs												
1,2-Dichlorobenzene	2000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	2000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	2200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis -1,2-Dichloroethene	NLE	µg/L	1.5	ND	3.09	ND	1.63	2.39	ND	1.44 J	1.89 J	1.64 J
Ethylbenzene	530	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl *tert* -butyl ether	70	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	2.5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert -Butyl alcohol	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.34	µg/L	**6.64**	ND	**3.49**	**2.65**	**2.67**	**2.55**	**1.52**	**3.96**	**3.84**	**1.60 J**
Trichloroethene	1	µg/L	ND	ND	ND	ND	ND	ND	ND	**1.11 J**	ND	ND
Total Xylenes	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs [2]	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals												
Antimony	5.6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	0.17	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	2000	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	6	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	3.4	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	92	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	1300	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	5	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	500	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	170	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry												
Temperature	NP	ºC	NA	20.9	8.42	NA	NA	NA	NA	NA	NA	NA
pH	6.5-8.5	NA	7.84	7.31	7.23	7.77	7.61	7.79	7.71	**5.66**	7.81	7.55
Ammonia	NP	mg/L	0.11	ND	3.04	ND	ND	0.12	ND	ND	0.42	0.17
Nitrates	NP	mg/L	1.1	0.4	0.6	0.44	0.81	1.18	0.5	ND	0.85	1.4
Phosphate	10	mg/L	ND	0.19	0.2	0.18	0.23	0.03	0.23	0.11	0.41	0.16
Sulfate	NP	mg/L	33	28.3	17	111	20.7	26.81	36.4	401	27.3	19.7
Dissolved Oxygen	NP	mg/L	7.01	8.77	8.67	9.1	8.97	7.53	8.11	3.71	8.63	7.76
Total Coliform	NP	cfu/100ml	3900	3720	520	380	10000	5080	1700	960	760	1720
Fecal Coliform	NP	cfu/100ml	280	320	60	180	600	180	30	140	100	10
% Salinity	NP	NA	NA	0	0	0	0	4	5	2	0	0

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

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NA - Not analyzed, not applicable

ND - Not detected

NLE - No limit established

NP - Not provided

Total Xylenes= Σ of *o* -xylene and *m,p* -xylene

Table 5-9
Summary of Surface Water Quality Results
SS-15 (Oct96-Dec08)
Fort Monmouth, New Jersey

Round Number	Fresh Water Criteria [1]	Units	29	30	31	32	33	34	35	36	37	38
Stream ID			SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15
Date Collected			11/4/2003	3/17/2004	6/29/2004	8/26/2004	11/23/2004	3/3/2005	6/14/2005	9/12/2005	11/30/2005	2/22/2006
Analyte/Lab ID			30700.20	40182.20	40500.20	40632.20	40804.12	50117.12	50312.06	50460.06	50623.06	60087.06
VOCs												
1,2-Dichlorobenzene	2000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	0.98 J	ND
1,3-Dichlorobenzene	2000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	0.25 J	ND
1,4-Dichlorobenzene	2200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	0.51 J	ND
Acetone	NLE	µg/L	ND	0.69 J B	ND	2.15	ND	ND	ND	ND	ND	1.34 J
cis -1,2-Dichloroethene	NLE	µg/L	1.71 J	0.55 J	1.18 J	1.78 J	2.17	1.51 J	3.23	5.05	ND	1.29 J
Ethylbenzene	530	µg/L	0.69 J	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl *tert* -butyl ether	70	µg/L	535.08	ND	ND	ND	ND	ND	ND	ND	ND	0.70 J
Methylene chloride	2.5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert -Butyl alcohol	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	0.34	µg/L	**1.49 J**	**2.26**	**1.28 J**	**1.25 J**	**2.00**	**2.92**	**2.34**	**1.25 J**	ND	**2.54**
Trichloroethene	1	µg/L	0.53 J	0.55 J	ND	0.78 J	ND	ND	**1.24 J**	0.91 J	ND	0.85 J
Total Xylenes	NLE	µg/L	6.27	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs [2]	NLE	µg/L	170	ND	ND	ND	ND	ND	ND	ND	ND	3
Metals												
Antimony	5.6	µg/L	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND
Arsenic	0.17	µg/L	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND
Barium	2000	µg/L	NA	NA	NA	NA	51.2	62.1	52.8	56.3	24.5	52.8
Beryllium	6	µg/L	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND
Cadmium	3.4	µg/L	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND
Chromium	92	µg/L	NA	NA	NA	NA	ND	ND	ND	ND	5.49	ND
Copper	1300	µg/L	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND
Lead	5	µg/L	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND
Nickel	500	µg/L	NA	NA	NA	NA	11.5	13.1	7.37	ND	ND	11.5
Selenium	170	µg/L	NA	NA	NA	NA	ND	ND	ND	ND	ND	ND
Wet Chemistry												
Temperature	NP	ºC	NA	10.66	13.41	21	11.79	3.07	25.72	24.12	14.32	5.01
pH	6.5-8.5	NA	7.56	7.59	7.66	7.53	**6.10**	6.88	7.08	6.92	6.91	7.37
Ammonia	NP	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrates	NP	mg/L	1.28	3.96	ND	1.9	1.32	2.02	ND	ND	ND	ND
Phosphate	10	mg/L	0.03	0.14	0.06	0.12	0.26	0.24	ND	ND	ND	ND
Sulfate	NP	mg/L	24.1	24	23.2	19.9	22.8	28.3	26.5	25.7	16.8	23.6
Dissolved Oxygen	NP	mg/L	8.53	9.74	8.73	7.37	4.87	0.48	7.06	0.67	11.32	16.65
Total Coliform	NP	cfu/100ml	170	390	14600	5440	2560	440	12100	10400	11500	250
Fecal Coliform	NP	cfu/100ml	ND	ND	ND	ND	60	0	ND	100	2000	ND
% Salinity	NP	NA	5	4	5	7	2	0	0	0	0	0

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

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Table 5-9
Summary of Surface Water Quality Results
SS-15 (Oct96-Dec08)
Fort Monmouth, New Jersey

Round Number	Fresh Water Criteria [1]	Units	39	40	41	42	43	44	45	46	47	48	49
Stream ID			SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15	SS-15
Date Collected			5/30/2006	9/19/2006	12/11/2006	3/13/2007	6/26/2007	9/13/2007	12/19/2007	3/25/2008	6/26/2008	9/30/2008	12/29/2008
Analyte/Lab ID			60249.06	60400.06	60523.06	70093.06	70230.06	70339.06	70541.06	80094.11	80213.06	80346.12	80478.12
VOCs													
1,2-Dichlorobenzene	2000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	2000	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	2200	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone	NLE	µg/L	ND	ND	ND	0.92 J	ND	ND	ND	ND	ND	ND	ND
cis -1,2-Dichloroethene	NLE	µg/L	ND	1.50 J	0.24 J	0.81 J	2.14	2.81	ND	1.35 J	2.89	0.88 J	0.94 J
Ethylbenzene	530	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl *tert* -butyl ether	70	µg/L	ND	ND	ND	0.47 J	ND	1.00 J	ND	0.88 J	0.63 J	ND	ND
Methylene chloride	2.5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert -Butyl alcohol	NLE	µg/L	ND	ND	ND	ND	ND	20.81	14.52	ND	ND	ND	ND
Tetrachloroethene	0.34	µg/L	ND	ND	ND	**2.21**	ND	**1.54 J**	**0.93 J**	**2.42**	**2.28**	ND	**1.55 J**
Trichloroethene	1	µg/L	ND	ND	ND	0.65 J	ND	ND	ND	**1.02 J**	**1.01 J**	ND	ND
Total Xylenes	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs [2]	NLE	µg/L	ND	ND	ND	ND	ND	ND	7	ND	ND	ND	ND
Metals													
Antimony	5.6	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	0.17	µg/L	ND	ND	ND	ND	**3.12 ER**	ND	ND	ND	**3.37 ER**	**3.50 ER**	ND
Barium	2000	µg/L	67	44.9	54.3	58.8	52.6	52.5	50.6	57.4	61.5	58.4	58.3
Beryllium	6	µg/L	0.105	0.242 ER	ND	0.156	ND	ND	0.106	ND	ND	0.247 ER	0.336 ER
Cadmium	3.4	µg/L	0.487	0.571 ER	0.639 ER	0.857 ER	0.435 ER	ND	0.879 ER	0.298 ER	ND	1.08 ER	0.471 ER
Chromium	92	µg/L	1.67	1.11 ER	0.899 ER	0.692 ER	0.432 ER	0.906 ER	1.44 ER	0.433 ER	0.758 ER	3.66 ER	3.37 ER
Copper	1300	µg/L	2.63	0.893 ER	ND	ND	1.84 ER	0.801 ER	2.50 ER	2.00 ER	ND	ND	ND
Lead	5	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	1.49 ER	ND	**5.74**
Nickel	500	µg/L	9.63	10.5	6.7	9.76	6.09	6.44	14.4	13	6.15	10.6	11.9
Selenium	170	µg/L	ND	10.9 ER	5.79 ER	7.29 ER	6.39 ER	ND	ND	ND	6.62 ER	8.61 ER	ND
Wet Chemistry													
Temperature	NP	ºC	21.74	20.78	5.79	8.21	22.3	18.7	4.82	8.62	23.47	17.60	8.33
pH	6.5-8.5	NA	7.31	7.89	**6.31**	6.87	6.86	7.81	6.63	7.87	8.22	6.97	7.09
Ammonia	NP	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nitrates	NP	mg/L	ND	ND	ND	1.05	ND	ND	NA	2.76	5.97	ND	ND
Phosphate	10	mg/L	ND	ND	ND	ND	ND	ND	NA	0.07	ND	ND	ND
Sulfate	NP	mg/L	21.2	24.7	45.1	30	20.9	22.8	NA	21.2	17.63	18.4	19.1
Dissolved Oxygen	NP	mg/L	11.32	7.26	6.46	8.41	6.94	6.54	3.01	9.47	8.28	7.55	6.99
Total Coliform	NP	cfu/100ml	TNTC	2550	350	600	2450	11400	800	120	4080	2650	600
Fecal Coliform	NP	cfu/100ml	500	150	100	NA	100	2000	50	ND	ND	50	20
% Salinity	NP	NA	0	0	0	0	0	0	0	0	0	0	0

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

µg/L - micrograms per liter

cfu/100 ml = colony-forming units/100 milliliters

B - Compound detected in the sample and its associated blank sample

ER - Estimated result

Exceedences of NJDEP SWQC are shaded and bold

J - Estimated concentration exceeds the MDL and is less than the RL

NA - Not analyzed, not applicable

ND - Not detected

NLE - No limit established

NP - Not provided

Total Xylenes= Σ of *o* -xylene and *m,p* -xylene

Table 5-10
Summary of Surface Water Quality Results
SS-27 (Jun00-Dec08)
Fort Monmouth, New Jersey

Round Number	Saline Water Criteria [1]	Units	15	16	17	18	19	20	21	22	23	24
Stream ID			SS-27	SS-27	SS-27	SS-27	SS-27	SS-27	SS-27	SS-27	SS-27	SS-27
Date Collected			6/12/2000	8/24/2000	11/20/2000	3/8/2001	5/16/2001	9/25/2001	11/14/2001	2/11/2002	6/18/2002	9/18/2002
Analyte/Lab ID			5468.26	5658.26	5868.25	1319	16120.26	16449.05	16579.16	20086.16	20376.16	20666.13
VOCs												
Acetone	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	2100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis -1,2-Dichloroethene	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl *tert* -butyl ether	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	1.6	µg/L	ND	**1.72**	**1.87**	ND	ND	ND	ND	ND	ND	ND
Total Xylenes	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	12	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs [2]	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals												
Antimony	640	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	0.061	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Barium	NLE	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium	42	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium	16	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	750	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Copper	NLE	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Lead	NLE	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nickel	1700	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Selenium	4200	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wet Chemistry												
Temperature	NP	ºC	27.1	24.7	22.4	NA	NA	21.1	7.44	NA	NA	NA
pH	6.5-8.5	NA	6.91	6.81	**6.41**	7.34	7.29	6.91	7.11	7.41	7.59	7.75
Ammonia	NP	mg/L	ND	0.612	0.413	ND	0.264	0.23	0.549	ND	ND	0.5
Nitrates	NP	mg/L	0.2	0.4	0.9	1.2	0.2	0.2	ND	0.09	0.65	0.47
Phosphate	10	mg/L	ND	ND	ND	ND	0.14	0.98	0.19	0.23	0.23	0.35
Sulfate	NP	mg/L	250	100		200	240	ND	1100	799	145.5	982
Dissolved Oxygen	NP	mg/L	6.51	7.23	7.47	8.91	7.59	7.49	9.11	9.37	8.77	7.81
Total Coliform	NP	cfu/100ml	6300	7200	880	20	2800	20300	620	760	6000	TNTC
Fecal Coliform	NP	cfu/100ml	1400	600	20	0	300	1460	20	800	500	TNTC
% Salinity	NP	NA	5	3	1.001	NA	NA	4	16	14	15	10

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

µg/L - micrograms per liter

cfu/100 ml = colony-forming units/100 milliliters

B - Compound detected in the sample and its associated blank sample

ER - Estimated result

Exceedences of NJDEP SWQC are shaded and bold

J - Estimated concentration exceeds the MDL and is less than the RL

NA - Not analyzed, not applicable

ND - Not detected

NLE - No limit established

NP - Not provided

TNTC - Too numerous to count

Total Xylenes= Σ of *o* -xylene and *m,p* -xylene

Table 5-10
Summary of Surface Water Quality Results
SS-27 (Jun00-Dec08)
Fort Monmouth, New Jersey

Round Number	Saline Water Criteria [1]	Units	25	26	27	28	29	30	31	32	33	34
Stream ID			SS-27	SS-27	SS-27	SS-27	SS-27	SS-27	SS-27	SS-27	SS-27	SS-27
Date Collected			11/4/2002	3/13/2003	5/21/2003	9/17/2003	11/4/2003	3/17/2004	6/29/2004	8/26/2004	11/23/2004	3/3/2005
Analyte/Lab ID			20780.09	30118.14	30247.25	30592.12	30700.12	40182.12	40500.12	40632.12	40804.17	50117.17
VOCs												
Acetone	NLE	µg/L	ND	ND	ND	ND	ND	0.70 J B	5.91	1.17 J	ND	ND
Chloroform	2100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	1.97 J	ND
cis -1,2-Dichloroethene	NLE	µg/L	ND	ND	1.38 J	1.16 J	0.88 J	ND	ND	0.75 J	ND	ND
Methyl *tert* -butyl ether	NLE	µg/L	ND	ND	ND	ND	377.93	ND	ND	ND	ND	ND
Tetrachloroethene	1.6	µg/L	ND	**1.71 J**	**2.68**	1.16 J	1.06 J	0.85 J	ND	0.56 J	ND	1.06 J
Total Xylenes	NLE	µg/L	ND	ND	ND	ND	4.39	ND	ND	ND	ND	ND
Trichloroethene	12	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs [2]	NLE	µg/L	ND	ND	ND	ND	28	ND	ND	ND	ND	ND
Metals												
Antimony	640	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Arsenic	0.061	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Barium	NLE	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	38	57.2
Beryllium	42	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Cadmium	16	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Chromium	750	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Copper	NLE	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Lead	NLE	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Nickel	1700	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	5.92	9.48
Selenium	4200	µg/L	NA	NA	NA	NA	NA	NA	NA	NA	ND	ND
Wet Chemistry												
Temperature	NP	ºC	NA	NA	NA	NA	NA	10.67	13.41	22.4	11.59	5.07
pH	6.5-8.5	NA	7.71	**6.33**	7.69	7.91	7.78	7.70	7.73	7.68	6.91	6.88
Ammonia	NP	mg/L	ND	0.303	0.43	0.18	ND	ND	ND	ND	ND	ND
Nitrates	NP	mg/L	0.28	1.24	0.98	1.38	0.78	2.64	ND	ND	4.84	2.33
Phosphate	10	mg/L	0.19	0.11	0.39	0.1	0.13	0.25	0.1	0.15	1.83	0.1
Sulfate	NP	mg/L	1130	26.7	34.4	32.5	209	43.3	154	209	204	32.7
Dissolved Oxygen	NP	mg/L	7.81	15.87	8.54	8.11	8.47	9.71	8.56	7.31	1.72	1.25
Total Coliform	NP	cfu/100ml	610	260	320	2480	990	350	TNTC	TNTC	1400	320
Fecal Coliform	NP	cfu/100ml	100	20	20	ND	20	40	TNTC	100	460	0
% Salinity	NP	NA	2	2	15	10	11	9	21	17	3	1

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

µg/L - micrograms per liter

cfu/100 ml = colony-forming units/100 milliliters

B - Compound detected in the sample and its associated blank sample

ER - Estimated result

Exceedences of NJDEP SWQC are shaded and bold

J - Estimated concentration exceeds the MDL and is less than the RL

NA - Not analyzed, not applicable

ND - Not detected

NLE - No limit established

NP - Not provided

TNTC - Too numerous to count

Total Xylenes= Σ of *o* -xylene and *m,p* -xylene

Table 5-10
Summary of Surface Water Quality Results
SS-27 (Jun00-Dec08)
Fort Monmouth, New Jersey

Round Number	Saline Water Criteria [1]	Units	35	36	37	38	39	40	41	42	43A	43B
Stream ID			SS-27	SS-27	SS-27	SS-27	SS-27	SS-27	SS-27	SS-27	SS-27	SS-27 Duplicate
Date Collected			6/14/2005	9/13/2005	12/1/2005	2/22/2006	5/31/2006	9/20/2006	12/11/2006	3/13/2007	6/26/2007	6/26/2007
Analyte/Lab ID			50313.09	50462.09	50624.09	60087.17	60251.08	60404.06	60523.17	70093.17	70234.06	70234.03
VOCs												
Acetone	NLE	µg/L	ND	ND	ND	1.50 J	ND	ND	ND	0.99 J	6.71	6.54
Chloroform	2100	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis -1,2-Dichloroethene	NLE	µg/L	0.79 J	1.11 J	ND	0.51 J	ND	ND	0.35 J	0.36 J	ND	ND
Methyl *tert* -butyl ether	NLE	µg/L	0.67 J	ND	ND	0.46 J	ND	ND	ND	ND	ND	ND
Tetrachloroethene	1.6	µg/L	0.58 J	ND	ND	1.04 J	ND	ND	0.44 J	1.07 J	ND	ND
Total Xylenes	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	12	µg/L	ND	ND	ND	0.35 J	ND	ND	0.30 J	ND	ND	ND
TICs [2]	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals												
Antimony	640	µg/L	ND	ND	ND	ND	3.48	ND	2.39 ER	ND	ND	ND
Arsenic	0.061	µg/L	**5.33**	ND	ND	ND	ND	ND	ND	ND	**3.05 ER**	ND
Barium	NLE	µg/L	69.3	51.3	32	44.8	46.2	33	29.9	41.9	24.8	21.8
Beryllium	42	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	0.129 ER	0.116 ER
Cadmium	16	µg/L	ND	ND	ND	ND	0.3	ND	0.330 ER	0.493 ER	0.691 ER	0.569 ER
Chromium	750	µg/L	ND	ND	ND	ND	ND	ND	ND	0.283 ER	2.42 ER	0.920 ER
Copper	NLE	µg/L	5.21	7.74	5.56	ND	2.09	4.62 ER	24	9.36	3.52 ER	2.41 ER
Lead	NLE	µg/L	ND	ND	ND	ND	ND	ND	ND	2.72 ER	2.52 ER	ND
Nickel	1700	µg/L	11.5	ND	5.46	10.3	5.23	6.02	67.7	7.22	4.13 ER	3.75 ER
Selenium	4200	µg/L	ND	ND	ND	ND	ND	12.8 ER	6.38 ER	7.94 ER	6.82 ER	5.77 ER
Wet Chemistry												
Temperature	NP	ºC	25.33	25.7	9.45	5.85	21.48	20.57	8.46	10.59	26.1	NA
pH	6.5-8.5	NA	6.87	6.81	**6.29**	7.54	**6.09**	7.46	7.11	7.31	6.37	NA
Ammonia	NP	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Nitrates	NP	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Phosphate	10	mg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	NA
Sulfate	NP	mg/L	588 E	234	427	46.9	116	542	232	63.9	17.3	NA
Dissolved Oxygen	NP	mg/L	2.98	0	13.91	17.29	9.76	3.03	8.51	7.27	6.71	NA
Total Coliform	NP	cfu/100ml	TNTC	17000	15900	250	TNTC	3700	950	500	25000	NA
Fecal Coliform	NP	cfu/100ml	1800	600	300	ND	200	800	100	NA	20000	NA
% Salinity	NP	NA	5	0	5	0	0	0	3	0.02	0	NA

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

µg/L - micrograms per liter

cfu/100 ml = colony-forming units/100 milliliters

B - Compound detected in the sample and its associated blank sample

ER - Estimated result

Exceedences of NJDEP SWQC are shaded and bold

J - Estimated concentration exceeds the MDL and is less than the RL

NA - Not analyzed, not applicable

ND - Not detected

NLE - No limit established

NP - Not provided

TNTC - Too numerous to count

Total Xylenes= Σ of *o* -xylene and *m,p* -xylene

Table 5-10
Summary of Surface Water Quality Results
SS-27 (Jun00-Dec08)
Fort Monmouth, New Jersey

Round Number	Saline Water Criteria [1]	Units	44	45	46A	46B	47	48	49
Stream ID			SS-27	SS-27	SS-27	SS-27 Duplicate	SS-27	SS-27	SS-27
Date Collected			9/13/2007	12/19/2007	3/26/2008	3/26/2008	6/26/2008	9/30/2008	12/29/2008
Analyte/Lab ID			70339.17	70541.17	80095.08	80095.03	80213.17	80346.17	80478.17
VOCs									
Acetone	NLE	µg/L	ND	ND	ND	NA	ND	ND	ND
Chloroform	2100	µg/L	ND	ND	ND	NA	ND	ND	ND
cis -1,2-Dichloroethene	NLE	µg/L	ND	ND	0.61 J	NA	0.71 J	0.36 J	ND
Methyl *tert* -butyl ether	NLE	µg/L	0.42 J	ND	0.42 J	NA	ND	ND	ND
Tetrachloroethene	1.6	µg/L	ND	ND	1.01 J	NA	0.69 J	ND	0.68 J
Total Xylenes	NLE	µg/L	ND	ND	ND	NA	ND	ND	ND
Trichloroethene	12	µg/L	ND	ND	0.40 J	NA	ND	ND	ND
TICs [2]	NLE	µg/L	ND	ND	ND	NA	ND	ND	11
Metals									
Antimony	640	µg/L	ND	ND	ND	ND	ND	ND	ND
Arsenic	0.061	µg/L	ND	ND	ND	ND	ND	ND	ND
Barium	NLE	µg/L	27.1	42.5	47.1	47.1	2.90 ER	34.1	45.3
Beryllium	42	µg/L	ND	ND	ND	ND	39.4	0.164 ER	0.203 ER
Cadmium	16	µg/L	0.843 ER	0.441 ER	0.254 ER	0.258 ER	ND	0.645 ER	0.515 ER
Chromium	750	µg/L	0.416 ER	1.04 ER	0.634 ER	0.252 ER	ND	2.99 ER	2.33 ER
Copper	NLE	µg/L	3.16 ER	6.08	2.16 ER	2.04 ER	ND	1.97 ER	ND
Lead	NLE	µg/L	ND	ND	ND	ND	ND	ND	3.59 ER
Nickel	1700	µg/L	1.51 ER	9.93	8.87	9.06	3.26 ER	7.49	8.03
Selenium	4200	µg/L	ND	ND	ND	ND	7.44 ER	10.0 ER	4.76 ER
Wet Chemistry									
Temperature	NP	ºC	21.0	5.17	7.52	NA	24.02	19.52	7.56
pH	6.5-8.5	NA	7.35	7.17	8.28	NA	7.55	6.83	7.14
Ammonia	NP	mg/L	ND	ND	ND	NA	ND	ND	ND
Nitrates	NP	mg/L	ND	NA	4.17	NA	17.6	ND	ND
Phosphate	10	mg/L	ND	NA	0.06	NA	ND	ND	ND
Sulfate	NP	mg/L	497	NA	24.6	NA	170	164	72.2
Dissolved Oxygen	NP	mg/L	5.01	4.33	9.15	NA	6.04	6.33	5.67
Total Coliform	NP	cfu/100ml	8400	850	180	NA	5520	2450	540
Fecal Coliform	NP	cfu/100ml	1900	50	ND	NA	160	550	120
% Salinity	NP	NA	0	0	0	NA	0	0	0

Notes:

[1] Health based NDEP Surface Water Quality Criteria as per N.J.A.C. 7:9B effective 4/17/98

[2] TICs - Tentatively identified compounds

µg/L - micrograms per liter

cfu/100 ml = colony-forming units/100 milliliters

B - Compound detected in the sample and its associated blank sample

ER - Estimated result

Exceedences of NJDEP SWQC are shaded and bold

J - Estimated concentration exceeds the MDL and is less than the RL

NA - Not analyzed, not applicable

ND - Not detected

NLE - No limit established

NP - Not provided

TNTC - Too numerous to count

Total Xylenes= Σ of *o* -xylene and *m,p* -xylene

Table 5-11
Surface Water Exceedance Summary
Site 283
Fort Monmouth, New Jersey

Analyte	Criterion	Field ID	Round	Date Collected	Lab Sample ID	Result
VOCs						
Tetrachloroethene	**0.34**	**SS-15**	#31	6/29/2004	4050020	**1.28 J**
			#32	8/26/2004	4063220	**1.25 J**
			#33	11/23/2004	4080412	**2.00**
			#34	3/3/2005	5011712	**2.92**
			#35	6/14/2005	5031206	**2.34**
			#36	9/12/2005	5046006	**1.25 J**
			#38	2/22/2006	6008706	**2.54**
			#42	3/13/2007	7009306	**2.21**
			#44	9/13/2007	7033906	**1.54 J**
			#45	12/19/2007	7054106	**0.93 J**
			#46	3/25/2008	8009411	**2.42**
			#47	6/26/2008	8021306	**2.28**
			#49	12/29/2008	8047812	**1.55 J**
Trichloroethene	**1**	**SS-15**	#35	6/14/2005	5031206	**1.24 J**
			#46	3/25/2008	8009411	**1.02 J**
			#47	6/26/2008	8021306	**1.01 J**
Metals						
Arsenic	**0.17**	**SS-14**	#39 (Duplicate)	5/30/2006	6024903	**2.54**
			#40	9/19/2006	6040004	**2.21 ER**
			#40 (Duplicate)	9/19/2006	6040003	**3.06 ER**
			#41	12/11/2006	6052304	**2.94 ER**
			#41 (Duplicate)	12/11/2006	6052303	**2.23 ER**
			#43	6/26/2007	7023004	**3.94 ER**
			#44	9/13/2007	7033904	**56.30**
			#47	6/26/2008	8021304	**2.56 ER**
			#48 (Duplicate)	9/30/2008	8034603	**3.47 ER**
			#49	12/29/2008	8047811	**2.72 ER**
		SS-15	#43	6/26/2007	7023006	**3.12 ER**
			#47	6/26/2008	8021306	**3.37 ER**
			#48	9/30/2008	8034612	**3.50 ER**
		SS-27	#35	6/14/2005	5031309	**5.33**
			#43	6/26/2007	7023406	**3.05 ER**
Lead	**5.00**	**SS-15**	#49	12/29/2008	8047812	**5.74**
Wet Chemistry						
pH	**6.5-8.5**	**SS-15**	#33	11/23/2004	4080412	**6.1**
			#41	12/11/2006	6052306	**6.31**
		SS-27	#37	12/1/2005	5062409	**6.29**
			#39	5/31/2006	6025106	**6.09**

All results are in micrograms per liter (µg/l).
VOCs = Volatile Organic Compounds
J - Estimated Concentration observed greater than the MDL and less than the RL.
ER-Estimated Result

Table 5-12
Ground Water Tentatively Identified Compounds (TICs)
Site 283
Fort Monmouth, New Jersey

	Well:	283MW01	283MW02	283MW03	283MW04	283MW05	283MW06
Round	**Date**						
20	**May-04**	ND	**2574/10**	ND	NS	NS	NS
21	**Jul-04**	ND	**2265/10**	ND	NS	NS	NS
22	**Nov-04**	8/1	**2380/10**	20/4	ND	ND	ND
23	**Jan-05**	ND	**1758/10**	ND	ND	ND	ND
24	**Apr-05**	14/2	**2136/10**	ND	ND	ND	ND
25	**Aug-05**	ND	**4370/10**	ND	ND	ND	ND
26	**Nov-05**	ND	**2010/10**	ND	ND	ND	ND
27	**Jan-06**	44/8	**1422/10**	ND	ND	ND	ND
28	**Apr-06**	23/6	**893/10**	41/9	4/1	4/1	4/1
29	**Jul-06**	13/3	**1946/10**	28/6	ND	ND	ND
30	**Oct-06**	ND	**902/10**	ND	ND	ND	ND
31	**Feb-07**	ND	**1688/15**	7/1	ND	ND	ND
32	**May-07**	ND	**2046/15**	ND	ND	ND	ND
33	**Jul-07**	ND	295/15	ND	ND	ND	ND
34	**Nov-07**	ND	181/15	ND	ND	ND	ND
35	**Mar-08**	ND	184/15	ND	ND	ND	ND
36	**May-08**	ND	185/15	ND	ND	ND	ND
37	**Aug-08**	ND	229/15	ND	ND	ND	ND
38	**Oct-08**	ND	252/15	ND	ND	ND	ND

Notes:
Exceedances are bolded and shaded.
Exceedances are based on 100 µg/L for individual TIC concentrations and 500 µg/L for Total TICs concentrations.
Results are given as Total TIC concentrations/# TICs.
ND = Not Detected.
NS = Not Sampled

Table 5-13
Surface Water Tentatively Identified Compounds (TICs)
Site 283
Fort Monmouth, New Jersey

	Well:	SS-14	SS-15	SS-27
Round	**Date**			
31	**Jun-04**	ND	ND	ND
32	**Aug-04**	ND	ND	ND
33	**Nov-04**	ND	ND	ND
34	**Mar-05**	ND	ND	ND
35	**Jun-05**	ND	ND	ND
36	**Sep-05**	ND	ND	ND
37	**Nov-05**	ND	ND	ND
38	**Feb-06**	4/1	3/1	ND
39	**May-06**	ND	ND	ND
40	**Sep-06**	ND	ND	ND
41	**Dec-06**	ND	ND	ND
42	**Mar-07**	ND	ND	ND
43	**Jun-07**	ND	ND	ND
44	**Sep-07**	ND	ND	ND
45	**Dec-07**	3/1	7/1	ND
46	**Mar-08**	ND	ND	ND
47	**Jun-08**	ND	ND	ND
48	**Sep-08**	ND	ND	ND
49	**Dec-08**	ND	ND	11/1

Notes:
Exceedances are bolded and shaded.
Exceedances are based on 100 µg/L for individual TIC concentrations and 500 µg/L for Total TICs concentrations.
Results are given as Total TIC concentrations/# TICs.
ND = Not Detected.
NS = Not Sampled

Table 5-14
Relative Percent Difference Calculations - Ground Water
Site 283 (2nd Quarter 2004 through 4th Quarter 2008)
Fort Monmouth, NJ

Round 20 **Q2 2004** **283MW03** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	Average All RPDs
Benzene	2.24	2.03	2.14	0.21	9.84%	
Ethylbenzene	0.3	0.99	0.65	0.69	106.98%	
Total Xylenes	0.92	2.24	1.58	1.32	83.54%	
				Average	**66.79%**	**66.79%**

Round 22a **Q4 2004** **283MW02** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	157.68	151.98	154.83	5.7	3.68%	
Ethylbenzene	258.39	225.24	241.82	33.15	13.71%	
Toluene	112.68	106.89	109.79	5.79	5.27%	
Total Xylenes	966.66	843.26	904.96	123.4	13.64%	
				Average	**9.08%**	**9.08%**

Round 22b **Q4 2004** **283MW02** **Sample Multiplier: 10**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	184.15	189.73	186.94	5.58	2.98%	
Ethylbenzene	1007.74	1002.41	1005.08	5.33	0.53%	
Toluene	126.86	131.1	128.98	4.24	3.29%	
Total Xylenes	2705.2	2711.77	2708.485	6.57	0.24%	
				Average	**1.76%**	**1.76%**

Round 22c **Q4 2004** **283MW02** **Sample Multiplier: 50**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	182.09	196.05	189.07	13.96	7.38%	
Ethylbenzene	954.58	1006.91	980.75	52.33	5.34%	
Toluene	124.83	135.02	129.93	10.19	7.84%	
Total Xylenes	2453.82	2630.01	2541.915	176.19	6.93%	
				Average	**6.87%**	**6.87%**

Round 23 **Q1 2005** **283MW04** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
All Non-Detect	0	0	0	0	0.00%	
				Average	**0.00%**	**0.00%**

Round 24a **Q2 2005** **283MW02** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	58.4	62.24	60.32	3.84	6.37%	
Ethylbenzene	309.23	234.22	271.73	75.01	27.61%	
Toluene	44.13	45.31	44.72	1.18	2.64%	
Total Xylenes	1074.82	826.19	950.505	248.63	26.16%	
				Average	**15.69%**	**15.69%**

Table 5-14
Relative Percent Difference Calculations - Ground Water
Site 283 (2nd Quarter 2004 through 4th Quarter 2008)
Fort Monmouth, NJ

Round 24b **Q2 2005** **283MW02** **Sample Multiplier: 10**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	63.83	45.96	54.90	17.87	32.55%	
Ethylbenzene	527.49	256.2	391.85	271.29	69.23%	
Toluene	45.15	27.17	36.16	17.98	49.72%	
Total Xylenes	1078.16	535.76	806.96	542.4	67.22%	
				Average	**54.68%**	**54.68%**

Round 25a **Q3 2005** **283MW02** **Sample Multiplier: 10**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	181.44	157.54	169.49	23.9	14.10%	
Ethylbenzene	1020.09	859.18	939.64	160.91	17.12%	
Toluene	65.92	57.99	61.96	7.93	12.80%	
Total Xylenes	1664.96	1450.48	1557.72	214.48	13.77%	
				Average	**14.45%**	**14.45%**

Round 25b **Q3 2005** **283MW02** **Sample Multiplier: 20**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	158.69	158.61	158.65	0.08	0.05%	
Ethylbenzene	885.06	883.11	884.09	1.95	0.22%	
Toluene	57.01	58.58	57.80	1.57	2.72%	
Total Xylenes	1429.19	1446.21	1437.70	17.02	1.18%	
				Average	**1.04%**	**1.04%**

Round 26a **Q4 2005** **283MW02** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	93.92	91	92.46	2.92	3.16%	
Ethylbenzene	281.39	276.78	279.09	4.61	1.65%	
Toluene	109.29	108.3	108.80	0.99	0.91%	
Total Xylenes	1184.31	1151.4	1167.86	32.91	2.82%	
				Average	**2.13%**	**2.13%**

Round 26b **Q4 2005** **283MW02** **Sample Multiplier: 10**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	120.22	113.35	116.79	6.87	5.88%	
Ethylbenzene	883.21	761.03	822.12	122.18	14.86%	
Toluene	135.3	125.07	130.19	10.23	7.86%	
Total Xylenes	3046.39	2781.53	2913.96	264.86	9.09%	
				Average	**9.42%**	**9.42%**

Round 26c **Q4 2005** **283MW02** **Sample Multiplier: 20**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	84.01	94.52	89.27	10.51	11.77%	
Ethylbenzene	368.03	539.24	453.64	171.21	37.74%	
Toluene	77.24	99.66	88.45	22.42	25.35%	
Total Xylenes	1388.56	2022.82	1705.69	634.26	37.18%	
				Average	**28.01%**	**28.01%**

Table 5-14
Relative Percent Difference Calculations - Ground Water
Site 283 (2nd Quarter 2004 through 4th Quarter 2008)
Fort Monmouth, NJ

Round 27a **Q1 2006** **283MW02** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	91.58	91.87	91.73	0.29	0.32%	
Ethylbenzene	225.09	228.73	226.91	3.64	1.60%	
Toluene	81.94	79.54	80.74	2.4	2.97%	
Total Xylenes	819.34	814.72	817.03	4.62	0.57%	
				Average	**1.36%**	**1.36%**

Round 27b **Q1 2006** **283MW02** **Sample Multiplier: 10**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	205.3	188.42	196.86	16.88	8.57%	
Ethylbenzene	999.02	899.67	949.35	99.35	10.47%	
Toluene	248.1	217.27	232.69	30.83	13.25%	
Total Xylenes	3049.12	2781.11	2915.12	268.01	9.19%	
				Average	**10.37%**	**10.37%**

Round 27c **Q1 2006** **283MW02** **Sample Multiplier: 50**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	118.14	115.92	117.03	2.22	1.90%	
Ethylbenzene	714.36	691.12	702.74	23.24	3.31%	
Toluene	121.64	119.42	120.53	2.22	1.84%	
Total Xylenes	2364.28	2276.27	2320.28	88.01	3.79%	
				Average	**2.71%**	**2.71%**

Round 28a **Q2 2006** **283MW02** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	73.35	65.07	69.21	8.28	11.96%	
Ethylbenzene	101.51	84.44	92.98	17.07	18.36%	
Toluene	30.28	27.31	28.80	2.97	10.31%	
Total Xylenes	284.32	234.93	259.63	49.39	19.02%	
				Average	**14.92%**	**14.92%**

Round 28b **Q2 2006** **283MW02** **Sample Multiplier: 5**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	102.2	94.02	98.11	8.18	8.34%	
Ethylbenzene	387.11	351.05	369.08	36.06	9.77%	
Toluene	36.17	30.96	33.57	5.21	15.52%	
Total Xylenes	700.25	610.92	655.59	89.33	13.63%	
				Average	**11.81%**	**11.81%**

Round 28c **Q2 2006** **283MW02** **Sample Multiplier: 10**

	Field Duplicate	Sample	Average	Difference	RPD
Benzene	159.69	129.31	144.50	30.38	21.02%
Ethylbenzene	624.98	558.02	591.50	66.96	11.32%
Toluene	57.73	42.73	50.23	15	29.86%
Total Xylenes	1083.46	848.13	965.80	235.33	24.37%

Table 5-14
Relative Percent Difference Calculations - Ground Water
Site 283 (2nd Quarter 2004 through 4th Quarter 2008)
Fort Monmouth, NJ

Average	**21.64%**	**21.64%**	

Table 5-14
Relative Percent Difference Calculations - Ground Water
Site 283 (2nd Quarter 2004 through 4th Quarter 2008)
Fort Monmouth, NJ

Round 28d **Q2 2006** **283MW02** **Sample Multiplier: 20**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	117.51	111.77	114.64	5.74	5.01%	
Ethylbenzene	635.97	635.14	635.56	0.83	0.13%	
Toluene	42.51	36.95	39.73	5.56	13.99%	
Total Xylenes	783.50	734.07	758.79	49.43	6.51%	
				Average	**6.41%**	**6.41%**

Round 29a **Q3 2006** **283MW02** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	17.59	27.04	22.32	9.45	42.35%	
Ethylbenzene	244.96	216.02	230.49	28.94	12.56%	
Toluene	21.96	26.66	24.31	4.7	19.33%	
Total Xylenes	777.23	684.67	730.95	92.56	12.66%	
				Average	**21.73%**	**21.73%**

Round 29b **Q3 2006** **283MW02** **Sample Multiplier: 20**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	30.22	21.16	25.69	9.06	35.27%	
Ethylbenzene	454.16	353.81	403.99	100.35	24.84%	
Toluene	41.54	36.88	39.21	4.66	11.88%	
Total Xylenes	919.67	695	807.34	224.67	27.83%	
				Average	**24.95%**	**24.95%**

Round 30a **Q4 2006** **283MW02** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
Acetone	68.5	68.1	68.30	0.4	0.59%	
Benzene	5.39	5.34	5.37	0.05	0.93%	
Chloroform	2.85	0.22	1.54	2.63	171.34%	
Ethylbenzene	96.71	93.88	95.30	2.83	2.97%	
Toluene	10.56	10.56	10.56	0	0.00%	
Total Xylenes	296.67	284.93	290.80	11.74	4.04%	
Styrene	1.64	1.64	1.64	0	0.00%	
				Average	**25.69%**	**25.69%**

Round 30b **Q4 2006** **283MW02** **Sample Multiplier: 10**

	Field Duplicate	Sample	Average	Difference	RPD	
Acetone	59.26	52.94	56.10	6.32	11.27%	
Benzene	5.33	4.88	5.11	0.45	8.81%	
Chloroform	0.22	2.21	1.22	1.99	163.79%	
Ethylbenzene	210.94	186.28	198.61	24.66	12.42%	
Toluene	10.12	9.3	9.71	0.82	8.44%	
Total Xylenes	401.68	351.65	376.67	50.03	13.28%	
Styrene	12.94	2.1	7.52	10.84	144.15%	
				Average	**144.15%**	**144.15%**

Table 5-14
Relative Percent Difference Calculations - Ground Water
Site 283 (2nd Quarter 2004 through 4th Quarter 2008)
Fort Monmouth, NJ

Round 31a **Q1 2007** **283MW02** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	15.55	15.03	15.29	0.52	3.40%	
Ethylbenzene	179.61	183	181.31	3.39	1.87%	
Toluene	33	30.96	31.98	2.04	6.38%	
Total Xylenes	467.28	491.17	479.23	23.89	4.99%	
				Average	**4.16%**	**4.16%**

Round 31b **Q1 2007** **283MW02** **Sample Multiplier: 10**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	11.82	11.03	11.43	0.79	6.91%	
Ethylbenzene	188.97	132.7	160.84	56.27	34.99%	
Toluene	21.84	17.94	19.89	3.9	19.61%	
Total Xylenes	457.94	313.02	385.48	144.92	37.59%	
				Average	**24.78%**	**24.78%**

Round 32a **Q2 2007** **283MW02** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	14.85	14.5	14.68	0.35	2.39%	
Ethylbenzene	210.67	187.38	199.03	23.29	11.70%	
Toluene	22.38	22.28	22.33	0.1	0.45%	
Total Xylenes	473.49	446.99	460.24	26.5	5.76%	
				Average	**5.07%**	**5.07%**

Round 32b **Q2 2007** **283MW02** **Sample Multiplier: 20**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	14.87	21.5	18.19	6.63	36.46%	
Ethylbenzene	223.42	333.76	278.59	110.34	39.61%	
Toluene	17.77	34.4	26.09	16.63	63.75%	
Total Xylenes	466.90	695.9	581.40	229	39.39%	
				Average	**44.80%**	**44.80%**

Round 33a **Q3 2007** **283MW02** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	6.53	8.46	7.50	1.93	25.75%	
Ethylbenzene	41.77	61.43	51.60	19.66	38.10%	
Toluene	6.06	7.64	6.85	1.58	23.07%	
Total Xylenes	255.43	277.62	266.53	22.19	8.33%	
				Average	**23.81%**	**23.81%**

Round 33b **Q3 2007** **283MW02** **Sample Multiplier: 5**

	Field Duplicate	Sample	Average	Difference	RPD	
Benzene	13.25	9.62	11.44	3.63	31.74%	
Ethylbenzene	85.43	129	107.22	43.57	40.64%	
Toluene	11.93	8.22	10.08	3.71	36.82%	
Total Xylenes	303.82	237.22	270.52	66.6	24.62%	
				Average	**33.46%**	**33.46%**

Table 5-14
Relative Percent Difference Calculations - Ground Water
Site 283 (2nd Quarter 2004 through 4th Quarter 2008)
Fort Monmouth, NJ

Round 34a **Q4 2007** **283MW02** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
Acetone	3.87	3.45	3.66	0.42	11.48%	
Benzene	72.36	73.22	72.79	0.86	1.18%	
Carbon Disulfide	0.32	0.28	0.30	0.04	13.33%	
Ethylbenzene	203.18	197.03	200.11	6.15	3.07%	
Toluene	26.86	26.42	26.64	0.44	1.65%	
Total Xylenes	360.66	349.57	355.12	11.09	3.12%	
Styrene	0.32	0.31	0.32	0.01	3.17%	
				Average	**5.29%**	**5.29%**

Round 34b **Q4 2007** **283MW02** **Sample Multiplier: 10**

	Field Duplicate	Sample	Average	Difference	RPD	
Acetone	21.56	23.33	22.45	1.77	7.89%	
Benzene	68.9	53.29	61.10	15.61	25.55%	
Ethylbenzene	322.53	252.58	287.56	69.95	24.33%	
Toluene	24.75	18.81	21.78	5.94	27.27%	
Total Xylenes	383.06	307.19	345.13	75.87	21.98%	
				Average	**21.40%**	**21.40%**

Round 35 **Q1 2008** **283MW01** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
All Non-Detect	0	0	0	0	0.00%	
				Average	**0.00%**	**0.00%**

Round 36 **Q1 2008** **283MW01** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
All Non-Detect	0	0	0	0	0.00%	
				Average	**0.00%**	**0.00%**

Round 37 **Q1 2008** **283MW01** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
All Non-Detect	0	0	0	0	0.00%	
				Average	**0.00%**	**0.00%**

Round 38 **Q1 2008** **283MW01** **Sample Multiplier: 1**

	Field Duplicate	Sample	Average	Difference	RPD	
All Non-Detect	0	0	0	0	0.00%	
				Average	**0.00%**	**0.00%**

Minimum All Relative Percent Differences	**0.00%**
Average All Relative Percent Differences	**18.81%**
Maximum All Relative Percent Differences	**144.15%**

RPD=Relative Percent Differences

* Method Detection Limit used for non-detect result.

Table 5-15
Relative Percent Difference Calculations - Surface Water
Site 283 (2nd Quarter 2004 through 4th Quarter 2008)
Fort Monmouth, NJ

2Q 2004 SS-22 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	Average All RPDs
Acetone	4.34	5.82	5.08	1.48	29.13%	
MTBE	4.68	4.87	4.775	0.19	3.98%	
				Average	**16.56%**	**16.56%**

3Q 2004 SS-22 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
Acetone	1.35	2.49	1.92	1.14	59.38%	
MTBE	2.34	2.37	2.355	0.03	1.27%	
				Average	**30.32%**	**30.32%**

4Q 2004 SS-21 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
Chloroform	0.51	0.59	0.55	0.08	14.55%	
MTBE	0.67	0.3	0.485	0.37	76.29%	
				Average	**45.42%**	**45.42%**

1Q 2005

Duplicate sample did not identified its surface water sample location

2Q 2005

Duplicate sample did not identified its surface water sample location

3Q 2005

Duplicate sample did not identified its surface water sample location

4Q 2005

Duplicate sample did not identified its surface water sample location

1Q 2006 SS-14 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
Acetone	1.2	0.36	0.78	0.84	107.69%	
MTBE	0.43	0.46	0.445	0.03	6.74%	
				Average	**57.22%**	**57.22%**

2Q 2006 SS-14 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
All non-detect	0	0	0	0	0.00%	
				Average	**0.00%**	**0.00%**

Table 5-15
Relative Percent Difference Calculations - Surface Water
Site 283 (2nd Quarter 2004 through 4th Quarter 2008)
Fort Monmouth, NJ

3Q 2006 SS-14 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
All non-detect	0	0	0	0	0.00%	
				Average	**0.00%**	**0.00%**

4Q 2006 SS-14 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
MTBE	0.21	0.29	0.25	0.08	32.00%	
				Average	**32.00%**	**32.00%**

1Q 2007 SS-14 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
cis-1,2-DCE	0.2	0.12	0.16	0.08	50.00%	
				Average	**50.00%**	**50.00%**

2Q 2007 SS-27 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
Acetone	6.54	6.71	6.625	0.17	2.57%	
				Average	**2.57%**	**2.57%**

3Q 2007 SS-14 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
TBA	6.8	9.39	8.095	2.59	32.00%	
				Average	**32.00%**	**32.00%**

4Q 2007 SS-14 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
All non-detect	0	0	0	0	0.00%	
				Average	**0.00%**	**0.00%**

1Q 2008 SS-14 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
All non-detect	0	0	0	0	0.00%	
				Average	**0.00%**	**0.00%**

1Q 2008 SS-27 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
All non-detect	0	0	0	0	0.00%	
				Average	**0.00%**	**0.00%**

Table 5-15
Relative Percent Difference Calculations - Surface Water
Site 283 (2nd Quarter 2004 through 4th Quarter 2008)
Fort Monmouth, NJ

2Q 2008 SS-14 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
All non-detect	0	0	0	0	0.00%	
				Average	**0.00%**	**0.00%**

3Q 2008 SS-14 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
All non-detect	0	0	0	0	0.00%	
				Average	**0.00%**	**0.00%**

4Q 2008 SS-14 Sample Multiplier: 1

	Field Duplicate	Sample	Average	Difference	RPD	
All non-detect	0	0	0	0	0.00%	
				Average	**0.00%**	**0.00%**

Minimum All Relative Percent Differences	**0.00%**
Average All Relative Percent Differences	**16.63%**
Maximum All Relative Percent Differences	**57.22%**

* Method Detection Limit used for non-detect result.

Appendices A through E and G through J omitted for brevity

Appendix A

UST Report Certification Forms

Appendix F

Response to October 24, 2007 NJDEP Comments

Army Response to October 24, 2007 NJDEP Correspondence Letter for Site 283

RE: October 28, 2005 Remedial Investigation Report (RIR) & Remedial Action Workplan (RAW) Prepared by Versar, Incorporated

A copy of the NJDEP's October 24, 2007 correspondence letter is provided in Appendix A.

1. General. The NJDEP finds the proposed remedial action of ORC injection at the Site 283 source area to be acceptable. However, the approval is given under the condition that additional remedial investigations shall also be conducted as outlined in the comments below. These investigations can be conducted concurrently with the proposed remedial action.

2. Section 2.4.2 (Hydrogeology): The report identifies tidal influence as one of the factors that could be influencing shallow ground water flow. Fort Monmouth shall comment on whether a tidal study was ever performed pursuant to **N.J.A.C. 7:26E-3.7(e)3iv(3)**. If a tidal study has not been conducted, Fort Monmouth shall conduct a tidal study.

   Army Response: In September 2009, Brinkerhoff Environmental Services, Inc. (BES) completed a ground water tidal study and Model of the Main Post and Charles Wood Areas of Fort Monmouth. Results of this study indicate that the groundwater in area of Site 283 is not tidally influenced. The report titled: MODFLOW GROUNDWATER MODELING, Dated June 10, 2010 was provided to the NJDEP on 25 June 2010.

3. Section 3.2 (Ground Water Sample Collection Activities): The report states that sampling and decontamination procedures were conducted in accordance with the December 1997 Fort Monmouth Standard Sampling Operating Procedure. All future sampling procedures and equipment decontamination must be conducted pursuant to the most recent version of the NJDEP Field Sampling Procedures Manual per the requirements of **N.J.A.C. 7:26E-4.4(d)**.

   Army Response: All sampling activities were conducted in accordance with the NJDEP Field Sampling Procedures Manual in effect at the time of sampling. Specific Standard Operating Procedures (SOPs) are provided in the Remedial Action Progress Reports for the applicable reporting periods. Future sampling activities will continue to be conducted in accordance with the latest NJDEP Field Sampling Procedures Manual as outlined in the Army's Revised Sampling Operating Procedures.

4. Section 3.2 (Ground Water Sample Collection Activities): The report is deficient pursuant to **N.J.A.C. 7:26E-4.8(c)7**. Information regarding the purging and sampling of the monitoring wells was not provided in the report. At a minimum, the purging and sampling information for the last 4 quarters of sampling must be submitted to NJDEP. The information should be submitted for all 21 sampling events if available on compact disc.

   Army Response:
   Sampling data is provided within the RAPRs both in the form of SOPs and Field Data forms. The SOPs are included in a separate appendix and the Field Data is included within the Laboratory analytical reports which are in a separate appendix. This data may be on the CD which accompanies the Report.

5. Section 5.1 (Ground Water Sampling Results): The ground water investigation was deficient pursuant to **N.J.A.C. 7:26E-2.1(c)**. Fort Monmouth failed to analyze ground water samples obtained from the monitoring wells for MTBE and TBA. The tank removed from Site 283 contained gasoline. Therefore, MTBE and TBA analysis is required for future sampling rounds of all Site 283 wells.

   Army Response: Groundwater sampling has been collected on a quarterly basis beginning on September 20, 1999. All groundwater samples were analyzed for VO+15 including MTBE and TBA. To date, MTBE and TBA have never been detected in any of the collected groundwater samples. Please refer to the specific laboratory analytical results for these analytes.

6. Section 5.1.1 (VOCs): the report states that the NJDEP has no criteria for VOC TICs in ground water. The Ground Water Quality Criteria for VOC TICs are as follows: 100 ppb for individual TICs, and 500 ppb for total TICs.

   Army Response: The Ground Water Quality Criteria for TICs are included in the RAPR.

7. Vapor Intrusion. Pursuant to **N.J.A.C. 7:26E-4.4(h)3viii**, Fort Monmouth is deficient in not evaluating Building 283 and adjacent subsurface utilities for vapor hazards associated with contaminated ground water. A vapor intrusion investigation is warranted based on the concentrations of benzene found in well 283-MW2. Fort Monmouth shall refer to the Department's October 2005 Vapor Intrusion Guidance Document for conducting a vapor intrusion investigation. The document is available online at www.state.nj.us/dep/srp/guidance/vaporintrusion/.

Army Response:
Will provide in final report

8. Sanitary Sewer. Pursuant to **N.J.A.C. 7:26E-4.4(e)**, Fort Monmouth was deficient in not properly locating all ground water sampling points. A 20-inch diameter sanitary sewer is located near the former UST location and well 283-MW2. The cross section on Figure 4-2 shows the sewer located below the water table. It is likely that the soils surrounding the sewer pipes are more permeable than the silty clays, fine sands and clayey silts identified in the boring logs for well 283-MW2. Ground water could be flowing preferentially along the sewer lines. Therefore, Fort Monmouth must install and sample well points along the sanitary sewer to the east and west of monitoring well 283-MW2. The approximate locations of the well points recommended by NJDEP are shown on the attached figure. Fort Monmouth shall submit a remedial investigation workplan pursuant to the applicable requirements of **N.J.A.C. 7:26E-4.2**. If the results of the investigation show contaminant migration along the sewer, complete delineation via additional well points and/or monitoring wells will be required.

   Army Response: The Army is currently evaluating the sanitary sewer line as a possible conduit for preferential migration of contaminants. The results of this evaluation will be included in the CEA.

9. Parkers Creek: Because of the proximity of ground water contamination to Parkers Creek, a surface water and sediment investigation and a Baseline Ecological Evaluation must be conducted in accordance with the applicable requirements of **N.J.A.C. 7:26E-4.5** and **4.7**. NJDEP understands that Fort Monmouth is considering and overall investigation/evaluation of Parkers Creek (and possibly Mill Creek and Lafetra Creek) that will address all potentially-contributing AOCs including Site 283 and the M-18 Landfill. NJDEP concurs with that approach.

   Army Response: On June 14, 2010, Shaw Group of Trenton, NJ began sampling of surface water and sediment at all surface water bodies proximate to the Main Post and Charles Wood. The results of this sampling effort will be incorporated in a Baseline Ecological Evaluation Report as a standalone document, to be provided to the NJDEP in addition to the next scheduled RAPR.

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Remediation Management & Response
P.O. Box 413
Trenton, New Jersey 08625-0413

JON S. CORZINE
Governor

LISA P. JACKSON
Commissioner

October 24, 2007

Mr. Joseph Fallon, CHMM
Directorate of Public Works
ATTN: IMNE-MON-PWE
167 Riverside Ave.
Fort Monmouth, NJ 07703

RE: Remedial Investigation Report and Remedial Action Workplan
Site 283
Fort Monmouth, NJ

Dear Mr. Fallon:

The NJDEP Division of Remediation Management & Response (DRMR) has completed its review of the report titled "Remedial Investigation Report and Remedial Action Workplan, Site 283", dated October 28, 2005, by Versar Inc. Our comments are attached.

NJDEP approves the proposed injections of oxygen release compound (ORC) to accelerate the degradation of volatile organic contamination in ground water at Site 283, based upon our review of the RIR and RAW. However, we have several requirements regarding additional investigation of the site, as outlined in the attached comments.

This approval letter shall constitute a permit-by-rule for discharges to ground water in accordance with N.J.A.C. 7:14A-7. This permit-by-rule will be in effect for 180 days, commencing at the start of the proposed injections of ORC at Site 283.

You or your staff may contact me at 609-633-0766 with any questions on the enclosed comments, or any other site remediation matters at Fort Monmouth.

Sincerely,

Larry Quinn

Larry Quinn, P.E., CHMM, Case Manager
Bureau of Design and Construction

Attachment

NJDEP COMMENTS ON
RI REPORT and RA WORKPLAN for SITE 283
FORT MONMOUTH, NJ

1. General. The NJDEP finds the proposed remedial action of ORC injection at the Site 283 source area to be acceptable. However, the approval is given under the condition that additional remedial investigations shall also be conducted as outlined in the comments below. These investigations can be conducted concurrently with the proposed remedial action.

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NJDEP COMMENTS ON
RI REPORT and RA WORKPLAN for SITE 283
FORT MONMOUTH, NJ (continued)

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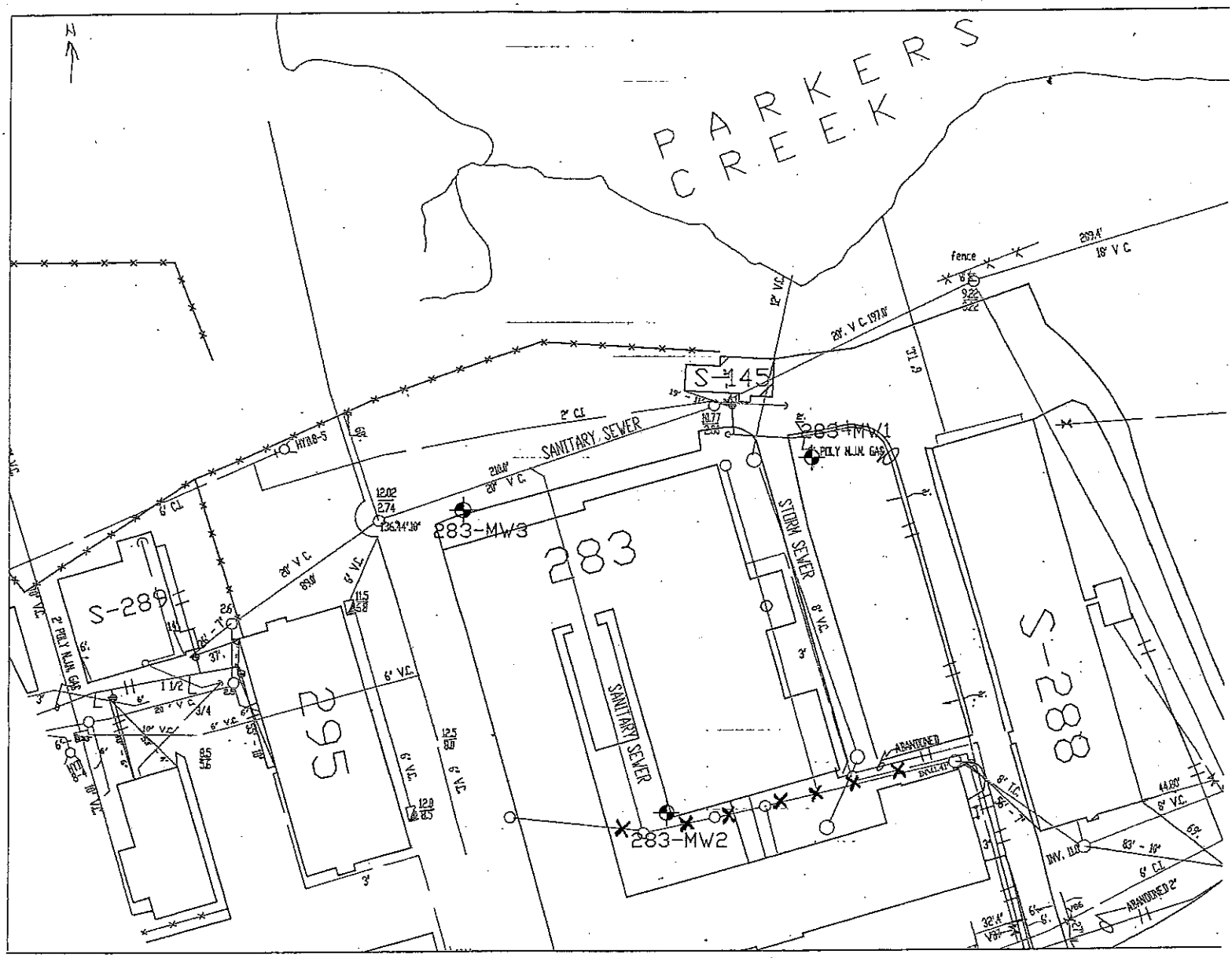

X Location of well points recommended by BGWPA for sanitary sewer investigation

Environment

Submitted to

U.S. Army Corps of Engineers
Baltimore District
10 South Howard Street
Baltimore, Maryland

Submitted by

AECOM
Alexandria, Virginia
and
Bureau Veritas North America, Inc.
Edison, New Jersey

Project No. 60247178

January 2013

Vapor Intrusion Site Investigation Report Main Post and Charles Wood Area OACSIM – U.S. Army Fort Monmouth Oceanport, New Jersey

Final

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List of Acronyms and Abbreviations

AA	ambient air
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BRAC	Base Realignment and Closure Act of 1990
BTEX	benzene, toluene, ethylbenzene, and xylenes
CECOM	Communications and Electronics Command
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWA	Charles Wood Area
DCA	dichloroethane
DCE	dichloroethene
EPA	Environmental Protection Agency
eV	electron volt
GWSLs	Groundwater Screening Levels
HVAC	heating, ventilation, and air conditioning
IA	indoor air
IASLs	Indoor Air Screening Levels
LEL	lower explosive limit
µg/L	micrograms per liter
$\mu g/m^3$	micrograms per cubic meter
mL/min	milli liters per minute
MP	Main Post
NELAP	National Environmental Laboratory Accreditation Program
NJAC	New Jersey Administrative Code
NJDEP	New Jersey Department of Environmental Protection
OQA	Office of Quality Assurance
PCA	tetrachloroethane
PCE	tetrachloroethene
PID	photoionization detector
QA/QC	quality assurance/quality control
QC	quality control
SGSLs	Soil-gas Screening Levels
SS	sub-slab
TCA	trichloroethane
TCE	trichloroethene
US	United States
USACE	United States Army Corps of Engineers
VI	vapor intrusion
VOCs	volatile organic compounds

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1 Introduction

This *Vapor Intrusion Site Investigation Report* documents the findings of a vapor intrusion (VI) site investigation conducted between February and April 2012 at Fort Monmouth, New Jersey by the Fort Monmouth Team, which consists of Bureau Veritas North America (Bureau Veritas), AECOM, and Fort Monmouth and U.S. Army Corps of Engineers representatives. The VI site investigation was completed in accordance with the New Jersey Department of Environmental Protection (NJDEP) document *Vapor Intrusion Technical Guidance*, dated January 2012 (*VI Guidance*); the *Vapor Intrusion Workplan* (Bureau Veritas-AECOM, 2012); the New Jersey Administrative Code (N.J.A.C.) 7:26E, Section 4.2; and all applicable existing Federal regulations (i.e., the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA]). The sampling methodology, and any deviations from the *VI Workplan* or the *VI Guidance*, was approved in a meeting with the NJDEP on 22 February 2012. This report summarizes the work conducted as part of this task order and the findings of this study.

1.1 Objectives and Scope of this Site Investigation

The overall objective for this investigation is to evaluate and provide recommendations related to the VI pathway at six buildings at Fort Monmouth, including five buildings at the Main Post (MP) and one building at the Charles Wood Area (CWA). In order to achieve this objective, the project includes the following activities:

1. Conduct a site visit for the purpose of identifying potential background sources of volatile organic compounds (VOCs) at sampling locations, complete Building Evaluation Forms, determine points of potential VI into targeted buildings, identify sampling locations, and document ventilation systems (if operational);
2. Collect co-located indoor air and sub-slab soil-gas samples in targeted buildings;
3. Collect background ambient air samples adjacent to targeted buildings;
4. Compare results with published NJDEP indoor air and soil-gas screening levels;
5. Determine whether or not subsurface utility lines are preferential pathways for VOC migration into targeted buildings; and
6. Evaluate the VI pathway and provide recommendations.

1.2 Fort Monmouth Background

Fort Monmouth was established in June 1917 and was originally named Camp Little Silver. The primary mission of Fort Monmouth was to provide command, administrative and logistical support for Headquarters, U.S. Army Communications and Electronics Command (CECOM). The support provided by the installation was used by tenant activities in the performance of research, development, procurement and production of prototype communications and electronics equipment for use by the United States Armed Forces. The post was closed 15 September 2011 in accordance with the recommendations of the Department of Defense Base Realignment and Closure Act of 1990 (BRAC), Public Law 101-510, as amended. The six buildings targeted in this VI site investigation have been vacant since the closure of the post.

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2 Physical Setting and General Site-Wide Conceptual Model

The following section describes the physical setting of Fort Monmouth, including physiography, geology, hydrogeology, surface water, ecology, and climatology.

2.1 Physiography and Topography

Fort Monmouth is located in the central-eastern portion of New Jersey in Monmouth County, approximately 45 miles south of New York City, New York, 70 miles northeast of Philadelphia, Pennsylvania, and 40 miles east of Trenton, New Jersey. The Atlantic Ocean is approximately 3 miles to the east. Fort Monmouth falls within the Boroughs of Eatontown, Oceanport, and Tinton Falls. The areas surrounding the post are characterized by a mixture of residential, commercial, and light industrial uses.

Fort Monmouth occupies approximately 1,126 acres and is currently comprised of two operational areas, the MP and the CWA. The MP is generally bounded by State Highway 35 to the west, Parkers Creek to the north, the New Jersey Transit Railroad to the east, and Main Street and State Highway 71 to the south. The CWA is bounded by the Garden State Parkway to the west, Tinton Avenue to the north, Maxwell Place and the New Jersey Transit Railroad to the east, and Pine Brook to the south. Figure 1 shows the location of both areas, and Figures 2 and 3 provide detailed maps of the MP and CWA, respectively.

Both the MP and CWA are located within New Jersey's Coastal Plains Physiographic Province, which is described as gently dipping to the southeast. The Coastal Plains Physiographic Province is characterized by sedimentary beds dissected by meandering rivers that drain to the Raritan or Delaware River. The topography of the installation is relatively flat, and has an elevation of 20 to 25 feet above mean sea level.

2.2 Soils

Surface soils in the vicinity of the MP and CWA are sandy loams ranging in depth from 9 to 12 inches. The surface soils are underlain by sandy loam, sandy clay loam, or loam that may grade to loamy sand at a depth of approximately 5 feet below ground surface (bgs). Some areas at the MP and CWA are covered by impermeable surfaces such as roads, parking lots, buildings, etc. Additional detail with respect to soils at the MP and CWA can be found in the *VI Workplan* (Bureau Veritas-AECOM, 2012). (Source: United States Department of Agriculture, Soil Conservation Service, *Soil Survey of Monmouth County New Jersey*, 1989).

2.3 Geology

Numerous geologic studies have been conducted in northern New Jersey in the vicinity of the Fort Monmouth area. The following section describes the regional and site-specific geology obtained from the *Geologic Map of New Jersey* (NJDEP, Division of Science, Research and Technology, Geological Survey, 1999); *Bedrock Geology of the Long Branch Quadrangle, Monmouth County, New Jersey* (Stanford and Sugarman in conjunction with USGS, 2010); and *Surficial Geology of the Long Branch Quadrangle, Monmouth County, New Jersey* (Stanford, 2000).

The State of New Jersey is divided into four Physiographic regions, including the Valley and Ridge, Highlands, Piedmont and Coastal Plain. The Valley & Ridge, Highlands, and Piedmont consist of consolidated Paleozoic and Precambrian rocks (folded and metamorphosed sedimentary rocks, crystalline intrusive and metamorphic rocks) that outcrop in the northern part of the state. The Coastal Plain occurs to the southeast and is characterized by a wedge of generally unconsolidated sedimentary deposits of Cretaceous (Mesozoic) to Miocene Age (Cenezoic) that thickens to the southeast. The fall line separates the older consolidated rocks of the Valley and Ridge, Highlands, and Piedmont from the unconsolidated Coastal Plain deposits, and is located approximately 25 miles northwest of Fort Monmouth.

The Coastal Plain sediments are comprised of layers of silt, sand and clay deposited in deltaic and marine environments as sea level fluctuated in Cretaceous and Tertiary time. The coastal plain deposits are overlain in some areas by a thin veneer of more recent (Late Tertiary and Quaternary) fluvial sand and gravel deposits associated with fluvial systems.

The MP and CWA are situated on Coastal Plain deposits. Both the MP and the CWA are underlain by surficial deposits of the Cape May Formation (Unit 2, Late Pleistocene and Unit 1, Middle Pliestocene, respectively). The Cape May Formation is

described as sand, with little silt and clay, and gravel. The sand is mostly quartz, with minor glauconite and mica; the gravel is quartz and quartzite. The MP also has intermittent deposits of alluvium composed of sand, silt, and clay, with some pebble gravel that occurs mostly in or adjacent to surficial waterways. Bedrock underlies the surficial deposits of the Cape May Formation, and going from younger (near surface) to older (deeper) consist of the Vincentown Formation (Tertiary), the Hornerstown Formation (Tertiary), the Tinton Formation (Cretaceous) and the Red Bank Formation (Cretaceous). The Vincentown Formation does not occur in the area of the MP. These bedrock formations are described as follows:

- The Vincentown Formation is described as glauconitic, silty, medium- to coarse-grained quartz sand with some fine-grained pebbles.
- The Vincentown Formation unconformably overlies the Hornerstown Formation, which is described as glauconitic clay and silty clay.
- The Hornerstown Formation unconformably overlies the Tinton Formation, which is described as glauconitic silty quartz sand with common iron cementation.
- The Red Bank Formation is quartz sand with little silt and glauconite.

2.4 Hydrogeology

2.4.1 Regional Hydrogeology

Regionally, the MP and CWA are located within a composite confining unit. Typically, silt and clay with localized sand lenses define the area. Confining units in the Fort Monmouth area include the Hornerstown and Tinton Formations, as well as the lower part of the Red Bank Formation. Localized water table aquifers are composed of massive quartz sand outcrops of the Vincentown Formation and the upper part of the Red Bank Formation. The aquifers grade into confining units southeastward in the subsurface where the quartz sands become more glauconitic and silty. Water quality in the aquifers is generally good, but iron and manganese levels may be locally elevated. Calcium-bicarbonate-type waters dominate this area.

2.4.2 Site-Specific Hydrogeology

Onsite depth to groundwater ranges from 2.37 to 30.19 feet bgs, with groundwater elevations ranging from -0.45 to 54.52 feet above mean sea level. The groundwater table is relatively shallow at the installation, and it fluctuates with the tidal action in Parkers and Oceanport Creeks at the MP.

2.5 Surface Water

The northeastern and southeastern portions of the MP are bordered by Parkers Creek and Oceanport Creek, respectively, and the southern portion of the MP is bordered by Husky Brook. The Shrewsbury River is located within one mile to the east of the MP. Wampam Brook is located to the south of the CWA, and an unnamed brook transverses the CWA from east to west. No other surface water bodies were identified within one mile of the CWA.

All identified surface water bodies ultimately drain into the Shrewsbury Bay, situated adjacent to the eastern edge of the MP. Shrewsbury Bay is separated from the Atlantic Ocean by a barrier island. However, channels through the barrier island ensure hydraulic connection between Shrewsbury Bay and the Atlantic Ocean. As a result, the water in Shrewsbury Bay is tidally influenced and is brackish to saline. Water in the tributary streams to Shrewsbury Bay is also tidally influenced, and is fresh water to brackish at low tide and brackish to saline at high tide.

Storm water drains from the site to municipal drainage systems via overland flow.

2.6 Ecology

Ecological features of this area include Southern mixed oak forest, Upland pine forest, Beech-oak forest, Red maple-sweet gum forest, Virginia pine successional forest, coastal white cedar swamp, hardwood swamp, emergent marshes, and freshwater tidal marsh.

2.7 Climatology/Meteorology

The climate in the Fort Monmouth area is typically humid subtropical and is impacted by continental and oceanic influences. The proximity of the Atlantic Ocean tends to minimize seasonal temperature fluctuations as compared to interior regions of the state. Based on data obtained from the National Weather Service, the temperature at Fort Monmouth ranges from 20^{o}F to 90^{o}F (average of 57^{o}F), and precipitation averages 42 inches per year. Winter is typically cold with occasional Nor'easters,

resulting in rain along the coast; springs are mild, with the average temperature in the 50s and common thunderstorms; summers are hot and humid, with rare hurricanes; and autumns are similar to spring in terms of temperature and precipitation, although unpredictable weather is common. New Jersey air quality has improved significantly over the last 40 years, but exceeds the current standards for ozone throughout the state and fine particles in urban areas.

2.8 Land Use over 1,000-Foot Radius

The area surrounding the MP and CWA are used for both residential and commercial purposes (see Figure 4). The following public places are located near the MP and CWA:

Main Post (MP)

- Wampam Brook Park – located to the southwest
- Old Wharf Park – located to the south at 321 E. Main St., Oceanport, NJ 07757
- St. Dorothea's Roman Catholic Church, 240 Broad Street, Eatontown, NJ 07724-1601
- Eatontown Historical Museum, 75 Broad Street, Eatontown, NJ 07724

Charles Wood Area (CWA)

- Borough of Tinton Falls, 556 Tinton Avenue, Tinton Falls, NJ 07724

2.9 General Site-Wide Conceptual Model for Vapor Intrusion

Vapor intrusion is typically conceptualized as shown Figure 5. Vapor intrusion occurs when vapors migrate from sources into buildings. These vapors may be generated at a variety of sources, including, but not limited to, leaking underground storage tanks, groundwater impacted by VOCs, gasoline that may have been released into the ground, and chemicals containing VOCs that may have been released into the ground. VOCs in the source area volatilize, creating volatile organic vapors in the ground. These vapors generally move away from the source area from advection (pressure gradients) and diffusion (concentration gradients). Vapor movement can be blocked by, among other conditions and structures, water trapped in the soil, less permeable soil (e.g., clay), and low permeability or impermeable manmade structures (e.g., building foundations). Therefore, the direction of vapor movement is difficult to predict.

The vapor eventually vents to the atmosphere or accumulates under a structure (such as a building). If vented to the atmosphere, the vapor is rapidly diluted and is not generally of concern. Vapors that accumulate under building foundations, however, could eventually migrate into the building. Vapor migration is most likely to occur along preferential pathways through a building foundation. Such pathways may include cracks in the concrete floor of a slab-on-grade building, areas where utility lines penetrate the foundation, or unpaved basements and crawl spaces. Once the vapor migrates into the building, it may affect indoor air quality. If the building is frequently occupied, there are human receptors for the VOC vapors and the vapor intrusion pathway is considered complete.

The term vapor intrusion, as it is used in this report, does not include migration of vapors from ambient air into buildings. Automobile exhaust, factory emissions from smokestacks, natural processes, and many other sources all impact local and regional air quality. Chemicals, including VOCs that are in ambient air, may affect indoor air quality, but this is not considered to be vapor intrusion. Likewise, VOCs in indoor air may be attributable to new carpeting, paints and stains/weatherproofing compounds, and many other sources. Although these VOCs may also affect indoor air quality, this also is not considered to be vapor intrusion.

Based upon the above discussion, the vapor intrusion pathway is considered complete when a source releases VOC vapors, the vapors accumulate under a building, and the vapors migrate into a building. Environmental studies, such as documented in this report, generate data to determine whether VOC vapors are present beneath buildings and in indoor air. If no source area exists, no vapors are present at elevated concentrations in soil-gas below buildings, or the vapors do not migrate into buildings, the vapor intrusion pathway is considered incomplete and there is no adverse impact to human receptors who may occupy the buildings.

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3 Vapor Intrusion Site Investigation Activities

The VI site investigation consisted of the following elements:

- Selection of buildings to be included in the VI site investigation;
- The 22 February 2012 kickoff meeting at the NJDEP;
- The 27 February 2012 site inspection, including inspection of targeted buildings;
- Collection and analysis of indoor air, ambient air, and sub-slab soil-gas samples; and
- Data analysis and reporting.

The VI site investigation was completed in accordance with the NJDEP *VI Guidance* (2012) and the *VI Workplan* (Bureau Veritas-AECOM, 2012); any deviations from the *VI Guidance* or the *VI Workplan* were approved in a meeting with the NJDEP on 22 February 2012 and are listed in Section 3.5 below. Sections 3.1 through 3.6 summarize the methods used to complete the investigation.

3.1 Selection of Targeted Buildings

Analytical data from prior groundwater sampling events and previous VI investigations (U.S. Army BRAC, 2008 and 2011) guided the selection of buildings for this VI site investigation. To determine the target buildings, the most recent available eight quarters of groundwater analytical data (the second quarter 2009 through the first quarter 2011) were compared to the NJDEP VI Groundwater Screening Levels (GWSLs) referenced in the NJDEP *VI Guidance* (the screening levels can be found here: http://www.nj.gov/dep/srp/guidance/vaporintrusion/). The NJDEP *VI Guidance* recommends a VI investigation for buildings within 100 feet horizontally or vertically of shallow groundwater contamination in excess of the GWSL, with an exception for compounds associated with gasoline (e.g., benzene, toluene, ethylbenzene, and xylenes [BTEX]). For locations where BTEX contamination is in excess of the GWSL, a 30-foot horizontal or vertical critical distance is used.

Based on concentrations of chlorinated VOCs and BTEX compounds in groundwater at Fort Monmouth, the following six buildings were targeted for the VI site investigation: Buildings 283, 602, 699, 700, 1001, and 2700. Building 283 is located within 30 feet of a groundwater monitoring well that previously contained benzene at a concentration above its GWSL. Buildings 602, 699, 700, 1001 and 2700 are located within 100 feet of a well that contained one or more chlorinated VOC at a concentration(s) above its respective GWSL. The chlorinated VOCs detected at concentrations above their respective GWSLs were tetrachloroethene (PCE), trichloroethene (TCE), chloroethane, and vinyl chloride. Appendix A contains maps showing historical groundwater analytical data for each building.

This selection of buildings was completed prior to the 22 February 2012 kickoff meeting, and recommendations for the target buildings were presented and discussed at the meeting (see Section 3.2 below).

3.2 Kickoff Meeting

The Fort Monmouth VI site investigation kickoff meeting was held at the NJDEP on 22 February 2012, with the following attendees: Linda Range and Anne Charles, NJDEP; James T. Moore, USACE; Wanda Green, Ft Monmouth; Dave Parse and Elizabeth Larsen, AECOM; Geoff Clark, Chris Ostermann and Sanford Garret, Bureau Veritas; and Joe Pearson, Calibre-Ft Monmouth. The following items were discussed at the meeting: project background, review of previous discussions with the NJDEP concerning the site investigation at Ft Monmouth, the purpose of the VI site investigation, target buildings, proposed sample types, methods and locations, proposed analytical parameters, and follow-up actions.

During the meeting, it was noted that concerns have been raised regarding VOC concentrations in groundwater in the vicinity of Buildings 812, 1122, and 2706 as well as in areas where no buildings currently exist at Fort Monmouth. However, as discussed at the meeting, a VI investigation is not warranted at Buildings 812, 1122 and 2706 as they are located outside of the critical distance (i.e., 100’ or 30’, depending on contaminant) recommended by the *VI Guidance*. At locations where no buildings currently exist, with the concern being that vapors could accumulate under buildings constructed during redevelopment, engineering controls should be designed as part of any redevelopment effort to match up the future land use with the potential threat to current and planned buildings.

Additionally, questions were raised concerning building 675, which lies hydraulically downgradient from monitoring well M5MW16 (the trigger well for building 602). Building 675 was not selected for the VI site investigation, as it is located outside the 100-foot radius of well M5MW16, although it is located downgradient of that well. Another monitoring well (M5MW19), which had PCE and TCE detections exceeding their respective GWSL, is located on the opposite side of Building 675 as compared to well M5MW16. It was agreed at the meeting that the building would be assessed and the interior air monitored during the site inspection, and that recommendations would be made at that time with respect to sampling.

The TO-15 analyte list was also discussed at the kickoff meeting, and a decision was made to use the following shortened VOC list: PCE, 1,1,2,2-tetrachloroethane (PCA), 1,1,1-trichloroethane (1,1,1-TCA), 1,1,2-TCA, TCE, 1,2-dichloroethane (1,2-DCA), cis-1,2-dichloroethene (cis-1,2,-DCE), trans-1,2-DCE, chloroethane, chloromethane, methylene chloride and vinyl chloride. These chlorinated VOCs are a subset of all TO-15 compounds. With the exception of Building 283 samples, which would only be analyzed for benzene as that was the only detected chemical of concern for that building, the samples collected at all targeted buildings would be analyzed for the shortened list. This is presented further in Section 3.5 (Deviations from the Guidance, Regulations, and Workplan) below.

3.3 Site Inspection

The site inspection was conducted on 27 February 2012 by Elizabeth Larsen (AECOM), Geoff Clark (Bureau Veritas) and Rob Youhas (Fort Monmouth). As part of the site inspection, each of the targeted buildings and three additional buildings were inspected to:

- Gather information on building use; condition; construction; and heating, ventilation, and air conditioning (HVAC) system operation;
- Fill out the NJDEP “Indoor Air Building Survey and Sampling Form”; and
- Monitor indoor air quality.

The team inspected the interior and immediate surroundings of the six targeted buildings (283, 602, 699, 700, 1001, and 2700). Additionally, Building 675 and two adjacent buildings, Buildings 676 and 677, were inspected to determine potential for addition to the VI site investigation. The purpose of the building inspections was to gather critical information and determine sampling locations within each building. During the building inspections, potential sources of VOC vapors were noted and the indoor air quality was monitored with a photoionization detector (PID). The results of the building inspections are summarized in Section 4.1 below and on the forms included in Appendix B.

3.4 Sampling Activities

At each selected building, ambient air, indoor air, and sub-slab soil-gas samples were collected to assess whether the VI pathway was complete. The sampling was completed over two events between 5 and 30 March 2012. Samples were collected in 6-liter Summa canisters provided by the contracted analytical laboratory, TestAmerica, Burlington, Vermont. TestAmerica Burlington is National Environmental Laboratory Accreditation Program (NELAP) accredited and certified by the NJDEP for the Low-level TO-15 Method.

Indoor air and sub-slab soil-gas samples were collected from the portion of each building closest to the well where VOCs were detected at a concentration above their respective GWSL (i.e., the trigger well). Except for Buildings 283, 1001, and 2700, all indoor air and sub-slab soil-gas samples were collected within the 100-foot radius of the trigger well. The exceptions were for the following reasons:

- Building 283. Because benzene was the chemical of concern, a 30-foot critical distance was used.
- Building 1001. Only the extreme southwestern corner of Building 1001 was within the 100-foot radius of the trigger well; as a result, it was not possible to collect the samples inside the building and within the 100-foot radius (see Figure 9).
- Building 2700. Including duplicate samples, a total of seven sub-slab and indoor air samples were collected at Building 2700 (see Figure 10); none of the indoor air and only one of the sub-slab samples (SS-15) was collected from a location beyond the 100-foot radius of the trigger well.

The specific sample collection methods used for the VI site investigation are provided below. The results from the investigation are summarized in Section 4.2 and in Table 2, field forms are provided in Appendix B, and analytical data are provided in Appendix C.

3.4.1 Indoor and Ambient Air Sampling Methods

A total of seven ambient air samples (including two duplicate ambient air samples) were collected and analyzed during this VI site investigation, and a total of 11 indoor air samples (including two duplicate indoor air samples) were collected. Note: the original indoor air sample (IA-7) collected at Building 1001 was not analyzed, as the final pressure reading indicated a positive pressure (i.e., higher pressure in the Summa canister than in the surrounding indoor air); therefore, indoor air sample IA-7-R was collected as a replacement sample and analyzed.

All other indoor air and ambient air sampling was completed prior to initiating the soil-gas sampling at each building, except as noted above, consistent with the *VI Guidance*. All indoor air sampling locations were within 20 feet of a sub-slab soil-gas location, as required by the *VI Workplan*. Note, however, that there was one more sub-slab soil-gas sample than indoor air sample collected in each building. The additional sub-slab soil-gas sample was generally collected more than 20 feet from an indoor air sample, as the spacing of sub-slab soil-gas samples was selected to be spatially representative of the area within 30 feet (at Building 283) or 100 feet (at all other targeted buildings) of the trigger well.

Indoor air sampling locations were biased to locations where cracks or seams were observed in the concrete foundation and/or where utility lines penetrated the slab. A crack was observed in the floor of Building 699, and a floor drain was observed in Building 1001. Consequently, indoor air samples IA-4 and IA-7-R, collected at Buildings 699 and 1001, respectively, were collected from within a foot of the floor near the crack and the floor drain. All ambient air samples and all other indoor air samples were through 3/8-inch inner diameter, 1/2-inch outer diameter Teflon-lined tubing attached to the canister. The end of the tubing was set at an adult's breathing zone height (i.e., approximately three to five feet above floor level). All Summa canisters used for collecting indoor air samples were equipped with five-micron filters and flow controllers, which allowed the canister to fill over a 24-hour period.

The Indoor air sampling sequence was as follows at each location:

1. The Summa canister and flow controller identification numbers were recorded.
2. The canister valve was opened and quickly shut, and the vacuum reading on the gauge was then recorded. Note: the vacuum in all cases was at least 18 inches of mercury, so the sampling was able to proceed.
3. The canister was opened, and the start time was recorded.
4. The pressure gauge was checked periodically during the sampling period, and the vacuum and time of the interim check were recorded on the sampling form. As the samples were generally collected over a 24-hour period, Bureau Veritas and AECOM personnel were not in attendance throughout the sampling period.
5. The sampling period was deemed to be complete when one of the following conditions occurred: 1) the Summa canister read between 1 and 5 inches of mercury, or 2) approximately 24 hours had elapsed.
6. At the end of the sampling period, the Summa canister valve was closed and the flow controller apparatus was detached.
7. The end time for the sampling was recorded.

Ambient air samples were collected using the same methods used to collect the indoor air samples, except that they were collected exterior to the targeted building. Except for ambient air sample AA-1, which was collected at Building 283, all ambient air sampling locations were at least 20 feet from the targeted building's nearest door or window, as specified in the *VI Workplan*. Ambient air sample AA-1 was collected from a courtyard between wings of Building 283 that had closely-spaced windows and several doors. Further, the ambient air sampling location was selected as far away as possible from a location formerly designated for smoking and from storm sewer manholes. As a result, AA-1 was situated approximately 10 to 15 feet from the nearest window. It is not believed that the proximity of sampling location AA-1 to windows in Building 283 affected data usability.

A weather station was established outside each building targeted during the investigation. The weather station was capable of measuring the temperature, pressure, and humidity. These data were recorded at intervals throughout the day.

Indoor air samples and ambient air samples were collected with as much temporal overlap as possible and prior to initiating intrusive activities associated with soil-gas sampling, except as noted above with regard to sample IA-7-R. All indoor and ambient air samples were analyzed for the VOCs listed in Table 1 using Low Level TO-15 Method.

3.4.2 Sub-Slab Soil-Gas Sampling Methods

The following methods were used to collect the 15 sub-slab soil-gas samples and two duplicate sub-slab soil-gas samples collected during the investigation:

1. A small one-square-foot section of floor was swept clean after removal of carpet, if necessary.

2. A hole was drilled through the entire thickness of the concrete slab using a hammer drill equipped with a 5/8-inch-diameter drill bit. In Buildings 283, 602, 699, 700, and 1001, which were slab-on-grade construction, the borehole accessed soil-gas below the building. Building 2700 was found to have a crawl space below the auditorium where sampling was proposed. The crawl space was observed to have a soil floor without a vapor barrier where the crawl space could be accessed without entry. As a result, the sub-slab soil-gas sample was collected from the crawl space through the floor slab. Concentrations of vapors within the crawl space are considered to be representative of concentrations within soil-gas because there is no barrier to vapor flux from the soil into the crawl space.
3. At least six inches of 3/8-inch inner diameter, 1/2-inch outer diameter Teflon-lined tubing was inserted through the borehole. The annular space between the tubing and the borehole was sealed using Play-Doh, which is a non-toxic/VOC-free modeling compound. The compound was also mounded above the concrete slab.
4. The tubing was attached to a Teflon "T" fitting equipped with a three-way valve. The three-way valve may be shut, may allow flow through the left branch of the "T," or may allow flow through the right branch of the "T." The left branch of the "T" was attached to a helium meter temporarily. The right branch was attached to a six-liter Summa canister, which was equipped with a five-micron filter and a flow controller set to allow approximately 200 milliliters per minute (mL/min).
5. A helium tracer gas was used to confirm the annular seal of each soil-gas sampling. A plastic shroud was placed over the sampling apparatus described above. The three-way valve was shut so as not to allow air flow through the system, and the helium meter was detached from the tubing and connected to the space under the shroud. A helium canister was used to introduce helium into the shroud; the shroud was filled with helium until the helium meter detected at least 10% helium.

   The helium meter was reconnected to the left branch of the tubing, and the three-way valve was opened to allow flow to the meter. The helium meter was used to check the concentration of helium in air in the tubing. When the concentration of helium was less than 10% of the helium concentration under the shroud, the system was considered to be intact and without leaks. The helium canister was then shut, and the three-way valve again was shut.

   In some instances, particularly in Building 1001, the concentration of helium measured in the sampling apparatus exceeded 10% of the helium concentration under the shroud. In these cases, the Play-Doh seal was mounded higher, and the concentration of helium in the system was re-checked. When the concentration of helium in the sampling apparatus was below 10% of the helium concentration below the shroud, the sampling proceeded. Otherwise, the borehole was abandoned and a new borehole was drilled, the borehole was sealed, and the helium tracer test was run at the new location. The borehole was abandoned because helium had accumulated below the concrete slab and a successful tracer test was consequently not possible at the original location. At two locations (see Figure 6, for example), the new borehole had to be drilled at a distance from the original location in order to have a successful helium tracer test.
6. Upon completion of a successful helium tracer test, the helium meter was replaced with a multi-gas meter equipped with a PID (11.7 eV lamp), lower explosive limit (LEL) sensor, oxygen sensor, hydrogen sulfide sensor, and carbon monoxide sensor. In addition to measuring these parameters in sub-slab soil-gas, the multi-gas meter was used to purge the borehole of at least 3 volumes of soil-gas at a maximum flow rate of 200 mL/min. A one-minute purge was used at all locations, as the same borehole diameter, minimal tubing diameter, and relatively consistent tubing length resulted in minimal variation in the volume of the sampling apparatus.
7. At the end of the purge, the valve was shut and the multi-gas meter was disconnected.
8. The Summa canister identification number and flow controller identification numbers were recorded on the sampling form and Chain of Custody form (Appendix C).
9. The canister vacuum was recorded. Note: In all cases, the vacuum was at least 18 inches of mercury, so the sampling was able to proceed.
10. The Summa canister valve and three-way valve were opened to allow gas to flow in to the Summa canister, and the sampling start time was recorded.
11. The Summa canisters were monitored during collection to ensure that the canister was filling and that the vacuum was not at "0." An interim check was performed at all locations and the time and vacuum of the interim checks was recorded on the sampling form.
12. The sampling period was deemed to be complete when the Summa canister vacuum read between 1 and 5 inches of mercury or 30 minutes had elapsed.
13. At the end of the sampling period, the Summa canister valve was closed and the flow controller apparatus was detached.
14. The end time for the sampling was recorded.
15. The tubing and related sampling equipment was disassembled and removed from the borehole, and the borehole was sealed using hydraulic cement.

3.5 Deviations from Guidance, Regulations, and the Workplan

NJDEP guidance documents and regulations relevant to the VI site investigation include N.J.A.C. 7:26E and the *VI Guidance*. Additionally, the VI site investigation was conducted in accordance with the *VI Workplan*. There were no deviations from N.J.A.C. 7:26E; deviations from the *VI Guidance* and the *VI Workplan* are listed below.

Deviations from the *VI Guidance*

1. The *VI Guidance* requires initial samples to be analyzed for all TO-15 compounds. However, groundwater analytical results generated at Fort Monmouth show few VOCs in groundwater at concentrations above their respective GWSLs. Therefore, the Fort Monmouth Team recommended sampling for specific VOCs at each building, as described below. The NJDEP verbally approved this approach during the 22 February 2012 kickoff meeting, and the *VI Workplan* documents this deviation from the *VI Guidance*.

   Rather than analyzing samples collected at Building 283 for all TO-15 compounds, these samples were only analyzed for benzene. Benzene was the only targeted analyte because groundwater samples collected in the vicinity of Building 283 did not contain any other compound at a concentration above its GWSL.

   Likewise, groundwater samples collected at Buildings 602, 699, 700, 1001 and 2700 only contained chlorinated VOCs at concentrations above GWSLs. Samples collected at these five buildings were analyzed for the following chlorinated VOCs: PCE, PCA, 1,1,1-TCA, 1,1,2-TCA, TCE, 1,2-DCA, cis-1,2,-DCE, trans-1,2-DCE, chloroethane, chloromethane, methylene chloride, and vinyl chloride. PCE, TCE, chloroethane, and vinyl chloride were all detected at concentrations above their respective GWSL in groundwater samples collected within 100 feet of Buildings 602, 699, 700, 1001, and 2700. The remaining compounds are considered to be parent or daughter products of the compounds detected in groundwater samples.

2. The *VI Guidance* requires VI sampling throughout the entire building footprint. However, many of the buildings targeted during this investigation have footprints that are much larger than the extent of the groundwater impacts (see Figures 6 through 10). Therefore, the Fort Monmouth Team proposed investigating the portion of the building closest to the groundwater impacts. As soil vapors are anticipated to decrease with distance from the groundwater impacts, the sub-slab soil-gas concentrations and potential for VI were anticipated to be greatest in the portion of each building where samples were proposed and collected. This approach was verbally approved by the NJDEP during the 22 February 20120 kickoff meeting. The *VI Workplan* documents this deviation from the *VI Guidance*.

Deviations from the *VI Workplan*

1. The *VI Workplan* required a helium concentration of between 10% and 20% under the shroud. However, in a few locations, the concentration of helium exceeded 20% before the helium canister was shut. This deviation from the *VI Workplan* is not considered to have affected data usability, as the helium tracer test was still able to confirm the absence of leaks in the seal.

2. The *VI Workplan* required that indoor air samples be collected prior to sub-slab soil-gas samples. This requirement prevented the potential for cross-contamination of the indoor air sample by sub-slab soil gas migrating through a borehole drilled through the concrete slab. However, indoor air was re-sampled at Building 1001, and the second indoor air sample (IA-7-R) was collected after sub-slab soil-gas samples SS-11 and SS-12 were collected (note: the sub-slab soil gas sampling points were abandoned and sealed prior to the re-sampling event). Re-sampling was necessary because the Summa canister associated with the initial indoor air sample (IA-7) exhibited positive pressure rather than the required vacuum. This deviation from the *VI Workplan* did not affect data usability. No targeted compounds were detected in indoor air sample IA-7-R, indicating that there was no cross contamination of this sample.

3. The *VI Workplan* required that all ambient air samples be collected at least 20 feet from the targeted building's nearest door or window. This requirement limited the amount of indoor air that could escape the building and be detected in the ambient air sample. The ambient air samples collected at Buildings 602, 699/700 (the same ambient air sample was collected at these two adjacent buildings), 1001, and 2700 all met this requirement. However, ambient air sample AA-1, which was associated with Building 283, was collected from a courtyard between wings of Building 283 that had closely-spaced windows and several doors. Further, the location for AA-1 was selected as far away as possible from a location formerly designated for smoking and from storm sewer manholes. As a result, AA-1 was situated approximately 10-15 feet from the nearest window. This deviation from the *VI Workplan* did not affect data usability. No benzene was detected in any samples, indicating that vapors from inside the building did not impact AA-1.

3.6 Data Evaluation and Reporting

All analytical results were compared to screening levels set forth in the *VI Guidance* and consistent with CERCLA. Indoor air and ambient air results were compared to the Indoor Air Screening Levels (IASLs). Additionally, the indoor air results were assessed relative to the ambient air screening results, as vapors in ambient (outdoor) air may impact indoor air quality. Sub-

slab soil-gas results were compared to the Soil-gas Screening Levels (SGSLs). All data generated during the VI site investigation are summarized in Section 4.2 and in Table 2.

In accordance with the *VI Workplan*, the Fort Monmouth Team completed a data quality review of all data generated during the investigation. The data quality review was conducted to determine: 1) if any data should be rejected or qualified; 2) if qualification is necessary, whether the results are likely biased high (positive bias) or low (negative bias); and 3) if the data are usable or not for their intended purpose. The initial step in the data quality review was a review of the Laboratory Chronicle for quality assurance/quality control (QA/QC) issues acknowledged by the analytical laboratory. Issues identified by TestAmerica in the Laboratory Chronicle were evaluated to determine whether data should be rejected or qualified. In addition to the Laboratory Chronicle review, the Fort Monmouth Team assessed quality control (QC) data associated with the following: sample holding times; the instrument performance check; continuing calibration data, internal standard area and retention time; the method blank; laboratory control sample; recovery of spiked compounds; and the detection limits. The above-listed QC data were compared to pre-defined limits, which have been established by the U.S. Environmental Protection Agency (EPA) Region II and adopted by the NJDEP Office of Quality Assurance (OQA).

The above-listed QC data were assessed, and deviations from the pre-defined limits were noted. Decisions were made as to whether data associated with deviations from pre-defined limits should be rejected or qualified. The decision whether to reject or qualify data as estimated is based on the degree of deviation from the QC limits and whether the issue could be systemic or pertains to a concentration for a single compound.

Findings from the data quality review are summarized in Section 5.1 below.

4 Vapor Intrusion Site Investigation Results

Consistent with the site-wide conceptual model, a site investigation has been performed that involves the following elements: selection of buildings to be included in the investigation; building inspections; collection and analysis of ambient air, indoor air, and sub-slab soil-gas samples; and data analysis and reporting. Evaluation of the VI pathway at these buildings is based on a multiple-lines-of-evidence approach, as reliance on a single approach or dataset is not only considered inadequate, but may also lead to flawed decision making. For example, reliance solely on a comparison of groundwater analytical data to GWSLs would lead to the incorrect conclusion that the VI pathway is complete at the targeted buildings. Sections 4.1 and 4.2 summarize the results of the building inspections and investigation sampling, respectively.

4.1 Building Inspection Results

The interior and immediate surroundings of Buildings 283, 602, 699, 700, 1001, and 2700 were inspected by Bureau Veritas and AECOM personnel on 27 February 2012 during the site inspection. A summary of salient observations is provided below for each building. Additional details are recorded on the Building Evaluation Forms provided in Appendix B.

Building 283

Building 283 is located in the northern portion of the MP (see Figure 2). The portion of Building 283 that lies within 30 feet of the trigger well (i.e., the area subject to this investigation) is vacant, but was formerly used for office space. An electric switch panel and associated infrastructure has been incorporated into the building; sampling locations were adjusted to avoid this potential hazard. The building is slab-on grade construction. The area subject to the investigation was divided into several rooms, and the indoor air and sub-slab soil-gas samples were located to assess the VI pathway in different rooms (see Figure 6). Other than carpeting, which appeared to be new relative to the age of the building, no potential sources of volatile organic vapors were observed during the building inspection. No volatile organic vapors were measured using a PID equipped with an 11.7 electron volt (eV) lamp.

Building 602

Building 602 is located in the western portion of the MP (see Figure 2). The portion of Building 602 that lies within 100 feet of the trigger well is vacant, but was formerly used for materials testing. The building, which is slab-on-grade construction, has an elevated ceiling and aluminum walls that are not airtight where they meet the concrete slab. A bay door is situated along the building's eastern side. A two-story mezzanine and a two story room are situated within a large open area that can be accessed by interior doors or the bay door. The area subject to the VI site investigation is partially within the two-story room. One sub-slab soil-gas sample and the indoor air sample were collected inside this room; the other sub-slab soil-gas sample was collected outside the room (see Figure 7). Other than oil and grease in one area of the floor and glue formerly used to hold down linoleum, no sources of volatile organic vapors were observed during the building inspection. The oil/grease and glue were located near the mezzanine section, which is almost forty feet from the nearest VI site investigation sampling location. These materials were not removed prior to conducting the VI sampling. No volatile organic vapors were measured using a PID equipped with an 11.7 eV lamp.

Building 699

Building 699 is located in the central portion of the MP (see Figure 2). The western portion of Building 699 was formerly used as a convenience store, while the eastern portion of the building was used as a vehicle service station. Gasoline dispensers were located in front of the convenience store. The building is entirely vacant at this time. Three bay doors accessed one room at the service station, while a fourth bay door accessed a separate room. The portion of Building 699 that lies within 100 feet of the trigger well is almost entirely within the room accessed by one bay door. The building is slab-on-grade construction.

As all VI samples were collected in the room accessible by one bay door (see Figure 8), only this room is described below. A crack in the floor and a vertical water pipe penetration of the slab were noted in the northeastern portion of the room. No volatile organic vapors were measured at the crack or the utility pipe penetration using a PID equipped with an 11.7 eV lamp. No sources of volatile organic vapors were identified in the room.

Building 700

Building 700 is located in the central portion of the MP, adjacent to Building 699 (see Figure 2). This building is vacant, but was previously used for office space in connection with Army recruitment. Building 700 is the site of a former dry cleaning

facility, which is believed to be the source of the chlorinated VOCs detected in groundwater near Buildings 699 and 700. The portion of the building that lies within 100 feet of the trigger well includes several rooms. The area subject to the site investigation was divided into several rooms, and the indoor air and sub-slab soil-gas samples were located to assess the VI pathway in different rooms (see Figure 8). Other than carpeting, which appeared to be new relative to the age of the building, no potential sources of volatile organic vapors were observed during the building inspection. No volatile organic vapors were measured using a PID equipped with an 11.7 eV lamp.

Building 1001

Building 1001 is located in the southern portion of the MP (see Figure 2). This building is vacant, but was previously used as a dining hall. Only the extreme southwestern portion of the building lies within 100 feet of the trigger well. This area was used as an electric room, and no sub-slab soil-gas or indoor air samples were collected in this room for safety purposes. Therefore, all site investigation samples were collected in the southwestern portion of Building 1001, but slightly more than 100 feet from the trigger well. The building is slab-on-grade construction.

Because the hammer drill was unable to penetrate the full thickness of the slab at several locations, sub-slab soil-gas sample SS-12 was offset three times and ultimately installed farther from (but within 20 feet of, as specified in the *VI Workplan*) indoor air sampling location IA-7-R than originally intended. The location of IA-7-R was as close as possible to a floor drain, which was considered to be a potential preferential pathway for volatile organic vapors from beneath the slab. The second sub-slab soil-gas sample (SS-11) was collected in a separate room. No VI samples were collected from the utility room, freezer, or electric room (see Figure 9), as the potential to hit an underground utility line was considered too great. No sources of volatile organic vapors were identified during the building inspection, and no volatile organic vapors were measured using a PID equipped with an 11.7 eV lamp.

Building 2700

Building 2700 is the only one of the six targeted buildings to be located at CWA (see Figure 3). Building 2700 is vacant, but was previously used for various purposes, including the following: meetings and conferences, office space and laboratory space. Only the extreme eastern portion of one wing of the building lies within 100 feet of the trigger well. The portion of Building 2700 within 100 feet of the trigger well was used as an auditorium. The concrete floor of the auditorium is situated above a crawl space that contains numerous utility lines. The crawl space can be accessed from the rear of the auditorium and in the level beneath the auditorium. A hole in the floor of a closet adjacent to the stage allows air exchange with the crawl space. Exterior doors are situated to either side of the stage, as shown on Figure 10. The crawl space interior was observed without entry from an access door located beyond the rear of the auditorium. At this location, the crawl space was observed to have a soil floor. No sources of volatile organic vapors were encountered during the building inspection, and no volatile organic vapors were measured using a PID equipped with an 11.7 eV lamp.

Sub-slab samples were situated as far as possible from the hole in the floor and from access portals, as these areas could potentially represent areas of lower vapor concentrations than other portions of the crawl space. Likewise, the indoor air samples were collected away from the exterior doors, which were kept shut to the extent possible during indoor air sample collection.

Buildings 675, 676 and 677

Buildings 675, 676 and 677 are located in the western portion of the MP, just northwest of Building 602 (see Figure 2). Although none of the three buildings lie within the 100-foot radius trigger for performance of a VI investigation, it was decided during the kickoff meeting that additional information was necessary due to their proximity to the trigger well for Building 602. As a result, the buildings were visited during the site inspection. Building 675 is a small, above-grade building with air space beneath the floor (similar to a trailer), Building 676 is a two-story building with slab-on-grade construction, and Building 677 is a one-story building with slab-on-grade construction and office space. Buildings 675 and 676 could not be accessed during the site inspection. No VI samples were collected inside the buildings.

4.2 Sampling Results

A total of 34 samples were collected between 5 and 30 March 2012 as part of the VI site investigation, including 14 sub-slab soil-gas samples, 9 indoor air samples, 5 ambient air samples, and 6 duplicate samples. As noted above, the samples were collected from the interior and exterior to Buildings 283, 602, 699, 700, 1001 and 2700. All samples were analyzed by TestAmerica, a laboratory with NELAP accreditation and certified by the NJDEP for the Low-level TO-15 Method. As verbally approved by the NJDEP during the 22 February 2012 kickoff meeting:

- Samples collected at Building 283 were analyzed for benzene (by the Low-level TO-15 Method). This parameter was selected because it was the only VOC detected at a concentration above its GWSL in the trigger well.

- Samples collected at Buildings 602, 699, 700, 1001 and 2700 were analyzed for 12 chlorinated VOCs (by the Low-level TO-15 Method), which were the compounds considered most likely to be parent or daughter products in groundwater at Fort Monmouth.

Analytical parameters are provided in Table 1, sampling results are provided in Table 2 and Appendix C, and a building-by-building discussion of the sampling results is provided below.

Building 283

Three sub-slab soil-gas samples (SS-1 through SS-3), two indoor air samples (IA-1 and IA-2), and one ambient air sample (AA-1) were collected at Building 283. As shown in Figure 6 and Table 2, no benzene was detected in any of the six VI samples. The reporting limits for the indoor/ambient air and sub-slab soil-gas samples were below the residential and non-residential IASLs and SGSLs for benzene.

Building 602

Two sub-slab soil-gas samples (SS-4 and SS-5), one indoor air sample (IA-3), and one ambient air sample (AA-2) were collected at Building 602. As shown in Figure 7 and Table 2, the only analyte detected in a sub-slab soil-gas sample was PCE, which was detected at a concentration of 38 micrograms per cubic meter ($\mu g/m^3$) at location SS-5; this concentration exceeds the residential and non-residential SGSLs for PCE, which are 34 and 36 $\mu g/m^3$, respectively. The reporting limits for all non-detect sub-slab soil-gas results were below the residential and non-residential SGSLs.

The only analyte detected in an indoor air and/or ambient air sample at Building 602 was chloromethane, which was detected at a concentration of 1 $\mu g/m^3$ in both IA-3 and AA-2; this concentration is below the residential and non-residential IASLs for chloromethane, which are 95 and 130 $\mu g/m^3$, respectively. The reporting limits for all non-detect indoor/ambient air results were below the residential and non-residential IASLs.

Building 699

Two sub-slab soil-gas samples (SS-6 and SS-7), 1 indoor air sample (IA-4), 1 ambient air sample (AA-3) and 2 duplicate ambient air samples were collected at Building 699. Note: sample AA-3 was the ambient air sample for both Buildings 699 and 700. As shown in Figure 8 and Table 2, the only analytes detected in a sub-slab soil-gas sample were PCE and TCE. PCE was detected at concentrations of 210 and 360 $\mu g/m^3$ at locations SS-6 and SS-7, respectively; both concentrations exceed the residential and non-residential SGSLs for PCE, which are 34 and 36 $\mu g/m^3$, respectively. TCE was detected at a concentration of 94 $\mu g/m^3$ at location SS-6; this concentration exceeds the residential and non-residential SGSLs for TCE, which are 27 and 27 $\mu g/m^3$, respectively. The reporting limits for all non-detect sub-slab soil-gas results were below the residential and non-residential SGSLs.

The only analyte detected in an indoor air, ambient air and/or duplicate ambient air sample at Building 699 was chloromethane, which was detected at a concentration of 1 $\mu g/m^3$ in IA-4, AA-3, and the duplicate samples collected at AA-3; this concentration is below the residential and non-residential IASLs for chloromethane, which are 95 and 130 $\mu g/m^3$, respectively. The reporting limits for all non-detect indoor/ambient/duplicate air results were below the residential and non-residential IASLs.

Building 700

Three sub-slab soil-gas samples (SS-8 through SS-10), 1 duplicate sub-slab soil-gas sample, 2 indoor air samples (IA-5 and IA-6), 1 duplicate indoor air sample, 1 ambient air sample (AA-3) and 2 duplicate ambient air samples were collected at Building 700. Note: sample AA-3 was the ambient air sample for both Buildings 699 and 700. The duplicate sub-slab soil-gas sample was collected at location SS-8, and the duplicate indoor air sample was collected at IA-5.

As shown in Figure 8 and Table 2, the only analyte detected in sub-slab soil-gas samples was PCE, which was detected at a concentration of 24 $\mu g/m^3$ at SS-9; this concentration is below the residential and non-residential SGSLs for PCE, which are 34 and 36 $\mu g/m^3$, respectively. The reporting limits for all non-detect sub-slab soil-gas results were below the residential and non-residential SGSLs.

The only analyte detected in an indoor air, duplicate indoor air, ambient air or duplicate ambient air sample at Building 700 was chloromethane, which was detected at a concentration of 1 $\mu g/m^3$ at IA-5, AA-3 and the duplicate samples collected at AA-3; this concentration is below the residential and non-residential IASLs for chloromethane, which are 95 and 130 $\mu g/m^3$, respectively. The reporting limits for all non-detect indoor/ambient/duplicate air results were below the residential and non-residential IASLs.

Building 1001

Two sub-slab soil-gas samples (SS-11 and SS-12), 1 indoor air sample (IA-7-R) and 1 ambient air sample (AA-4) were collected at Building 1001. As shown in Figure 9 and Table 2, no analytes were detected in the sub-slab soil-gas samples. The reporting limits for all non-detect sub-slab soil-gas results were below the residential and non-residential SGSLs.

The only analyte detected in the indoor and ambient air samples at Building 1001 was chloromethane, which was detected at a concentration of 1 µg/m^3 in both IA-7-R and AA-4; this concentration is below the residential and non-residential IASLs for chloromethane, which are 95 and 130 µg/m^3, respectively. The reporting limits for all non-detect indoor/ambient air results were below the residential and non-residential IASLs.

Building 2700

Two sub-slab soil-gas samples (SS-13 and SS-15), one duplicate sub-slab soil-gas sample, two indoor air samples (IA-8 and IA-9), one duplicate indoor air sample, and one ambient air sample (AA-5) were collected at Building 2700. The duplicate sub-slab soil-gas sample was collected at SS-13, and the duplicate indoor air sample was collected at IA-8.

As noted above, the auditorium where these samples were collected was situated above a crawl space. The sub-slab soil-gas samples were therefore collected by drilling through the concrete floor of the auditorium and collecting a sample from the crawl space. As shown in Figure 10 and Table 2, no analytes were detected in the sub-slab soil-gas samples or in the duplicate sub-slab soil-gas sample. The reporting limits for all non-detect sub-slab soil-gas results were below the residential and non-residential SGSLs.

The only analyte detected in an indoor air, duplicate indoor air or ambient air sample at Building 2700 was chloromethane, which was detected at a concentration of 1 µg/m^3 in both IA-9 and AA-5; this concentration is below the residential and non-residential IASLs for chloromethane, which are 95 and 130 µg/m^3, respectively. The reporting limits for all non-detect indoor/ambient air results were below the residential and non-residential IASLs.

5 Discussion of Vapor Intrusion Site Investigation Results

This section presents a discussion of the VI site investigation sampling results. Section 5.1 summarizes the findings of the data quality review, and Section 5.2 presents a building-by-building discussion of the sampling results and evaluation of the VI pathway based on a the multiple-lines-of-evidence approach..

5.1 Summary of the Data Quality Review

All samples collected during this site investigation were submitted to TestAmerica for analysis for benzene (samples collected at Building 283 only) or the site-specific list of chlorinated VOCs (samples collected at Buildings 602, 699, 700, 1001 and 2700). TestAmerica is a laboratory with NELAP accreditation and certification by the NJDEP for the Low-level TO-15 Method.

The data quality review included QC data listed in Section 3.6. The following list includes all QC issues identified during this data quality review. Based on the listed issues, no data generated during the investigation were rejected, and few data were qualified. The data are usable for their intended purpose, which is to assess the VI pathway at Fort Monmouth.

Issues Identified during the Data Quality Assessment

1. Laboratory Data Package 200-10127-1, Recovery of Spiked Compounds: The percent recovery for ethanol in a matrix spike sample was 0%. This result was outside the QC limits of 70 to 130% recovery. Typically, this result would result in laboratory-reported ethanol data being rejected or qualified. However, ethanol was not a targeted analyte for the VI site investigation; therefore, no action was taken.
2. Laboratory Data Package 200-10127-1, Laboratory Control Sample: The percent recovery for methanol in laboratory control sample 200-36628/5 was 187%. This exceeds the QC limits of 60 to 140% recovery. As such, a positive bias in the methylene chloride data is anticipated. Laboratory control sample 200-36628/5 was associated with samples AA-2, IA-3, SS-4, and SS-5, all of which were collected at building 602. Methylene chloride was not detected in these samples, so the potential positive bias did not impact data quality. The methylene chloride results for the above-listed samples are considered to be non-detect, qualified as estimated.

5.2 Discussion of the Sampling Results and the Vapor Intrusion Pathway

Vapor intrusion is typically conceptualized with chemicals volatilizing from impacted soil and/or groundwater beneath a building and diffusing toward areas of lower chemical concentration (see Figure 5). The migration of vapors into a building is controlled by factors such as pressure changes related to a building's HVAC system, barometric pressure changes and wind load, and the rate of movement of the vapors into a building is controlled by factors such as soil type, chemical properties, building design and condition and pressure differentials. Upon entry into a building, vapors mix with the existing air through the natural or mechanical ventilation of the building. Assessment of the VI pathway typically includes a discussion of the physical setting, potential sources and transport pathways, and involves a multiple-lines-of-evidence approach. For the purposes of this VI site investigation, the physical setting, potential sources, and transport pathways can be summarized as follows:

- Physical Setting: The geology at Fort Monmouth consists of sandy loam, sandy clay loam or loam that may grade to loamy sand to a depth of approximately 5 feet bgs, which is in turn underlain by a thick sequence of Coastal Plain sediments comprised of layers of silt, sand and clay deposited in deltaic and marine environments. The groundwater table is relatively shallow at the installation (2.37 to 30.19 feet bgs), and it fluctuates with the tidal action in Parkers and Oceanport Creeks at the MP. The study area is characterized by very low-level (or non detect) benzene concentrations in shallow groundwater near Building 283, and by low-level chlorinated VOC concentrations in shallow groundwater near Buildings 602, 699, 700, 1001 and 2700.

  The presence or absence of the fine-grained silts and clays likely plays a role in contaminant distribution and migration at the site. Where present, the low-permeability materials will impede vertical migration of contamination (e.g., VOCs volatilizing off a groundwater plume and diffusing upward through the soil column); where absent, vertical migration is more likely. However, the shallow depth to groundwater and tidal action, combined with sandy soils, increase the likelihood that VOCs volatilizing off a groundwater plume could reach building slabs.

- Potential Sources: For the purposes of this site investigation, it is assumed that the sole potential source of VI at Fort Monmouth is shallow groundwater contamination, which could allow VOCs to volatilize and diffuse upward through the soil column to beneath a building slab.
- Transport Pathways: The four main transport pathways include:
    1. Diffusion of vapors from sources in the unsaturated zone, which is considered unlikely at the six targeted buildings as there are no known sources under or immediately adjacent to any of the buildings;
    2. Diffusion of vapors from shallow groundwater, which is considered the primary potential transport pathway;
    3. Advective/convective transport of vapors (i.e., the horizontal and vertical movement of vapors located near a building foundation from areas of higher pressure to areas of lower pressure), which could occur if vapors diffusing off groundwater reach building slabs; and
    4. Vapor migration through preferential pathways (preferential pathways include natural [e.g., vertically fractured soil] and man-made [e.g., buried utilities] pathways in the subsurface with high gas permeability through which vapors can rapidly migrate), which was not specifically targeted during the VI site investigation.

A building-by-building discussion of the sampling results and evaluation of the VI pathway is provided below. The primary lines of evidence that were considered in the assessment of the VI pathway at each building include: 1) VOC concentrations in shallow groundwater, as reported in previous groundwater monitoring reports; 2) indoor air, sub-slab-soil-gas, and ambient/outdoor air concentrations, as measured in samples collected during the VI site investigation; and 3) potential sources, including information gathered during building inspections on potential indoor air and outdoor air sources.

Note: The majority of indoor and ambient air samples (13 of 16 samples) collected and analyzed for chlorinated VOCs contained chloromethane at a concentration of 1 µg/m^3. Chloromethane was detected at this consistently low concentration in air samples collected at different times and at different locations; no chloromethane was detected in any of the sub-slab soil-gas samples. Therefore, the data suggest that chloromethane is a background presence in air and unrelated to activities at Fort Monmouth. Also supporting this conclusion:

1. An Agency for Toxic Substances and Disease Registry (ATSDR) document dated December 1998 and entitled "*Public Health Statement Chloromethane CAS # 74-87-3*" indicates that similarly low concentrations of chloromethane are naturally occurring; natural sources include oceans, rotting wood, forest fires and volcanoes.
2. Chloromethane has been detected in air samples collected throughout New Jersey.

Building 283

All samples collected at Building 283 were only analyzed for benzene, as that was the only detected chemical of concern in groundwater at well 283MW-2, the trigger well for this investigation. However, groundwater samples collected from well 283MW-2 have not contained benzene at concentrations above its GWSL since 19 May 2009 (benzene was detected at 1.29 micrograms per liter [µg/L] in February 2011; the GWSL is 15 µg/L), minimizing the concern for VI in the building. During the current site investigation, no benzene was detected in any sub-slab soil-gas, indoor air or ambient air samples collected at Building 283, and nothing of concern was noted during the building inspection. Therefore, there is no current source for benzene at/near Building 283, there is no accumulation of benzene vapors beneath Building 283, and there are no detectable concentrations of benzene within Building 283. As a result, the VI pathway for benzene at Building 283 is considered incomplete.

Building 602

All samples collected at Building 602 were analyzed for the 12 chlorinated VOCs based on detections of PCE, TCE and vinyl chloride in groundwater at well M5MW-16 (see Appendix A), the trigger well for this investigation. However, during the most recent groundwater sampling event (February 2011), only vinyl chloride was detected above its GWSL (detected at 1.65 µg/L versus a GWSL of 1 µg/L), minimizing the concern for VI in the building. During the current site investigation, only PCE and chloromethane were detected in any sub-slab soil-gas, indoor air, or ambient air samples collected at Building 602. PCE was only detected in one sub-slab soil-gas sample (SS-5 at 38 µg/m^3) at a concentration exceeding the residential and non-residential SGSLs of 34 and 36 µg/m^3, respectively. PCE was not detected in sub-slab soil-gas sample SS-4 or the indoor and ambient air samples. As discussed above, chloromethane is considered to be unrelated to activities at Fort Monmouth. Also, nothing of concern was noted during the building inspection.

Based on historical groundwater analytical data and VI data collected during this site investigation, it appears that groundwater is acting as a source for the PCE contamination detected in sub-slab soil gas at Building 602. However, PCE was only detected in one of two sub-slab soil-gas samples at a concentration above residential and non-residential SGSLs, and it was not detected in indoor air. As a result, the VI pathway for PCE and the other targeted chlorinated VOCs at Building 602 is considered incomplete.

Building 699

All samples collected at Building 699 were analyzed for the 12 chlorinated VOCs based on detections of PCE at wells 699MW-09 and 699MW-16 (see Appendix A), the trigger wells for this investigation. However, during the most recent groundwater sampling event (March 2011), PCE was not detected above its GWSL (1 µg/L), so any groundwater source has attenuated thus minimizing the concern for VI in the building. During the current site investigation, both sub-slab soil-gas samples (SS-6 and SS-7) collected at Building 699 contained PCE at concentrations (210 and 360 µg/m^3) above the residential and non-residential SGSLs, and sub-slab soil-gas sample SS-6 contained TCE at a concentration (94 µg/m^3) above the residential and non-residential SGSLs. No other chlorinated VOCs were detected in either sub-slab soil-gas sample collected at Building 699, and no chlorinated VOCs (including PCE) were detected in the indoor or ambient air samples (other than chloromethane). Also, nothing of concern was noted during the building inspection.

Based on historical groundwater analytical data and VI data collected during this site investigation, it appears that groundwater is acting as a source for the PCE (and likely TCE) contamination detected in sub-slab soil gas at Building 699. However, neither PCE nor TCE was detected in indoor air. As a result, the VI pathway for PCE, TCE, and the other targeted chlorinated VOCs at Building 699 is considered incomplete.

Building 700

As was the case at Building 699, all samples collected at Building 700 were analyzed for the 12 chlorinated VOCs based on detections of PCE at wells 699MW-09 and 699MW-16 (see Appendix A), the trigger wells for this investigation. However, during the most recent groundwater sampling event (March 2011), PCE was not detected above its GWSL (1 µg/L), minimizing the concern for VI in the building. During the current site investigation, only PCE and chloromethane were detected in any sub-slab soil-gas, indoor air, or ambient air samples collected at Building 700. PCE was only detected in one sub-slab soil-gas sample (SS-9 at 24 µg/m^3) at a concentration below the residential and non-residential SGSLs of 34 and 36 µg/m^3, respectively. No other chlorinated VOCs were detected in the other sub-slab soil-gas sample collected at Building 700, and no chlorinated VOCs (including PCE) were detected in the indoor or ambient air samples (other than chloromethane). Also, nothing of concern was noted during the building inspection.

Based on historical groundwater analytical data and VI data collected during this site investigation, it appears that groundwater is acting as a source for the PCE contamination detected in sub-slab soil gas at Building 700. However, PCE was only detected in one of four sub-slab soil-gas samples (including one duplicate) at a concentration below residential and non-residential SGSLs, and it was not detected in indoor air. As a result, the VI pathway for PCE and the other targeted chlorinated VOCs at Building 700 is considered incomplete.

Building 1001

All samples collected at Building 1001 were analyzed for the 12 chlorinated VOCs based on detections of vinyl chloride and chloroethane in groundwater at wells 812MW-04 and 812MW-05 (see Appendix A), the trigger wells for this investigation. However, during the most recent groundwater sampling event (February 2011), vinyl chloride and chloroethane were not detected above their respective GWSLs (1 µg/L for vinyl chloride, 4 µg/L for chloroethane), minimizing the concern for VI in the building. During the current site investigation, only chloromethane was detected (in the indoor air and ambient air samples); no other chlorinated VOCs were detected in the samples collected at Building 1001. As discussed above, chloromethane is considered to be unrelated to activities at Fort Monmouth. Also, nothing of concern was noted during the building inspection. Therefore, there is no current source for chlorinated VOCs at/near Building 1001, there is no accumulation of chlorinated VOC vapors beneath Building 1001, and there are no detectable concentrations of chlorinated VOCs within Building 1001. As a result, the VI pathway for chlorinated VOCs at Building 1001 is considered incomplete.

Building 2700

All samples collected at Building 2700 were analyzed for the 12 chlorinated VOCs based on detections of TCE in groundwater at wells CW1MW-28, CW1MW-29 and CW1MW-281 (see Appendix A), the trigger wells for this investigation. During the most recent groundwater sampling event (February 2011), TCE was detected above its respective GWSL (1 µg/L), suggesting it could be a potential source for VI in the building. During the current site investigation, only chloromethane was detected (in the indoor air and ambient air samples); no TCE or other chlorinated VOCs were detected in the samples collected at Building 2700. As discussed above, chloromethane is considered to be unrelated to activities at Fort Monmouth. Also, nothing of concern was noted during the building inspection.

Based on historical groundwater analytical data, it appears that groundwater could be a potential TCE source for VI in the building. However, based on the VI data collected during this site investigation, there is no accumulation of chlorinated VOC vapors beneath Building 2700 and there are no detectable concentrations of chlorinated VOCs within Building 2700. As a result, the VI pathway for chlorinated VOCs at Building 2700 is considered incomplete.

Buildings 675, 676 and 677

Because Buildings 675, 676 and 677 do not lie within the 100-foot radius trigger for performance of a VI investigation, no VI samples were collected. Instead, the VI pathway at Buildings 675, 676 and 675 was assessed through data generated at Building 602, which is located adjacent to the three buildings and within the 100-foot trigger radius. Because the VI pathway at Building 602 is considered incomplete, the pathway at Buildings 675, 676 and 675 is also considered incomplete. Additionally, the above-grade construction of Building 675, which lines downgradient of the trigger well, eliminates potential risk related to the VI pathway.

6 Conclusions and Recommendations

Based on the results of this VI site investigation, the Fort Monmouth Team has reached the following conclusions:

- Based on groundwater sampling analytical data generated at Fort Monmouth through the first quarter 2011 and as approved at the 22 February 2012 kickoff meeting at the NJDEP, the VI site investigation was only warranted at Buildings 283, 602, 699, 700, 1001 and 2700.
- At Building 283, there is no current source for benzene, there is no accumulation of benzene vapors beneath the building, and there are no detectable concentrations of benzene within the building. As a result, the VI pathway for benzene at Building 283 is considered incomplete and no further action is recommended.
- Based on historical groundwater analytical data and VI data collected at Building 602 during this site investigation, it appears that groundwater was acting, but no longer acts, as a source for the PCE contamination detected in sub-slab soil gas at the building. However, because PCE was only detected in one of two sub-slab soil-gas samples and was not detected in the indoor air sample, the VI pathway for PCE and the other targeted chlorinated VOCs at Building 602 is considered incomplete and no further action is recommended. Based on this conclusion, the VI pathway at Buildings 675, 676 and 677 (located adjacent to Building 602) is also considered incomplete and no further action is recommended.
- Based on historical groundwater analytical data and VI data collected at Building 699 during this site investigation, it appears that groundwater is acting as a source for the PCE (and likely TCE) contamination detected in sub-slab soil gas at the building. Because neither PCE nor TCE was detected in the indoor air sample, the VI pathway for PCE, TCE, and the other targeted chlorinated VOCs at Building 699 is considered incomplete at this time. However, VI at this location should be considered when the remedy for Building 700 is being evaluated; additional sampling is recommended after the completion of the Building 700 remedy, if necessary.
- Based on historical groundwater analytical data and VI data collected at Building 700 during this site investigation, it appears that groundwater is acting as a source for the PCE contamination detected in sub-slab soil gas at the building. PCE was only detected in one of four sub-slab soil-gas samples and was not detected in the indoor air samples, and hence, the VI pathway for PCE and the other targeted chlorinated VOCs at Building 700 is considered incomplete at this time. The area around Building 700 will be subject to an RI/FS for the PCE spill. During the FS portion, the potential for VI should be considered and if necessary, after the Building 700 remedy is implemented, additional VI sampling is recommended.
- At Building 1001, there is no current source for chlorinated VOCs, there is no accumulation of chlorinated VOC vapors beneath the building, and there are no detectable concentrations of chlorinated VOCs within the building. As a result, the VI pathway for chlorinated VOCs at Building 1001 is considered incomplete and no further action is recommended.
- Based on historical groundwater analytical data at Building 2700, it appears that groundwater could be a potential TCE source for VI in the building. However, based on the VI data collected during this site investigation, there is no accumulation of chlorinated VOC vapors beneath the building and there are no detectable concentrations of chlorinated VOCs within the building. As a result, the VI pathway for chlorinated VOCs at Building 2700 is considered incomplete and no further action is recommended.
- At locations where no buildings currently exist, with the concern being that vapors could accumulate under buildings constructed during redevelopment, the Fort Monmouth Team recommends that engineering controls be designed as part of any redevelopment effort to match up the future land use with the potential threat to current and planned buildings by the new owner.

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7 References

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Figures

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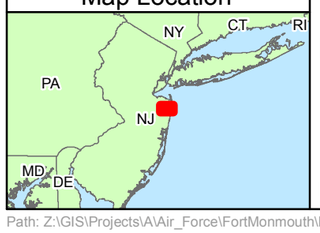
Map Location



Legend

- Base Boundary
- Stream (USGS)
- Lake (USGS)

Image Source: Bing Aerial Imagery

Site Description:
Fort Monmouth
Main Post & Charles Wood Area
Monmouth County, NJ
Longitude – 74° 2' 33.39" W
Latitude – 40° 18' 49.33" N
Latitude and Longitude
represents center point of Main Post

N
W E
S

Fort Monmouth

Site Location Map

Scale: 1:43,200

0 1,800 3,600 7,200 Feet

AECOM

	Figure 1
June 5, 2012	Project #: 60247178.1.3

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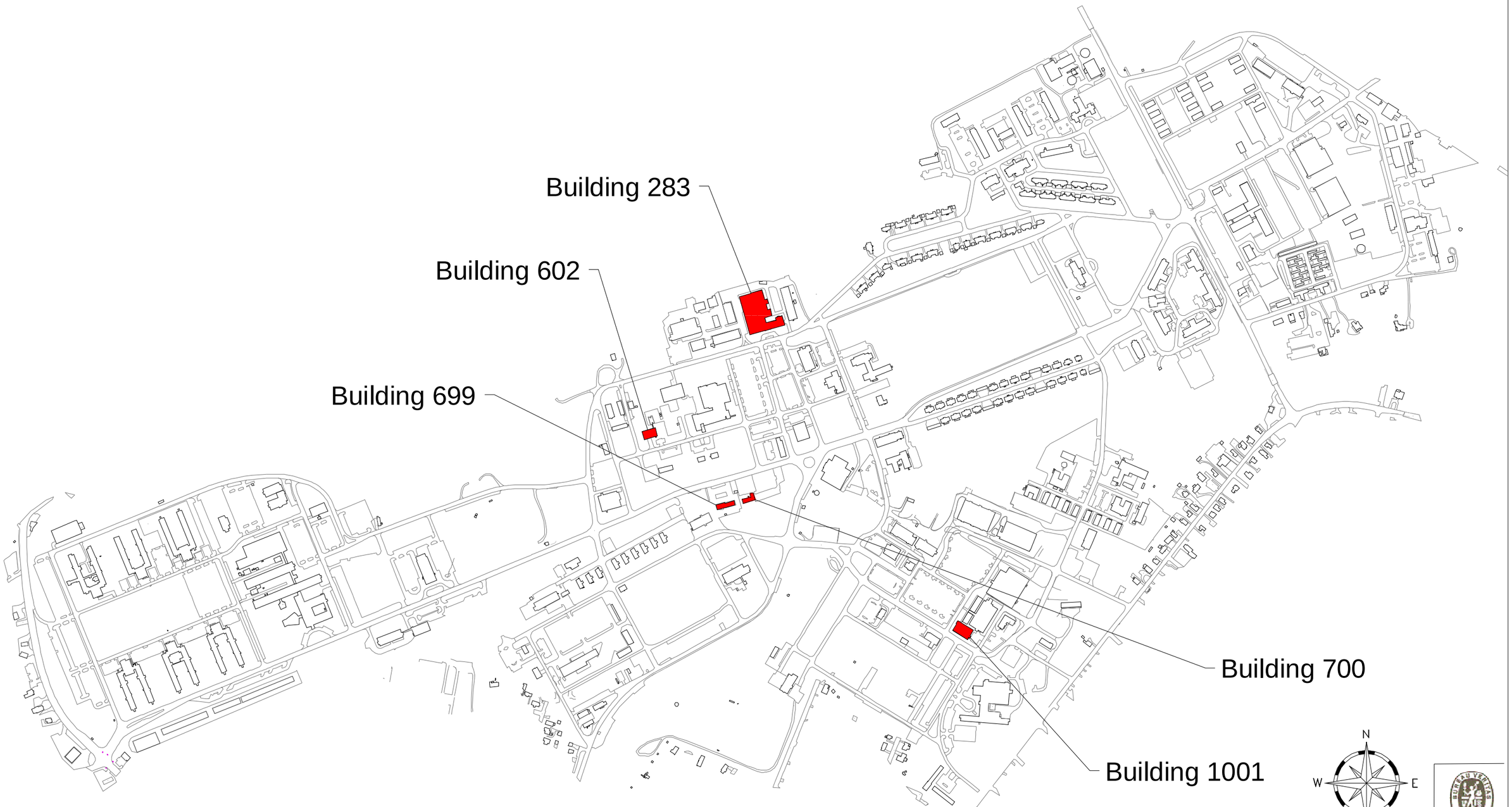


SCALE: 1" = 700'

0' 700' 1400' 2800'

DRAWN BY: L. Deskins	DATE: 5-7-12	LOCATION	TITLE
CHECKED BY: I. Goldsberry	DATE: 5-7-12	Main Post	Main Post Fort Monmouth, New Jersey
APPROVED BY: D. Parse	DATE: 5-7-12		FIGURE 2
BUREAU VERITAS PROJECT NO. 12012-000065.00			

N

W E

S

SCALE: 1" = 700'

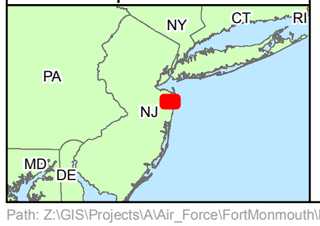
0' 700' 1400' 2800'

DRAWN BY: L. Deskins	DATE: 5-7-12	LOCATION: Charles Wood Area	TITLE: Charles Wood Area, Fort Monmouth, New Jersey
CHECKED BY: I. Goldsberry	DATE: 5-7-12		
APPROVED BY: D. Parse	DATE: 5-7-12		
BUREAU VERITAS PROJECT NO. 12012-000065.00			FIGURE: 3

Main Post

Charles Wood Area

Map Location



Legend

- Base Boundary
- Open Water
- Perennial Ice/Snow
- Developed, Low Intensity
- Developed, Medium Intensity
- Developed, High Intensity
- Barren Land (Rock/Sand/Clay)
- Deciduous Forest
- Evergreen Forest
- Mixed Forest
- Shrub/Scrub
- Grassland/Herbaceous
- Pasture/Hay
- Cultivated Crops
- Woody Wetlands
- Emergent Herbaceous Wetlands

N
W E
S

Fort Monmouth

Land Use Map

Scale: 1:43,200

0 1,800 3,600 7,200 Feet

AECOM

Figure 4

June 5, 2012

Project #: 60247178.1.3

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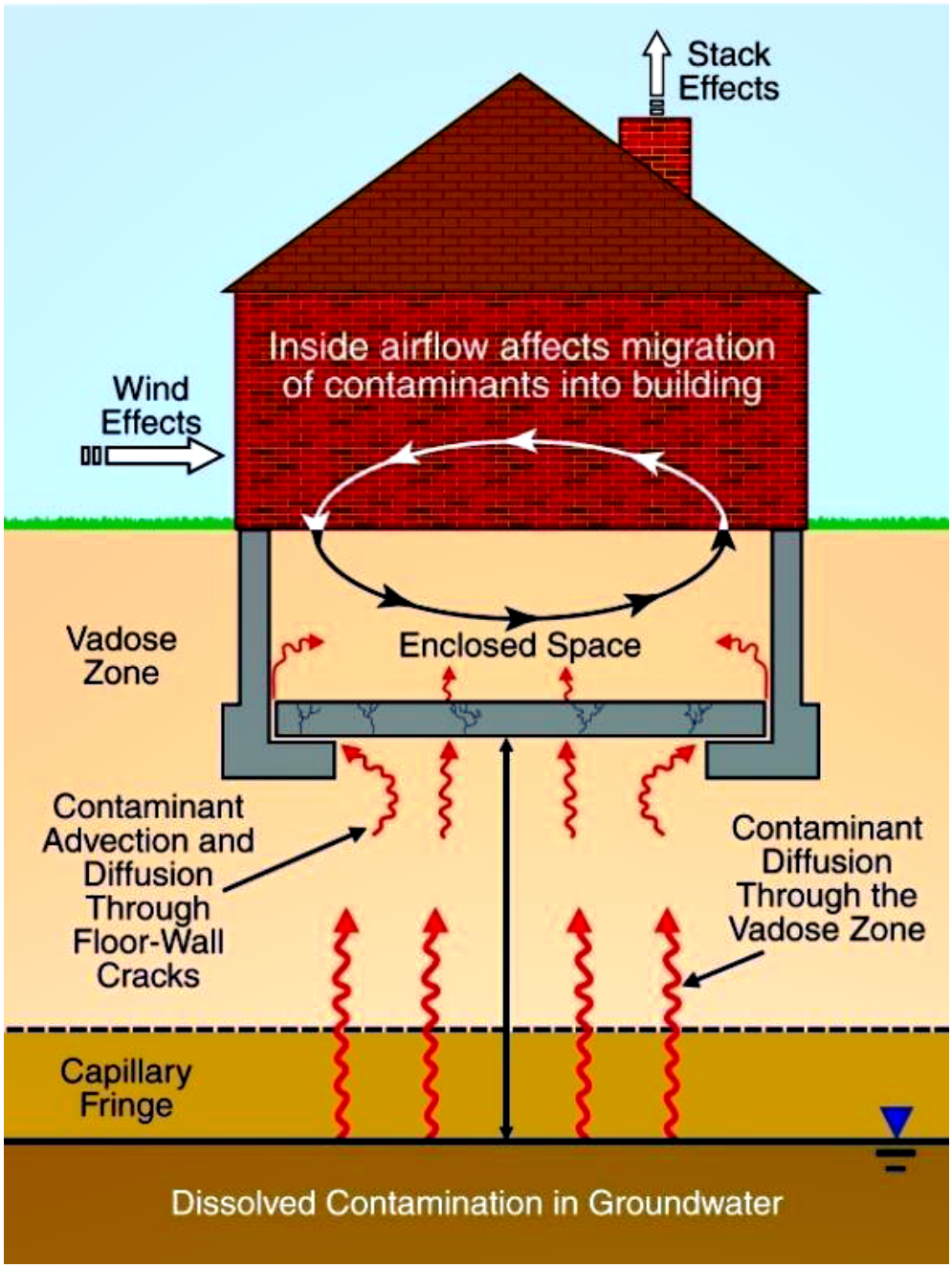

From: USEPA, 2002. OSWER Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils.

AECOM
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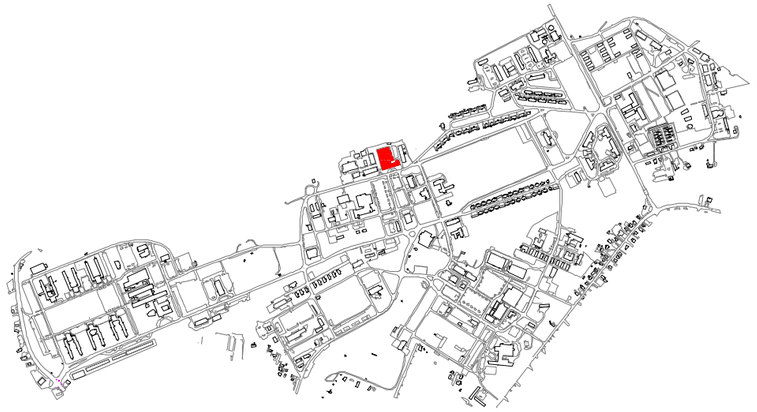
Phone: 703-549-8728 Fax: 703-549-9134 www.aecom.com

Figure 5
General VI Site-wide Conceptual Model

Project #:	Task #:
Designed By:	Drawn By:
Checked By:	Date:
	Sheet:

Figure_5.pdf



Key Map
(Not To Scale)

No detections at this location.

30-Foot Radius from Well 283MW02

IA-2
SS-3
SS-2
IA-1
SS-1
283MW02
AA-1

U.G.

Legend

- SS-1 — Vapor Sub-slab Soil Gas Sampling Location
- IA-1 — Indoor Air Sampling Location
- AA-1 — Ambient Air Sampling Location
- Single Door
- Double Doors
- Storm Sewer with Manholes
- Inactive Utility Line
- Underground Electric
- 283MW02 — Benzene Concentration above GWSL

Notes

1) Sampling locations and features inside Building 283 are based on field measurements and a drawing prepared by London, Kantor, Umland and Associates entitled Heating Systems Replacement Building 283, and dated August 14, 1978.

2) Locations of wells, buildings, roads, and all other features exterior to Building 283 were provided by Fort Monmouth personnel.

3) Only detections are presented in the figure; if no data box is presented at a sample location, then no analytes were detected.

SCALE: 1" = 20'

0' 20' 40' 80'

N W E S

DRAWN BY: L. Deskins	DATE: 6-8-12	LOCATION: Building 283 Main Post	TITLE: Building 283 Vapor Intrusion (VI) Site Investigation Sampling Results
CHECKED BY: I. Goldsberry	DATE: 6-8-12		
APPROVED BY: D. Parse	DATE: 6-8-12		
BUREAU VERITAS PROJECT NO. 12012-000068.00			FIGURE 6

Tables

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Table 1: Sample Details and Analytical Parameters

Sample Number(s)	Building Number and Property Address (Street Name)	Parcel/Site ID	Medium	Approximate Number of Square Feet Subject to Vapor Intrusion Investigation	Number of Samples, Sample Method, and Analytical Parameters
SS-1 SS-2 SS-3 IA-1 IA-2 AA-1	Building 283 Sherrill Avenue	Parcel 50	Soil-gas Indoor Air Ambient Air	1,500	3 Sub-Slab 2 Indoor Air 1 Ambient Air Summa Canister LLTO-15 Benzene
SS-4 SS-5 IA-3 AA-2	Building 602 Telegraph Avenue	Site M5	Soil-gas Indoor Air Ambient Air	1,200	2 Sub-Slab 1 Indoor Air 1 Ambient Air Summa Canister LLTO-15 List 1
SS-6 SS-7 IA-4 AA-3 2 Duplicate Samples at AA-3	Building 699 Saltzman Avenue	Parcel 52	Soil-gas Indoor Air Ambient Air	1,200	2 Sub-Slab 1 Indoor Air 3 Ambient Air Summa Canister LLTO-15 List 1
SS-8 SS-9 SS-10 IA-5 IA-6 Duplicate samples at SS-8 & IA-5	Building 700 Saltzman Avenue	Parcel 52	Soil-gas Indoor Air	4,000	4 Sub-Slab 3 Indoor Air Summa Canister LLTO-15 List 1
SS-11 SS-12 IA-7-R AA-4	Building 1001 Saltzman Avenue	Not Provided	Soil-gas Indoor Air Ambient Air	500	2 Sub-Slab 1 Indoor Air 1 Ambient Air Summa Canister LLTO-15 List 1
SS-13 SS-14 SS-15 IA-8 IA-9 AA-5 Duplicate samples at SS-13 and IA-8	Building 2700 Corregidor Road	Parcel 15	Soil-gas Indoor Air Ambient Air	3,500	4 Sub-Slab 3 Indoor Air 1 Ambient Air Summa Canister LLTO-15 List 1

Notes and Abbreviations:

SS – Sub-Slab

IA – Indoor Air

AA – Ambient Air

DUP – Duplicate

1) The analytical program requires List 1 where a halogenated VOC was detected at a concentration above its Groundwater Screening Level (GWSL). List 1 includes the following halogenated TO-15 compounds: Chloroethane; Chloromethane; 1,1-Dichloroethane; 1,2-Dichloroethane; 1,1-Dichloroethene; cis-1,2-Dichloroethene; trans-1,2-Dichloroethene; Dichloromethane; Methylene Chloride; 1,1,2,2-Tetrachloroethane; Tetrachloroethene (PCE); 1,1,1-Trichloroethane; 1,1,2-Trichloroethane; Trichloroethene (TCE); and, Vinyl Chloride.

Table 2: Summary of VI Site Investigation Results

Building ID	Soil Gas Screening Levels		Indoor Air Screening Levels		Building 283			Building 283			Building 283			Building 283			Building 283			Building 283		
Sample Type					Sub-Slab Soil Gas			Sub-Slab Soil Gas			Sub-Slab Soil Gas			Ambient Air			Indoor Air			Indoor Air		
Field Sample ID					SS-1			SS-2			SS-3			AA-1			IA-1			IA-2		
Lab Sample ID	Residential	Non-Residential	Residential	Non-Residential	22-9749-10			22-9749-11			22-9749-12			22-9749-4			22-9749-2			22-9749-3		
Sample Collection Date(s)	(ug/m^3)	(ug/m^3)	(ug/m^3)	(ug/m^3)	3/6/2012			3/6/2012			3/6/2012			3/5/2012			3/5/2012			3/5/2012		
NJDEP-LLTO015-RESULTS					Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Benzene	16	26	2	2	ND		6	ND		6	ND		6	ND		0.6	ND		0.6	ND		0.6
Chloroethane	110	250	2	5	NA			NA			NA			NA			NA			NA		
Chloromethane	4,700	6,600	95	130	NA			NA			NA			NA			NA			NA		
1,2-Dichloroethane	20	20	2	2	NA			NA			NA			NA			NA			NA		
1,2-Dichloroethene (cis)	1,800	2,600	36	51	NA			NA			NA			NA			NA			NA		
1,2-Dichloroethene (trans)	3,600	5,100	73	100	NA			NA			NA			NA			NA			NA		
Methylene chloride	190	430	4	9	NA			NA			NA			NA			NA			NA		
1,1,2,2-Tetrachloroethane	34	34	3	3	NA			NA			NA			NA			NA			NA		
Tetrachloroethene	34	36	3	3	NA			NA			NA			NA			NA			NA		
1,1,1-Trichloroethane	51,000	72,000	1,000	1,400	NA			NA			NA			NA			NA			NA		
1,1,2-Trichloroethane	27	27	3	3	NA			NA			NA			NA			NA			NA		
Trichloroethene	27	27	3	3	NA			NA			NA			NA			NA			NA		
Vinyl chloride	13	48	1	1	NA			NA			NA			NA			NA			NA		

Notes and Abbreviations:
NA - Not Analyzed
ND - The compound was targeted for analysis, but was not detected above the reporting limit
Qual - Laboratory data qualifier
RL - Reporting Limit
* - Field duplicate sample

1) All results and reporting limits are provided in units of micrograms per cubic meter ($\mu g/m^3$).
2) Detections appear in bold font.
3) Concentrations that are highlighted in yellow exceed at least the appropriate Residential Screening Levels.
4) Ambient air sample AA-3 and the duplicates collected at this location apply to both Building 699 and Building 700, which are immediately adjacent to one-another. As such, the results are shown for both Buildings 699 and 700.

Appendix A

Historical Groundwater Analytical Data

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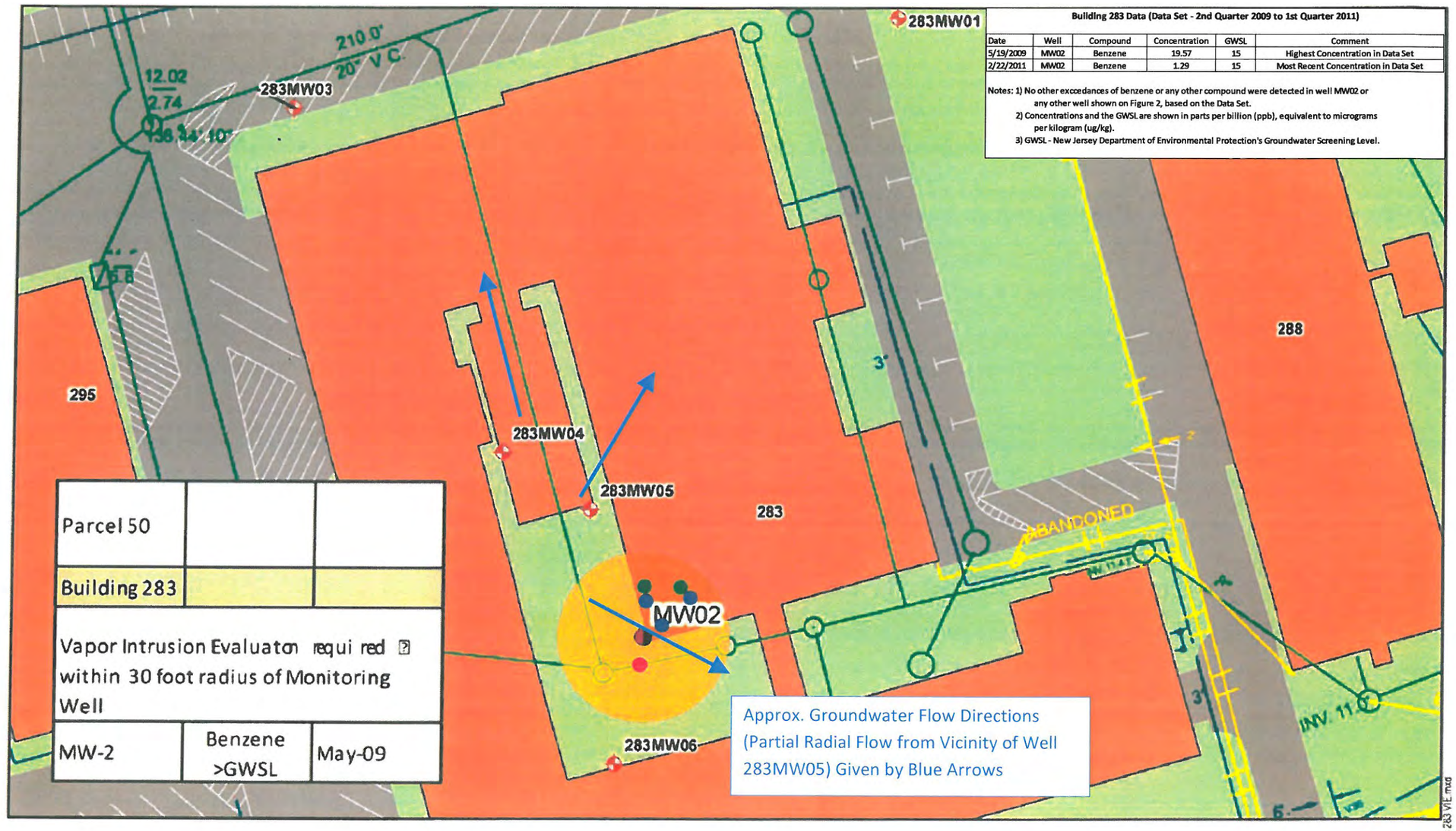

Building 283 Data (Data Set - 2nd Quarter 2009 to 1st Quarter 2011)

Date	Well	Compound	Concentration	GWSL	Comment
5/19/2009	MW02	Benzene	19.57	15	Highest Concentration in Data Set
2/22/2011	MW02	Benzene	1.29	15	Most Recent Concentration in Data Set

Notes: 1) No other exccedances of benzene or any other compound were detected in well MW02 or any other well shown on Figure 2, based on the Data Set.
2) Concentrations and the GWSL are shown in parts per billion (ppb), equivalent to micrograms per kilogram (ug/kg).
3) GWSL - New Jersey Department of Environmental Protection's Groundwater Screening Level.

Legend

- VIE Monitoring Wells_2
- Monitoring Well
- 30' Radius
- Existing Building
- Water
- Sewer
- Gas
- Steam
- Condensate
- Roadway & Parking
- Post Boundary
- Ambient Air Sample
- Indoor Air Sample
- Sub-Slab Sample

0' 30' 60' 120'

N W E S

BUREAU VERITAS

DRAWN BY: C. Ostermann	DATE: 2-9-12
CHECKED BY: G. Clark	DATE: 2-9-12
APPROVED BY: B. Munoz	DATE: 2-9-12
BUREAU VERITAS PROJECT NO.	

LOCATION: Main Post Building 283 Sherill Avenue

TITLE: Proposed Vapor Sampling Points Building 283

FIGURE: 2

Appendix B

Field Forms

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Building Evaluation Form Building 283, Main Post (Note: Information only for areas subject to VI Investigation)

Address: United States Army Fort Monmouth, Oceanport, New Jersey Date: 27 February 2012

Occupant Name: Vacant Phone: Not Applicable

Owner's Name: United States Army Phone: See Point of Contact

Owner's Address: P.O. Box 148, Oceanport, New Jersey

Point of Contact: Ms. Wanda Green Phone: 732-380-7064

Contact Information: Property owner requested the investigation. NJDEP notified on 22 February 2012

Conducted By: Ms. Wanda Green Company: OACSIM US Army Ft. Monmouth

A. GENERAL BUILDING INFORMATION

Provides information on building construction that will be used to identify possible points of VI (including preferential pathways) and documents the rationale for selecting sample locations.
(* Denotes information used in the EPA Spreadsheet Model.)

Building Type/Use: Now Vacant

Residential		Government
X Office (formerly)		School
Commercial		Warehouse
Industrial		Other:

Number of Occupants: Adults____ Infants____ Children 1-6____ Children 6-15____ N/A - vacant

*Area of Building Footprint: **Subject to VI: 1,500 sq ft** Number of Floors: **Subject to VI: One**

*Ceiling Height: 2 dropped ceilings lower at 8.5'; next at ~12.5'; Roof at ~30' - Building Age: **Approx. 77 years**

General Description of Building Construction Materials: **Brick & cinder block (exterior)**

acoustic board & paneling on interior sheet rock walls

*Foundation Type:	Basement	Crawl Space	X Slab	
Foundation Materials:	Poured Concrete		X Cinder Blocks	Earthen
	Wood		Other, specify	
Foundation Wall Material:	Poured Concrete		X Cinder Blocks	Earthen
	Wood		Stone	

Draw in the Floor Plan:

See Figure 2 of VI Investigation Report for a Plan View of the Area Subject to the VI Investigation

If there is a basement, please answer questions in Section B. If there is not a basement, skip to Section C.

There is no basement in the area subject to the VI Investigation.

B. BASEMENT INFORMATION

Provides information regarding VI and the potential for groundwater intrusion into basement, as well as documents human activity patterns (e.g., sleeping in the basement) that should be used to determine where samples should be collected.

(* Denotes information used in the EPA Spreadsheet Model.)

*Depth of basement or crawl space: _____

Is the basement finished? Yes No

Does anyone live in the basement as a primary residence or use the basement daily? Yes No

The basement is generally: Wet Dry Damp

Is there a sump in the basement? Yes No

If yes, please describe the size, the construction, where it is located and whether or not there is a sump pump and how it is activated.

_____

_____

_____

Does the basement have cracks? Yes No

If yes, what is the PID/FID/CGI reading? _____

Does the basement have a drainage point in floor? Yes No

If yes, what is the PID/FID/CGI reading? _____

Does the basement have pipes or utility conduits through floor or outside walls? Yes No

If yes, what is the PID/FID/CGI reading? _____

Is the basement sealed with waterproof paint or epoxy coating? Yes No

Does the basement have flooring over the foundation? Yes No

If yes, what type? Tile Carpet Wood

Pergo Other, specify _____

Are there odors in the basement? Yes No

If yes, describe: _____

C. FIRST FLOOR INFORMATION

Provides information on building construction and human activity patterns to be used to determine where samples should be collected.

What are the walls constructed of? **X** Cinder Block & Brick **X** Sheet Rock **X** Paneling

Other, Specify **Acoustic Board**

Is there flooring in the first floor? **X**Yes No

If Yes, what type? **X** Tile **X** Carpet Wood

Pergo Other, Specify _____

Are there pipes or utility conduits through the outside walls or floor? Yes **X** No

Not in rooms where VI Investigation samples were collected

If yes, what is the PID/FID/CGI reading?

Are there odors on the first floor? Yes **X** No If yes, describe _____

D. SECOND FLOOR INFORMATION (if applicable)

N/A - No second floor in area subject to VI Investigation

Provides information on building construction and human activity patterns to be used to determine where samples should be collected.

What are the walls constructed of? Cinder Block Sheet Rock Paneling

Other, specify _____

Is there flooring in the second floor? Yes No

If yes, what type? Tile Carpet Wood

_____ Pergo Other, specify

Are there pipes or utility conduits through the outside walls or floor? Yes No

If yes, what is the PID/FID/CGI reading? _____

Are there odors on the second floor? Yes No

If yes, describe _____

E. HEATING AND VENTILATION SYSTEMS

Provides information on the type of heating and ventilation system used in the structure to help identify potential indoor and outdoor contaminant sources, as well as provides information to assist with data interpretation.

What type of heating system(s) are used in the building? (Check all that apply)

Heat Pump/Furnace	Hot Air Radiation
Steam Radiation	Unvented Kerosene Heater
Wood Stove	**X** Electric Baseboard
X Other, specify:	Electric heaters w/ natural gas & forced air to some rooms.

What type of fuel(s) are used in the building? (Check all that apply)

X Natural Gas	**X** Electric
Fuel Oil	Wood
Coal	Solar
Other, specify _____	

What type of mechanical ventilation systems are present and/or currently operating in the building? (Check all that apply) **None observed in area subject to VI Investigation**

Mechanical Fans	Open Windows
Individual Air Conditioning Units	Kitchen Range Hood
Bathroom Ventilation Fan	Air-to-Air Heat Exchanger
Other, specify	

F. POTENTIAL SOURCES OF INDOOR CHEMICALS:

Helps identify typical sources of indoor air contamination that may be found in the building (including attached garages), and documents whether the item was removed from the building prior to the sampling event. **None observed in areas subject to the VI Investigation.**

Which of these items are present in the building? (Check all that apply)

Potential VOC Source	Location of Source	Removed at least 24 hours prior to sampling (Yes/No/NA)
Paints		
Gas-powered equipment		
Gasoline storage cans		
Cleaning solvents (thinner)		
Air fresheners		
Oven cleaners		
Carpet / Upholstery cleaners		
Hairspray		
Nail polish / Polish remover		
Bathroom cleaner		
Appliance cleaner		
Furniture / Floor polish		
Mothballs		
Fuel tank		
Woodstove		
Fireplace		
Perfume / Colognes		
Hobby supplies (e.g., solvents, paints, lacquers, glues, photographic darkroom chemicals)		
Scented trees, wreaths, potpourri, etc.		

Potential VOC Source	Location of Source	Removed at least 24 hours prior to sampling (Yes/No/NA)
Polish / Wax		
Insecticide / Pesticide		
Kerosene		
Other		

G. BUILDING USE:
Provides miscellaneous information about human activities and building construction that may assist in the data interpretation and identification of indoor and outdoor contaminant sources.

Is there standing water in the building (historic or current)? Yes X No

Is there water damage in the building (historic or current)? Yes X No

Is there fire damage to the building? Yes X No If yes, date_____

Is there a septic system? Yes X No If yes, date of system_____

Do one or more smokers occupy this building on a regular basis? Yes X No

Has anybody smoked in the building in the last 48 hours? Yes X No

Does the building have an attached garage? Yes X No

If so, is a car usually parked in the garage? Yes No

Do the occupants of the building frequently have their clothes dry-cleaned? Yes X No

Was recent remodeling or painting done in the building? Yes X No

Date: _____ Location: _____ Activity:

_____

Are there any pressed wood products in the building (e.g., hardwood, plywood, wall paneling, particleboard, fiberboard)? X Yes No

Wall paneling and acoustic board

Are there new furniture, upholstery, drapes, or other textiles in the building? Yes X No

Date: _____ Location: _____ Item(s):

_____

Has the building been treated with any insecticides/pesticides? Yes X No

Chemicals used and how often they are applied? **None are currently used; cleaning chemicals may have been used historically.**

Do any of the occupants apply pesticides/herbicides in the yard or garden? Yes **X** No

If yes, what chemicals are used and how often are they applied?_____

_____

Type of ground cover (e.g., grass, pavement, etc.) outside the building: Grass

Is there a well on the property? **X** Yes No

If yes, what is it used for and where is it screened? Monitoring wells (see Figure 2)

Is there any other information about the structural features of this building, the habits of its occupants or potential sources of constituent contaminants to the indoor air that may be of importance in facilitating the evaluation of the indoor air quality of the building?

_____

_____

_____

H. OTHER POTENTIAL SOURCES OF INDOOR OR OUTDOOR AIR CONTAMINATION

Helps identify typical sources of background indoor air contamination that may be found in the building or outside the building, and includes a table to document the results of portable field screening measurements. A portable photo-ionization detector (PID) can be used to identify individual cans of solvents that should be removed prior to the sampling event or to identify VI points and help with on-site decisions regarding sample placement.

Outdoor Sources of Contamination (check all that apply): Smoking area to south of Room 115.

Garbage Dumpsters	Heavy Motor Traffic
Loading Dock In Use	Construction Activities
Airport Flight Path	Railyard / Railcar Traffic

Nearby Industries, specify _____

UST/AST (gasoline / heating fuel / other, specify _____)

Is there a known spill or release outside or inside the building? **X** Yes No

If yes, was it:

Oil	Natural Gas
Kerosene	Heating Oil
Used Vehicle Oil	Solvents
Pesticide / Insecticide	⊛ Other, describe Gasoline

Describe any additional information about the release (amount, when it occurred, action taken to clean up, etc):

The release resulted from a leaking underground storage tank. As of 26 January 2010, remaining contamination was limited to benzene in groundwater at one well. Additional groundwater samples collected from May 2010 through the first quarter 2011 demonstrate that all groundwater impacts have attenuated as a result of active groundwater remediation.

I. BUILDING SCREENING RESULTS (PID/FID/CGI)

Location	FID (ppm)	PID (ppm)	CGI (%)
Basement			
First Floor		0.0	
Second Floor			
Other			

PID – photo-ionization detector; FID – flame ionization detector; CGI – combustible gas indicator.

Note: Data measured using a Photoionization detector (PID) with an 11.7 electron-Volt lamp.

INSTRUCTIONS FOR OCCUPANTS OF BUILDING PRIOR TO SAMPLING EVENT (to be followed starting at least 24 hours prior to and during the sampling event)

- Operate furnace and whole house air-conditioner as appropriate for current weather conditions.
- Do not keep doors open.
- Do not use air fresheners or odor eliminators.
- Do not smoke in the house.
- Do not use wood stoves, fireplace or auxiliary heating equipment (e.g., kerosene heater).
- Do not use paints or varnishes.
- Do not use cleaning products (e.g., bathroom cleaners, furniture polish, appliance cleaners, all-purpose cleaners, floor cleaners).
- Do not use cosmetics, including hair spray, nail polish, nail polish remover, perfume, etc.
- Do not partake in indoor hobbies that use solvents.
- Do not apply pesticides.
- Do not store containers of gasoline, oil, petroleum-based or other solvents, within the house or attached garage (except for fuel oil tanks).
- Do not operate or store automobiles in an attached garage.

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APPENDIX K: FTMM-61 Building 283 Gasoline Storage

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1.0 WATER LEVEL MEASUREMENTS AND WELL ASSESSMENT K-1
2.0 GROUNDWATER SAMPLING K-1
3.0 HISTORICAL GROUNDWATER SAMPLING RESULTS K-1
4.0 ANNUAL (FOURTH QUARTER) 2014 GROUNDWATER RESULTS K-2
5.0 FINDINGS AND RECOMMENDATIONS K-2

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Table No.	Title
1	Groundwater Gauging Data and Elevations (September 29, 2014) and LFPS Sampling Summary
2	Historical Groundwater Analytical Results
3	Groundwater Analytical Results - 2013 and 2014
4	Review of Historical Groundwater Sampling Results

LIST OF FIGURES

Figure No.	Title
1	Layout of FTMM-61 Building 283 Gasoline Storage
2	FTMM-61 Shallow Groundwater Contours - September 29, 2014

LIST OF ATTACHMENTS

Attachment	Title
A	LFPS Field Sheets

1.0 WATER LEVEL MEASUREMENTS AND WELL ASSESSMENT

Monitoring wells located within FTMM-61 were gauged on September 29, 2014. Monitoring well locations as well as other site features are provided in **Figure 1**. Details regarding the water level measurements are provided in **Table 1**. Groundwater elevations in monitoring wells ranged from 3.04 (283MW01) to 8.75 (283MW04) feet above mean sea level (amsl). The inferred shallow groundwater flow direction is generally to the northwest, as shown in **Figure 2**.

During the groundwater gauging, the physical condition of FTMM-61 monitoring wells were assessed. The site monitoring wells were found to be in good condition.

2.0 GROUNDWATER SAMPLING

A groundwater sample was collected from monitoring well 283MW02 located at FTMM-61 as part of the annual (fourth quarter) 2014 groundwater sampling event. FTMM-61 is sampled on an annual basis. The groundwater sampling program included measuring the depth to groundwater in monitoring wells prior to sampling and collection of groundwater samples using low-flow purging and sampling (LFPS). The groundwater sample was collected on October 2, 2014. The groundwater sample was analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) via the United States Environmental Protection Agency (USEPA) Method SW8260C.

The sample was collected in accordance with the New Jersey Department of Environmental Protection (NJDEP) Field Sampling Procedures Manual (FSPM) and the Sampling Analysis Plan (SAP). Field blanks, duplicates, matrix spike, matrix spike duplicate and quality assurance (QA) split samples were collected for every 5% of samples collected per parameter, per matrix, in accordance with the Quality Assurance Project Plan (QAPP). Trip blanks accompanied each cooler each day in which VOCs were collected for laboratory analysis.

The completed LFPS field sheets can be found in **Attachment A**.

3.0 HISTORICAL GROUNDWATER SAMPLING RESULTS

From March 2008 to November 2010, groundwater samples were collected from FTMM-61 monitoring wells and analyzed for VOCs and metals.

The last four historical rounds of quarterly groundwater sampling conducted at FTMM-61, from November 2010 to August 2011, also consisted of VOC and metals analysis. Historically, benzene, VOC tentatively identified compounds (TICS), aluminum, antimony, arsenic, beryllium, iron, manganese, lead and sodium were detected above their respective NJDEP Ground Water Quality Standard (GWQS). Cadmium, sodium, and beryllium were detected at concentrations greater than their background concentrations established in the 1995 Weston Report. Elevated sodium concentrations are attributable to the proximity of the site to the ocean and brackish water bodies. Beryllium and cadmium were both one-time detections attributed to background conditions (Weston, 1995) and not associated with historical site operations. Historical groundwater analytical results are presented in **Table 2.**

Groundwater samples collected from four monitoring wells during the August 2013 Baseline Groundwater Sampling Event and were analyzed for VOCs and lead. No analytes were detected above their respective NJDEP GWQS. Groundwater analytical detections from samples collected during the August 2013 sampling event are presented in **Table 3**.

The Final August 2013 Baseline Groundwater Sampling Report was accepted by the NJDEP in their February 5, 2015 letter. Based on this approval, three out of the four groundwater monitoring wells were removed from the long term monitoring (LTM) program including 283MW01, 283MW03 and 283MW04; and lead analysis was discontinued.

4.0 ANNUAL (FOURTH QUARTER) 2014 GROUNDWATER RESULTS

No VOCs were detected above their method detection limit in the sample collected at monitoring well 283MW02. Groundwater analytical detections from the sample collected during the annual (fourth quarter) 2014 sampling event are presented in **Table 3**.

5.0 FINDINGS AND RECOMMENDATIONS

Historically, monitoring well 283MW02 has exhibited concentrations above the NJDEP GWQS for benzene and VOC TICs. Concentrations of these compounds have been decreasing over time and currently benzene and VOC TICs concentrations were non-detect during the 2013 and 2014 sampling events. The NJDEP, in their July 3, 2014 comment letter (see **Appendix Q**), approved one additional round of sampling to confirm the 2013 VOCs results at monitoring well 283MW02 before discontinuing the LTM program at FTMM-61. The 2014 results confirm the 2013 results; concentrations of VOCs were non-detect in the groundwater sample at well 283MW02. Therefore, based on the collective groundwater sampling results, it is recommended that the groundwater LTM program be discontinued at FTMM-61. A review of the historical groundwater results are presented in **Table 4**, which provides the matrix used to determine the status of wells relative to future groundwater sampling and analyses.

TABLES

Table 1 Groundwater Gauging Data and Elevations (September 29, 2014) and LFPS Sampling Summary

Table 2 Historical Groundwater Analytical Results

Table 3 Groundwater Analytical Results - 2013 and 2014

Table 4 Review of Historical Groundwater Sampling Results

Table 1
Groundwater Gauging Data and Elevations (September 29, 2014) and LFPS Sampling Summary
Site FTMM-61 Building 283 Gasoline Storage
Annual (Fourth Quarter) 2014 Groundwater Sampling Report
Fort Monmouth, New Jersey

Site/Well ID	Installation Date	Well Permit #	Y Coord. (North)	X Coord. (East)	Depth (ft. bgs)	Casing Length (ft)	Screen Length (ft)	TOC Elevation (ft)	Gauge Time	PID Reading (ppm)	Gauged Depth to Water (ft. TOC)	Gauged Depth to Bottom (ft. TOC)	Calculated Groundwater Elevation (ft)	Well Sampled this Event
Shallow Monitoring Wells														
283MW01	3/28/2000	29-40367	540322.37	618946.24	25.0	5.0	20.0	10.25	8:40	0.0	7.21	19.10	3.04	
283MW02	7/28/1999	29-40887	540539.91	619033.20	20.0	5.0	15.0	12.43	8:51	0.0	6.60	19.95	5.83	x
283MW03	3/28/2000	29-41650	540508.03	618821.32	20.0	5.0	15.0	10.77	8:53	0.0	7.23	24.80	3.54	
283MW04	10/13/2004	29-00050701	540387.14	618896.25	18.0	3.0	15.0	13.93	8:49	0.0	5.18	18.15	8.75	
283MW05	10/13/2004	29-00050702	540367.06	618927.34	18.0	3.0	15.0	13.82	8:45	0.0	6.90	17.20	6.92	
283MW06	9/22/2004	29-00050703	540277.76	618936.66	18.0	3.0	15.0	13.56	8:38	0.0	6.21	18.19	7.35	

Notes:
1) The synoptic round of water levels in the wells was collected on September 29, 2014.
2) Information on well permit number, X and Y coordinates, depth, screen length, screen interval and TOC elevation were provided by FTMM in a table in June 2013.
3) ft = feet
4) DTW = depth to water (measured from the top of well casing)
5) DTB = depth to bottom of well (measured from the top of well casing)
6) bgs = below ground surface
7) ppm = parts per million (of VOCs)
8) TOC = Top of Casing
9) Elevation = feet above mean sea level
10) N/A = information not available
11) LFPS = Low-Flow Purging and Sampling

Table 2
Historical Groundwater Analytical Results
Site FTMM-61 Building 283 Gasoline Storage
Annual (Fourth Quarter) 2014 Groundwater Sampling Report
Fort Monmouth, New Jersey

				283MW01																											
Round No.	NJDEP GWQS	USEPA MCL	Weston 1995 Background (Main Post)	34		34 Dup		35		35 Dup		36		36 Dup		37		37 Dup		38		38 Dup		39		39 Dup		40	
Date Collected				3/6/2008		3/6/2008		5/2/2008		5/2/2008		8/6/2008		8/6/2008		10/23/2008		10/23/2008		3/12/2009		3/12/2009		5/19/2009		5/19/2009		8/19/2009	
ANALYTE/Lab ID				80069.04		80069.03		80150.04		80150.03		80280.04		80280.03		80385.04		80385.02		90104.04		90104.03		90203.04		90203.04		90348.04	
Volatile Organic Compounds (µg/L)																															
Benzene	1	5	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromodichloromethane	1	80	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroform	70	80	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cyclohexane	100.0	NLE	--	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Ethylbenzene	700	700	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isopropylbenzene	700	NLE	--	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Methylcyclohexane	NLE	NLE	--	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
4-Methyl-2-pentanone	NLE	NLE	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Styrene	100	100	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Toluene	600	1000	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Xylenes (Total)	1000	10,000	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TICs*	500	NLE	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Metals (µg/L)																															
Aluminum	200	NLE	121000	6400.00		6450.00		4890.00		4830.00		4590.00		4620.00		4650.00		4710.00		3820.00		3810.00		2710.00		2640.00		3050.00			
Antimony	6	6	20.70	ND		ND		ND		ND		ND		ND		ND		ND		ND		10.30		1.20		2.03	ER	ND			
Arsenic	3	10	89.30	ND		ND		ND		ND		ND		ND		ND		3.95	ER	2.98	ER	16.00		12.40		11.90		5.48			
Barium	6000	2000	699.00	133.00		134.00		112.00		110.00		118.00		117.00		111.00		113.00		87.80		88.30		72.60		70.30		90.20			
Beryllium	1	4	2.10	1.14	ER	1.16	ER	1.23	ER	1.15	ER	1.28	ER	1.27	ER	1.20	ER	1.21	ER	0.79		0.83		0.71		0.68		1.01			
Cadmium	4	5	9.50	0.62	ER	0.58	ER	ND		0.29	ER	0.48	ER	0.36	ER	0.87	ER	0.84	ER	ND		ND		0.61	ER	0.40	ER	ND			
Calcium	NLE	NLE	45400.00	14300.00		14400.00		11400.00		11300.00		10300.00		10300.00		11100.00		11300.00		9610.00		9970.00		8670.00		8360.00		9130.00			
Chromium	70	100	191.00	0.95	ER	1.10	ER	0.53	ER	0.80	ER	1.26	ER	1.23	ER	1.05	ER	1.08	ER	1.43	ER	1.28	ER	0.66	ER	0.39	ER	1.58	ER		
Cobalt	NLE	NLE	18.30	6.73		6.76		5.79		5.54		5.52		5.41		5.45		5.47		4.70		4.73		3.83		3.71		4.09			
Copper	1300	1300	65.60	5.77		4.08	ER	1.53	ER	2.01	ER	2.14	ER	2.39	ER	1.98	ER	2.16	ER	2.48	ER	2.32	ER	2.49	ER	2.15	ER	2.78	ER		
Iron	300	NLE	431000	ND		ND		72.20		44.70		135.00		113.00		216.00		227.00		146.00	ER	75.30	ER	83.50	ER	67.70	ER	170.00	ER		
Lead	5	15	22.70	ND		ND		ND		ND		ND		ND		ND		2.48	ER	1.53	ER	ND		2.62	ER	ND		ND			
Magnesium	NLE	NLE	62700	27500.00		27600.00		22500.00		22300.00		20600.00		20600.00		21400.00		21700.00		18500.00		18500.00		13800.00		13400.00		16400.00			
Manganese	50	NLE	331	64.20		64.60		52.80		52.00		48.50		48.30		52.00		51.60		44.20		44.40		35.10		33.90		39.30			
Mercury	2	2	0.26	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		0.16	ER		
Nickel	100	NLE	187	21.40		20.00		14.90		15.10		13.40		12.90		12.90		13.00		11.20		12.10		9.80		9.33		11.60			
Potassium	NLE	NLE	137000	7700.00		7920.00		6550.00		6310.00		6730.00		6620.00		7280.00		7280.00		5360.00		5350.00		5300.00		5130.00		7270.00			
Selenium	40	50	29.60	ND		4.20 ER	ER	5.65	ER	6.32	ER	8.88	ER	3.90	ER	6.58	ER	6.52	ER	47.80		50.90		5.02	ER	ND		19.30			
Silver	40	NLE	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND			
Sodium	50000	NLE	21500	138000.00		140000.00		125000.00		123000.00		125000.00		126000.00		121000.00		121000.00		118000.00		118000.00		94300.00		91700.00		107000.00			
Thallium	2	2	5.50	ND		ND		ND		ND		ND		ND		ND		1.60	ER	ND		ND		ND		ND		ND			
Vanadium	60	NLE	108	1.02		0.79		0.23		0.50		ND		ND		ND		ND		0.43	ER	0.83	ER	ND		0.37	ER	ND			
Zinc	2000	NLE	233	131.00		131.00		96.20		95.90		81.70		81.60		92.10		94.10		78.00		78.60		64.60		62.50		75.70			

Notes:
Shaded cells = concentrations exceed the NJDEP GWQS

*TICs - Tentatively identified compounds, cannot exceed 500 µg/L for VOCs and SVOCs. No individual compound can exceed 100 µg/L.
NJDEP GWQS = Ground Water Quality Criteria as per N.J.A.C. 7:9-6 (July 22, 2010)

USEPA MCL = U.S. Environmental Protection Agency Maximum Contaminant Level (2012)
LF = Low-flow sampling method used to collect sample
< = Analyte does not exceed the detection limit shown
J = Estimated concentration exceeds the method detection limit (MDL) and is less than the reporting limit (RL)
NA = Not analyzed
ND = Not detected
NLE = No limit established
ER = Estimated Result

Table 2
Historical Groundwater Analytical Results
Site FTMM-61 Building 283 Gasoline Storage
Annual (Fourth Quarter) 2014 Groundwater Sampling Report
Fort Monmouth, New Jersey

				283MW01																283MW02							
Round No.	NJDEP GWQS	USEPA MCL	Weston 1995 Background (Main Post)	41		42		LF3		LF4		LF5		LF5 Dup		LF6	LF7	LF8	Dup	37		38		39		40	
Date Collected				11/5/2009		1/26/2010		5/17/2010		9/29/2010		11/18/2010		11/18/2010		2/22/2011	4/19/2011	8/18/2011	8/18/2011	3/6/2008		5/2/2008		8/6/2008		10/23/2008	
ANALYTE/Lab ID				90437.04		10035.04		10194.05		10416.02		10499.04		10499.03		11064.08	11154.01	11346.04	11346.03	80069.05		80150.05		80280.05		80385.05	
Volatile Organic Compounds (µg/L)																											
Benzene	1	5	--	ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	27.91		26.57		76.07		48.45	
Bromodichloromethane	1	80	--	ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND		ND		ND		ND	
Chloroform	70	80	--	ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	ND		ND		ND		ND	
Cyclohexane	100.0	NLE	--	NA		NA		NA		NA		NA		NA		NA	NA	ND	ND	NA		NA		NA		NA	
Ethylbenzene	700	700	--	ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	374.24		322.15		317.43		358.50	
Isopropylbenzene	700	NLE	--	NA		NA		NA		NA		NA		NA		NA	NA	ND	ND	NA		NA		NA		NA	
Methylcyclohexane	NLE	NLE	--	NA		NA		NA		NA		NA		NA		NA	NA	ND	ND	NA		NA		NA		NA	
4-Methyl-2-pentanone	NLE	NLE	--	ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	1.04	J	ND		ND		ND	
Styrene	100	100	--	ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	0.90	J	0.97	J	ND		ND	
Toluene	600	1000	--	ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	27.72		21.68		35.37		28.06	
Xylenes (Total)	1000	10,000	--	ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	484.87		305.69		545.78		484.30	
TICs*	500	NLE	--	ND		ND		ND		ND		ND		ND		ND	ND	ND	ND	184.00		185.00		229.00		252.00	
Metals (µg/L)																											
Aluminum	200	NLE	121000	3580.00		4050.00		3370.00		1770.00		2190.00		2030.00		3990.00	2820.00	2410.00	2420.00	396.00		272.00		190.00		222.00	
Antimony	6	6	20.70	ND		5.09	ER	ND		6.72	ER	ND		ND		<6.0	<6.0	<6.0	<6.0	ND		ND		ND		ND	
Arsenic	3	10	89.30	1.27	ER	ND		1.34	ER	ND		ND		ND		<3.0	<3.0	<3.0	<3.0	7.67		23.20		8.48		13.30	
Barium	6000	2000	699.00	95.20		97.80		79.50		67.00		86.50		80.00		<200	<200	<200	<200	41.30		38.70		48.90		29.70	
Beryllium	1	4	2.10	1.00		0.90		0.84		0.55		0.88		0.85		1.50	<1.0	<1.0	<1.0	ND		0.21	ER	ND		0.20	ER
Cadmium	4	5	9.50	ND		ND		ND		ND		0.70	ER	0.54	ER	<3.0	10.20	<3.0	<3.0	ND		0.30	ER	0.64	ER	0.28	ER
Calcium	NLE	NLE	45400.00	8650.00		10300.00		8300.00		13800.00		15500.00		14100.00		9590.00	14900.00	7660.00	7970.00	1440.00		1770.00		1280.00		962.00	
Chromium	70	100	191.00	ND		ND		ND		ND		ND		ND		<10	<10	<10	<10	4.89	ER	2.98	ER	2.57	ER	1.80	ER
Cobalt	NLE	NLE	18.30	4.56		5.02		4.13		2.29		3.71		3.48		<50	<50	<50	<50	ND		ND		0.23		ND	
Copper	1300	1300	65.60	ND		ND		1.54	ER	6.57		1.92	ER	1.16	ER	<10	<10	<10	<10	2.04	ER	ND		ND		ND	
Iron	300	NLE	431000	148.00	ER	83.80	ER	ND		35.50		167.00	ER	1.81		<100	504.00	127.00	285.00	2880.00		2800.00		3260.00		1700.00	
Lead	5	15	22.70	ND		ND		ND		ND		ND		ND		<3.0	<3.0	<3.0	<3.0	7.86		8.05		4.73	ER	7.34	
Magnesium	NLE	NLE	62700	17100.00		20200.00		16400.00		11400.00		14100.00		12800.00		16700.00	13200.00	12300.00	12500.00	999.00		898.00		1040.00		683.00	
Manganese	50	NLE	331	39.90		56.70		39.50		29.90		34.90		31.70		51.90	43.20	43.90	39.20	5.19		5.62		4.67		3.57	
Mercury	2	2	0.26	ND		ND		ND		ND		ND		ND		<0.20	<0.20	<0.20	<0.20	ND		ND		ND		ND	
Nickel	100	NLE	187	12.10		15.50		10.10		8.21		11.30		10.40		12.90	11.30	10.90	<10	5.16		2.18	ER	1.95	ER	2.45	ER
Potassium	NLE	NLE	137000	6630.00		6740.00		6280.00		7170.00		8930.00		8320.00		<10000	<10000	<10000	<10000	1640.00		1650.00		ND		1300.00	
Selenium	40	50	29.60	18.00	ER	ND		NR		ND		2.33	ER	ND		<10	<10	<10	<10	9.64	ER	9.33	ER	9.83	ER	8.33	ER
Silver	40	NLE	ND	ND		1.81	ER	ND		ND		ND		ND		<10	<10	<10	<10	ND		ND		1.01		ND	
Sodium	50000	NLE	21500	114000.00		121000.00		104000.00		119000.00		119000.00		111000.00		116000.00	116000.00	101000.00	90700.00	14700.00		14900.00		14700.00		13100.00	
Thallium	2	2	5.50	ND		ND		ND		ND		ND		ND		<2.0	<2.0	<2.0	<2.0	ND		ND		ND		1.48	ER
Vanadium	60	NLE	108	0.82	ER	1.35	ER	ND		0.75	ER	0.69	ER	ND		<50	<50	<50	<50	2.30		2.02		0.38		ND	
Zinc	2000	NLE	233	77.10		71.60		74.30		54.40		68.70		62.70		88.80	85.60	78.50	73.30	12.00		3.43		ND		6.81	

Notes:
Shaded cells = concentrations exceed the NJDEP GWQS

*TICs - Tentatively identified compounds, cannot exceed 500 µg/L for VOCs and SVOCs. No individual compound can exceed 100 µg/L.
NJDEP GWQS = Ground Water Quality Criteria as per N.J.A.C. 7:9-6 (July 22, 2010)

USEPA MCL = U.S. Environmental Protection Agency Maximum Contaminant Level (2012)
LF = Low-flow sampling method used to collect sample
< = Analyte does not exceed the detection limit shown
J = Estimated concentration exceeds the method detection limit (MDL) and is less than the reporting limit (RL)
NA = Not analyzed
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Table 2
Historical Groundwater Analytical Results
Site FTMM-61 Building 283 Gasoline Storage
Annual (Fourth Quarter) 2014 Groundwater Sampling Report
Fort Monmouth, New Jersey

				283MW02												283MW03		
Round No.	NJDEP GWQS	USEPA MCL	Weston 1995 Background (Main Post)	41	42	43	44	45	LF3	LF3 Dup	LF4	LF5	LF6	LF7	LF8	34	35	36
Date Collected				3/12/2009	5/19/2009	8/19/2009	11/5/2009	1/26/2010	5/20/2010	5/20/2010	9/30/2010	11/18/2010	2/22/2011	4/18/2011	8/18/2011	3/6/2008	5/2/2008	8/6/2008
ANALYTE/Lab ID				90104.05	90203.05	90348.05	90437.05	10035.05	10204.04	10204.03	10419.07	10499.07	11064.05	11152.05	11346.09	80096.06	80150.06	80280.06
Volatile Organic Compounds (µg/L)																		
Benzene	1	5	--	20.86	19.57	4.03	1.57 J	3.83	ND	ND	0.87 J	2.99	1.29	1.08	1.60	ND	ND	ND
Bromodichloromethane	1	80	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	70	80	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	100.0	NLE	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	23.90	NA	NA	NA
Ethylbenzene	700	700	--	241.36 D	287.82 D	26.78	7.13	117.05 D	6.51	8.72	34.01	1.03	2.02	85.23	38.30	ND	ND	ND
Isopropylbenzene	700	NLE	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.20	NA	NA	NA
Methylcyclohexane	NLE	NLE	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	6.50	NA	NA	NA
4-Methyl-2-pentanone	NLE	NLE	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	100	100	--	0.51 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	600	1000	--	15.06	30.58	4.88	1.22 J	6.97	1.04 J	1.23 J	1.15 J	2.66	1.87	3.24	1.70	ND	ND	ND
Xylenes (Total)	1000	10,000	--	155.23 D	582.38 D	89.24	17.30	260.18	86.67	95.71	63.60	118.66	131.82	185.03	88.10	ND	ND	ND
TICs*	500	NLE	--	231.00	247.00	249.00	134.00	1840.00	2920.00	3161.00	586.00	4805.00	2405.00	1982.00	263.70	ND	ND	ND
Metals (µg/L)																		
Aluminum	200	NLE	121000	1120.00	288.00	347.00	409.00	2.73	75.90 ER	73.50 ER	111.00	111.00	<200	1570.00	3150.00	88.80	ND	ND
Antimony	6	6	20.70	1.29 ER	ND	10.30	ND	ND	6.27 ER	10.20	6.29 ER	6.95 ER	<6.0	<6.0	<6.0	ND	ND	ND
Arsenic	3	10	89.30	39.10	14.40	38.20	10.25	8.38	22.61	23.28	12.98	14.49	4.90	7.50	7.90	5.62	5.45	4.06 ER
Barium	6000	2000	699.00	37.30	29.80	29.40	49.00	26.30	23.40	23.50	36.70	53.10	<200	<200	<200	227.00	168.00	231.00
Beryllium	1	4	2.10	ND	ND	ND	ND	ND	0.04 ER	ND	ND	ND	<1.0	<1.0	<1.0	ND	0.24 ER	ND
Cadmium	4	5	9.50	ND	0.47 ER	ND	ND	ND	ND	ND	ND	0.74 ER	<3.0	<3.0	<3.0	0.23 ER	2.87	2.47
Calcium	NLE	NLE	45400.00	2190.00	1210.00	116000.00	168000.00	65800.00	19700.00	20100.00	44500.00	56800.00	21400.00	<5000	29100.00	23400.00	24300.00	26000.00
Chromium	70	100	191.00	14.00	2.91 ER	17.80	13.50	6.12	1.44 ER	1.44 ER	2.84 ER	2.19 ER	<10	<10	33.10	ND	ND	ND
Cobalt	NLE	NLE	18.30	0.66 ER	0.29 ER	ND	ND	ND	ND	ND	ND	0.32 ER	<50	<50	<50	1.27	1.46	1.59
Copper	1300	1300	65.60	ND	ND	6.55	2.11 ER	ND	ND	ND	4.54 ER	2.50 ER	<10	11.20	13.80	1.38 ER	ND	ND
Iron	300	NLE	431000	4220.00	2010.00	ND	530.00	625.00	1260.00	1210.00	461.00 ER	1030.00	1120.00	3350.00	8040.00	24700.00	24500.00	23000.00
Lead	5	15	22.70	10.40	6.03	6.52	5.53	6.95	11.50	10.20	4.12 ER	6.90	4.40	3.90	7.80	ND	1.43 ER	ND
Magnesium	NLE	NLE	62700	1160.00	799.00 ER	237.00 ER	2950.00	1080.00	747.00 ER	765.00 ER	4300.00	2120.00	<5000	<5000	<5000	4480.00	4740.00	4940.00
Manganese	50	NLE	331	7.12	4.30 ER	4.74 ER	30.10	7.08	8.41	7.91	9.42	25.70	16.60	<15	27.90	65.60	73.30	76.30
Mercury	2	2	0.26	0.55	ND	ND	ND	ND	ND	ND	ND	ND	<0.20	<0.20	<0.20	ND	ND	ND
Nickel	100	NLE	187	1.64 ER	2.05 ER	1.94 ER	7.75	5.12	2.07 ER	2.37 ER	1.62 ER	4.63 ER	<10	<10	<10	12.30	10.60	11.00
Potassium	NLE	NLE	137000	2340.00	1180.00	4690.00	3440.00	2240.00	1400.00	1440.00	2850.00	2650.00	<10000	<10000	<10000	10900.00	11000.00	10500.00
Selenium	40	50	29.60	30.30	7.34 ER	126.00	50.70	19.20 ER	NR	NR	8.33	4.69 ER	<10	<10	<10	ND	ND	ND
Silver	40	NLE	ND	ND	ND	ND	7.54	4.42 ER	ND	ND	ND	ND	<10	<10	<10	ND	2.92	3.53
Sodium	50000	NLE	21500	14000.00	11800.00	17900.00	17100.00	14400.00	12800.00	14300.00	17900.00	13800.00	16000.00	11300.00	24000.00	10600.00	10700.00	11700.00
Thallium	2	2	5.50	ND	ND	ND	ND	ND	ND	ND	ND	ND	<2.0	<2.0	<2.0	ND	ND	ND
Vanadium	60	NLE	108	6.56	1.80 ER	7.24	8.39	5.42	1.26 ER	0.64 ER	2.63 ER	1.64 ER	<50	<50	<50	ND	ND	ND
Zinc	2000	NLE	233	9.64 ER	6.70 ER	5.17 ER	16.00 ER	ND	7.74 ER	8.23 ER	2.30 ER	5.00 ER	<20	30.50	30.60	19.30	7.27	ND

Notes:
Shaded cells = concentrations exceed the NJDEP GWQS

*TICs - Tentatively identified compounds, cannot exceed 500 µg/L for VOCs and SVOCs. No individual compound can exceed 100 µg/L.
NJDEP GWQS = Ground Water Quality Criteria as per N.J.A.C. 7:9-6 (July 22, 2010)

USEPA MCL = U.S. Environmental Protection Agency Maximum Contaminant Level (2012)
LF = Low-flow sampling method used to collect sample
< = Analyte does not exceed the detection limit shown
J = Estimated concentration exceeds the method detection limit (MDL) and is less than the reporting limit (RL)
NA = Not analyzed
ND = Not detected
NLE = No limit established
ER = Estimated Result

Table 2
Historical Groundwater Analytical Results
Site FTMM-61 Building 283 Gasoline Storage
Annual (Fourth Quarter) 2014 Groundwater Sampling Report
Fort Monmouth, New Jersey

				283MW03																					
Round No.	NJDEP GWQS	USEPA MCL	Weston 1995 Background (Main Post)	37		38		39		40		41		42		LF3		LF3 Dup		LF4		LF5		LF5 Dup		LF6	LF7	LF8
Date Collected				10/23/2008		3/12/2009		5/19/2009		8/19/2009		11/5/2009		1/26/2010		5/17/2010		5/17/2010		9/29/2010		11/17/2010		11/17/2010		2/22/2011	4/19/2011	8/18/2011
ANALYTE/Lab ID				80385.06		90104.06		90203.06		90348.06		90437.06		10035.06		10194.04		10194.03		10416.01		10495.04		10495.03		11064.09	11154.02	11346.05
Volatile Organic Compounds (µg/L)																												
Benzene	1	5	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND
Bromodichloromethane	1	80	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND
Chloroform	70	80	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND
Cyclohexane	100.0	NLE	--	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	NA	ND
Ethylbenzene	700	700	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND
Isopropylbenzene	700	NLE	--	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	NA	ND
Methylcyclohexane	NLE	NLE	--	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	NA	ND
4-Methyl-2-pentanone	NLE	NLE	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND
Styrene	100	100	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND
Toluene	600	1000	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND
Xylenes (Total)	1000	10,000	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND
TICs*	500	NLE	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	ND	ND
Metals (µg/L)																												
Aluminum	200	NLE	121000	79.00		31.50	ER	33.60	ER	116.00		78.30	ER	23.80	ER	21.20	ER	19.80	ER	84.10	ER	19.20	ER	ND		<200	<200	377.00
Antimony	6	6	20.70	ND		12.10		1.44	ER	4.97	ER	ND		ND		ND		ND		ND		ND		ND		<6.0	<6.0	<6.0
Arsenic	3	10	89.30	ND		64.00		20.50		20.90		4.75	ER	3.69	ER	3.59	ER	3.95	ER	3.69	ER	4.33	ER	3.79	ER	<3.0	6.90	6.20
Barium	6000	2000	699.00	205.00		320.00		136.00		407.00		227.00		307.00		92.80		81.20		92.80		93.60		90.80		<200	271.00	479.00
Beryllium	1	4	2.10	0.21	ER	0.14	ER	ND		0.28	ER	0.16	ER	0.12	ER	0.05	ER	0.07	ER	0.07	ER	ND		ND		3.20	<1.0	<1.0
Cadmium	4	5	9.50	ND		ND		0.45	ER	1.23	ER	ND		ND		ND		ND		ND		0.84	ER	0.58	ER	<3.0	<3.0	<3.0
Calcium	NLE	NLE	45400.00	23200.00		22200.00		19200.00		21200.00		18700.00		18500.00		15600.00		13900.00		14300.00		15600.00		15300.00		14000.00	13600.00	13900.00
Chromium	70	100	191.00	ND		1.11	ER	ND		ND		ND		ND		ND		ND		ND		0.78	ER	0.74	ER	<10	<10	<10
Cobalt	NLE	NLE	18.30	1.73		1.58	ER	2.17		1.79	ER	1.64	ER	1.47	ER	1.71	ER	1.37	ER	1.77	ER	2.01		2.02		<50	<50	<50
Copper	1300	1300	65.60	ND		ND		ND		1.09	ER	ND		ND		ND		ND		1.29	ER	ND		ND		<10	<10	<10
Iron	300	NLE	431000	19700.00		21400.00		12500.00		22400.00		16100.00		21500.00		8970.00		7940.00		7480.00		9390.00		8910.00		12500.00	30600.00	29500.00
Lead	5	15	22.70	ND		7.10		2.12	ER	ND		ND		ND		ND		ND		ND		ND		ND		3.20	<3.0	<3.0
Magnesium	NLE	NLE	62700	4570.00		4200.00		3730.00		4090.00		3570.00		3660.00		3070.00		2790.00		2920.00		2970.00		2920.00		<5000	<5000	<5000
Manganese	50	NLE	331	67.20		63.30		57.00		61.60		49.90		51.30		42.40		38.40		38.90		44.20		41.10		46.10	44.60	48.80
Mercury	2	2	0.26	ND		ND		ND		0.08	ER	ND		ND		ND		ND		ND		ND		ND		<0.20	<0.20	<0.20
Nickel	100	NLE	187	9.78		7.29		10.30		12.00		10.20		11.10		7.50		6.89		10.80		10.70		10.10		<10	<10	<10
Potassium	NLE	NLE	137000	11200.00		10800.00		10000.00		10800.00		9540.00		10700.00		9640.00		8580.00		7990.00		10200.00		10000.00		<10000	<10000	10100.00
Selenium	40	50	29.60	ND		43.30		6.11	ER	8.19	ER	ND		ND		NR		NR		ND		ND		1.42	ER	<10	<10	<10
Silver	40	NLE	ND	ND		ND		ND		3.50	ER	ND		ND		0.86	ER	0.55	ER	1.30	ER	1.44	ER	1.26	ER	<10	<10	<10
Sodium	50000	NLE	21500	10600.00		18300.00		9860.00		10000.00		9620.00		10300.00		10600.00		8940.00		9850.00		10600.00		9980.00		<10000	<10000	11300.00
Thallium	2	2	5.50	1.75	ER	ND		ND		ND		1.03	ER	ND		ND		ND		ND		ND		ND		<2.0	<2.0	<2.0
Vanadium	60	NLE	108	ND		2.04	ER	0.41	ER	2.32	ER	2.47	ER	ND		ND		ND		ND		ND		ND		<50	<50	<50
Zinc	2000	NLE	233	12.80		20.70	ER	10.80	ER	27.00		9.61	ER	ND		8.67	ER	7.26	ER	10.70	ER	9.50	ER	9.31	ER	<20	<20	27.90

Notes:
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Table 2
Historical Groundwater Analytical Results
Site FTMM-61 Building 283 Gasoline Storage
Annual (Fourth Quarter) 2014 Groundwater Sampling Report
Fort Monmouth, New Jersey

				283MW04																					
Round No.	NJDEP GWQS	USEPA MCL	Weston 1995 Background (Main Post)	14		15		16		17		18		19		20		21		21 Dup		22		22 Dup		LF1		LF2		LF3		LF4
Date Collected				3/6/2008		5/2/2008		8/6/2008		10/23/2008		3/12/2009		5/19/2009		8/19/2009		11/5/2009		11/5/2009		1/26/2010		1/26/2010		5/17/2010		9/30/2010		11/18/2010		2/22/2011
ANALYTE/Lab ID				80069.07		80150.07		80280.07		80385.07		90104.07		90203.07		90348.07		90437.07		90437.03		10035.07		10035.03		10194.07		10419.05		10499.05		11064.04
Volatile Organic Compounds (µg/L)																															
Benzene	1	5	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromodichloromethane	1	80	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroform	70	80	--	2.77		1.89	J	2.79		ND		0.74	J	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cyclohexane	100.0	NLE	--	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Ethylbenzene	700	700	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isopropylbenzene	700	NLE	--	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Methylcyclohexane	NLE	NLE	--	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
4-Methyl-2-pentanone	NLE	NLE	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Styrene	100	100	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Toluene	600	1000	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Xylenes (Total)	1000	10,000	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TICs*	500	NLE	--	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Metals (µg/L)																															
Aluminum	200	NLE	121000	961.00		448.00		1580.00		ND		874.00		1070.00		2160.00		2560.00		3560.00		2420.00		1780.00		41.80	ER	319.00		70.30	ER	3170.00
Antimony	6	6	20.70	ND		ND		ND		ND		ND		2.57	ER	ND		ND		ND		5.43	ER	ND		ND		ND		ND		<6.0
Arsenic	3	10	89.30	ND		ND		ND		ND		ND		ND		10.90		41.87		69.48		38.13		26.55		1.44	ER	ND		ND		7.60
Barium	6000	2000	699.00	21.40		11.80		37.10		6.56		13.90		15.10		27.70		24.00		36.40		22.20		21.50		3.76	ER	8.99		5.27		<200
Beryllium	1	4	2.10	0.11	ER	0.21	ER	0.12	ER	0.20	ER	ND		0.12	ER	0.21	ER	0.20	ER	0.26	ER	0.12	ER	0.09	ER	ND		ND		ND		2.10
Cadmium	4	5	9.50	ND		ND		0.50	ER	0.25	ER	0.21	ER	0.73	ER	ND		ND		ND		ND		ND		ND		ND		ND		<3.0
Calcium	NLE	NLE	45400.00	1550.00		1410.00		1580.00		1110.00		1230.00		1270.00		1510.00		1360.00		1680.00		1980.00		1510.00		737.00	ER	715.00	ER	701.00	ER	<5000
Chromium	70	100	191.00	6.84		2.03	ER	3.66	ER	0.66	ER	2.02	ER	3.77	ER	6.84		9.60		11.60		4.96	ER	8.28		ND		2.68	ER	1.79	ER	34.50
Cobalt	NLE	NLE	18.30	0.26		0.34		0.87		0.31		0.46	ER	0.85	ER	0.52	ER	0.40		0.78	ER	0.63	ER	ND		ND		ND		0.32	ER	<50
Copper	1300	1300	65.60	3.47	ER	ND		7.02		ND		3.33	ER	3.62	ER	10.60		5.00		9.65		6.41		1.32	ER	ND		ND		ND		<10
Iron	300	NLE	431000	1510.00		2230.00		2280.00		543.00		1350.00		1530.00		5640.00		7860.00		6220.00		3010.00		2800.00		ND		814.00		268.00	ER	9520.00
Lead	5	15	22.70	ND		ND		ND		2.37	ER	ND		2.66	ER	ND		ND		ND		ND		ND		ND		ND		ND		5.50
Magnesium	NLE	NLE	62700	1860.00		1590.00		2170.00		1210.00		1350.00		1260.00		1670.00		1460.00		1870.00		1840.00		1590.00		756.00	ER	911.00	ER	795.00	ER	<5000
Manganese	50	NLE	331	2.48		2.40		2.51		2.79		2.23	ER	2.06	ER	5.44		3.50	ER	4.79	ER	3.83	ER	3.72	ER	0.82	ER	1.31	ER	1.04	ER	<15
Mercury	2	2	0.26	ND		ND		ND		ND		ND		ND		0.15	ER	0.09	ER	0.15	ER	ND		ND		ND		ND		ND		<0.20
Nickel	100	NLE	187	4.98	ER	2.15	ER	2.38	ER	1.17	ER	ND		0.80	ER	2.89	ER	2.00	ER	3.33	ER	4.17	ER	3.46	ER	ND		ND		1.41	ER	<10
Potassium	NLE	NLE	137000	2290.00		1860.00		832.00		1740.00		1620.00		1780.00		2150.00		1930.00		2280.00		2180.00		2260.00		1820.00		1480.00		2960.00		<10000
Selenium	40	50	29.60	ND		6.65	ER	5.98	ER	7.28	ER	5.11	ER	2.57	ER	ND		ND		ND		ND		ND		NR		3.01	ER	3.02	ER	<10
Silver	40	NLE	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		<10
Sodium	50000	NLE	21500	16100.00		15000.00		12800.00		13400.00		13100.00		10800.00		12000.00		10800.00		10600.00		12500.00		11500.00		9780.00		10000.00		10700.00		<10000
Thallium	2	2	5.50	ND		ND		ND		2.05	ER	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		<2.0
Vanadium	60	NLE	108	3.04		2.34		2.51		ND		2.44	ER	1.96	ER	6.84		9.20		10.20		5.49		5.01		ND		1.20	ER	0.69	ER	<50
Zinc	2000	NLE	233	15.30		5.99		6.89		6.88		8.90	ER	7.89	ER	18.50	ER	14.00	ER	17.40	ER	ND		ND		3.10	ER	3.90	ER	3.40	ER	33.30

Notes:
Shaded cells = concentrations exceed the NJDEP GWQS

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NJDEP GWQS = Ground Water Quality Criteria as per N.J.A.C. 7:9-6 (July 22, 2010)

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Table 2
Historical Groundwater Analytical Results
Site FTMM-61 Building 283 Gasoline Storage
Annual (Fourth Quarter) 2014 Groundwater Sampling Report
Fort Monmouth, New Jersey

				283MW04		283MW05																	
Round No.	NJDEP GWQS	USEPA MCL	Weston 1995 Background (Main Post)	LF5	LF6	14	15	16	17	18	19	20	21	22	LF1	LF2	LF3	LF4	LF4 Dup	LF5
Date Collected				4/18/2011	8/18/2011	3/6/2008	5/2/2008	8/6/2008	10/23/2008	3/12/2009	5/19/2009	9/17/2009	11/5/2009	1/26/2010	5/17/2010	9/30/2010	11/18/2010	2/22/2011	2/22/2011	4/18/2011
ANALYTE/Lab ID				11152.07	11346.07	80069.08	80150.08	80280.08	80385.08	90104.08	90203.08	90387.01	90437.08	10035.08	10194.08	10419.06	10499.06	11064.07	11064.03	11152.06
Volatile Organic Compounds (µg/L)																				
Benzene	1	5	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	1	80	--	ND	ND	0.30 J	0.27 J	0.66 J	0.48 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	70	80	--	ND	ND	1.78 J	1.80 J	3.88	2.80	0.44 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	100.0	NLE	--	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	700	700	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	700	NLE	--	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	NLE	NLE	--	NA	ND	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone	NLE	NLE	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	100	100	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	600	1000	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes (Total)	1000	10,000	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TICs*	500	NLE	--	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Metals (µg/L)																				
Aluminum	200	NLE	121000	508.00	1800.00	1380.00	446.00	2080.00	243.00	1010.00	1140.00	24000.00	1240.00	339.00	98.20 ER	339.00	222.00	615.00	592.00	320.00
Antimony	6	6	20.70	<6.0	<6.0	ND	ND	ND	ND	ND	1.66 ER	ND	ND	ND	ND	ND	ND	<6.0	<6.0	<6.0
Arsenic	3	10	89.30	<3.0	3.40	ND	2.76 ER	ND	6.81	ND	6.54	41.60	18.95	4.24 ER	1.15 ER	ND	ND	<3.0	<3.0	<3.0
Barium	6000	2000	699.00	<200	<200	54.70	41.80	84.00	20.00	49.50	46.20	172.00	44.40	17.60	18.50	13.10	25.80	<200	<200	<200
Beryllium	1	4	2.10	<1.0	<1.0	0.15 ER	0.22 ER	0.20 ER	0.27 ER	0.15 ER	1.32	1.48	0.12 ER	ND	0.05 ER	ND	ND	<1.0	<1.0	<1.0
Cadmium	4	5	9.50	<3.0	<3.0	0.29 ER	ND	0.54 ER	0.33 ER	ND	0.55 ER	2.19	ND	ND	ND	ND	0.42 ER	<3.0	<3.0	<3.0
Calcium	NLE	NLE	45400.00	<5000	<5000	1410.00	1470.00	1660.00	1010.00	1190.00	1090.00	1320.00	1090.00	1340.00	1030.00	665.00 ER	766.00 ER	<5000	<5000	<5000
Chromium	70	100	191.00	<10	25.20	8.56	1.09 ER	3.25 ER	0.72 ER	1.61 ER	1.50 ER	272.00	4.53 ER	1.24 ER	ND	3.38 ER	3.03 ER	<10	<10	<10
Cobalt	NLE	NLE	18.30	<50	<50	0.36	0.52	1.07	0.28	0.49 ER	0.94 ER	4.49	0.44 ER	ND	ND	ND	0.36 ER	<50	<50	<50
Copper	1300	1300	65.60	<10	<10	4.09 ER	ND	4.96 ER	ND	2.11 ER	3.64 ER	13.20	ND	ND	ND	1.03 ER	ND	<10	<10	<10
Iron	300	NLE	431000	1380.00	5640.00	1810.00	2370.00	3610.00	432.00	1170.00	1190.00	61300.00	5320.00	904.00	ND	1000.00	574.00	1500.00	1210.00	803.00
Lead	5	15	22.70	<3.0	<3.0	ND	ND	ND	2.13 ER	ND	ND	14.70	ND	ND	ND	ND	2.60 ER	<3.0	<3.0	<3.0
Magnesium	NLE	NLE	62700	<5000	<5000	2980.00	2720.00	3280.00	1760.00	2440.00	2050.00	11400.00	2120.00	2020.00	1750.00	1190.00	1660.00	<5000	<5000	<5000
Manganese	50	NLE	331	<15	<15	5.16	4.47	6.09	2.54	4.69 ER	3.68 ER	41.80	5.21	3.54 ER	2.32 ER	2.11 ER	2.85 ER	<15	<15	<15
Mercury	2	2	0.26	<0.20	<0.20	ND	ND	ND	ND	ND	ND	0.21 ER	ND	ND	ND	ND	ND	<0.20	<0.20	<0.20
Nickel	100	NLE	187	<10	<10	6.42	3.16 ER	4.34 ER	1.34 ER	0.99 ER	2.03 ER	15.40	2.80 ER	2.58 ER	ND	0.69 ER	2.01 ER	<10	<10	<10
Potassium	NLE	NLE	137000	<10000	<10000	1930.00	1560.00	844.00	1350.00	1480.00	1460.00	15000.00	1810.00	1730.00	1930.00	1290.00	2740.00	<10000	<10000	<10000
Selenium	40	50	29.60	<10	<10	ND	4.24 ER	3.67 ER	4.95 ER	20.10	8.75 ER	ND	ND	ND	NR	2.70 ER	3.39 ER	<10	<10	<10
Silver	40	NLE	ND	<10	<10	ND	ND	0.87	ND	ND	ND	ND	ND	ND	ND	ND	ND	<10	<10	<10
Sodium	50000	NLE	21500	<10000	13600.00	11100.00	1140.00	8580.00	10600.00	9630.00	7560.00	8560.00	7910.00	9260.00	9010.00	7150.00	8580.00	<10000	<10000	<10000
Thallium	2	2	5.50	<2.0	<2.0	ND	ND	ND	1.40 ER	ND	ND	ND	ND	ND	ND	ND	ND	<2.0	<2.0	<2.0
Vanadium	60	NLE	108	<50	<50	3.63	2.17	3.11	ND	1.37 ER	1.37 ER	111.00	5.87	1.41 ER	ND	1.64 ER	ND	<50	<50	<50
Zinc	2000	NLE	233	<20	<20	22.20	11.20	18.10	10.00	12.90 ER	12.20 ER	91.80	9.07 ER	ND	6.51 ER	5.58 ER	7.69 ER	<20	<20	<20

Notes:
Shaded cells = concentrations exceed the NJDEP GWQS

*TICs - Tentatively identified compounds, cannot exceed 500 µg/L for VOCs and SVOCs. No individual compound can exceed 100 µg/L.
NJDEP GWQS = Ground Water Quality Criteria as per N.J.A.C. 7:9-6 (July 22, 2010)

USEPA MCL = U.S. Environmental Protection Agency Maximum Contaminant Level (2012)
LF = Low-flow sampling method used to collect sample
< = Analyte does not exceed the detection limit shown
J = Estimated concentration exceeds the method detection limit (MDL) and is less than the reporting limit (RL)
NA = Not analyzed
ND = Not detected
NLE = No limit established
ER = Estimated Result

Table 2
Historical Groundwater Analytical Results
Site FTMM-61 Building 283 Gasoline Storage
Annual (Fourth Quarter) 2014 Groundwater Sampling Report
Fort Monmouth, New Jersey

				283MW05	283MW06																					
Round No.	NJDEP GWQS	USEPA MCL	Weston 1995 Background (Main Post)	LF6	14		15		16		17		18		19		20		20 Dup		21		22		LF1		LF2		LF2 Dup		LF3	
Date Collected				8/18/2011	3/6/2008		5/2/2008		8/6/2008		10/23/2008		3/12/2009		5/19/2009		8/19/2009		8/19/2009		11/5/2009		1/26/2010		5/17/2010		9/30/2010		9/30/2010		11/17/2010	
ANALYTE/Lab ID				11346.08	80069.09		80150.09		80280.09		80385.09		90104.09		90203.09		90348.08		90348.03		90437.09		10035.09		10194.06		10419.04		10419.03		10495.06	
Volatile Organic Compounds (µg/L)																															
Benzene	1	5	--	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Bromodichloromethane	1	80	--	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Chloroform	70	80	--	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Cyclohexane	100.0	NLE	--	ND	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Ethylbenzene	700	700	--	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Isopropylbenzene	700	NLE	--	ND	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
Methylcyclohexane	NLE	NLE	--	ND	NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA		NA	
4-Methyl-2-pentanone	NLE	NLE	--	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Styrene	100	100	--	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Toluene	600	1000	--	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Xylenes (Total)	1000	10,000	--	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
TICs*	500	NLE	--	ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Metals (µg/L)																															
Aluminum	200	NLE	121000	4330.00	759.00		561.00		999.00		180.00		965.00		570.00		6060.00		4340.00		3080.00		1480.00		316.00		281.00		422.00		198.00	
Antimony	6	6	20.70	<6.0	ND		ND		ND		ND		ND		3.29	ER	ND		4.87	ER	ND		ND		ND		5.85	ER	ND		ND	
Arsenic	3	10	89.30	8.40	ND		4.45	ER	ND		ND		ND		5.09		13.80		11.20		30.76		14.32		2.22	ER	1.20	ER	0.67	ER	ND	
Barium	6000	2000	699.00	<200	49.60		46.30		48.00		24.80		64.40		30.20		133.00		91.90		106.00		57.40		19.10		69.00		70.10		42.50	
Beryllium	1	4	2.10	<1.0	0.10	ER	0.22	ER	ND		0.24	ER	0.12	ER	ND		0.79		0.54		0.46	ER	0.20	ER	ND		ND		ND		ND	
Cadmium	4	5	9.50	<3.0	0.25	ER	0.39	ER	0.44	ER	0.23	ER	0.29	ER	0.58	ER	0.53	ER	ND		ND		ND		ND		ND		ND		ND	
Calcium	NLE	NLE	45400.00	<5000	430.00		503.00		331.00		585.00		545.00	ER	282.00	ER	14500.00		11400.00		46700.00		13200.00		11300.00		16000.00		15500.00		8940.00	
Chromium	70	100	191.00	50.40	6.07		2.57	ER	2.36	ER	0.66	ER	2.83	ER	1.46	ER	12.10		11.70		19.20		7.70		4.11	ER	8.00		8.67		6.30	
Cobalt	NLE	NLE	18.30	<50	ND		ND		0.25		ND		ND		0.45	ER	ND		0.48	ER	0.87	ER	ND		ND		ND		ND		ND	
Copper	1300	1300	65.60	<10	1.99	ER	0.73	ER	1.20	ER	ND		3.21	ER	1.70	ER	24.00		16.80		5.70		ND		ND		1.06	ER	1.64	ER	ND	
Iron	300	NLE	431000	12200.00	1310.00		2970.00		2320.00		434.00		1550.00		1070.00		4700.00		4670.00		8510.00		3830.00		234.00	ER	570.00		927.00		587.00	
Lead	5	15	22.70	4.60	ND		ND		ND		1.80	ER	3.42	ER	ND		6.67		3.76	ER	5.25		ND		ND		ND		ND		ND	
Magnesium	NLE	NLE	62700	<5000	1090.00		907.00		738.00		617.00		957.00	ER	478.00	ER	1310.00		981.00	ER	1480.00		970.00	ER	583.00	ER	2220.00		2280.00		1200.00	
Manganese	50	NLE	331	18.20	2.32		2.83		3.11		1.52		3.64	ER	3.45	ER	11.90		10.50		11.60		9.34		2.88	ER	3.49	ER	3.97	ER	2.12	ER
Mercury	2	2	0.26	<0.20	ND		ND		ND		ND		ND		ND		0.39	ER	0.25	ER	ND		ND		ND		ND		ND		ND	
Nickel	100	NLE	187	<10	4.90	ER	1.83	ER	0.87	ER	0.96	ER	ND		0.68	ER	9.01		2.64	ER	5.30		3.76	ER	ND		1.21	ER	2.05	ER	1.71	ER
Potassium	NLE	NLE	137000	<10000	1210.00		833.00		ND		837.00		836.00	ER	757.00	ER	1300.00		1350.00		1360.00		1320.00		1520.00		1480.00		1620.00		2460.00	
Selenium	40	50	29.60	<10	3.65	ER	5.86	ER	4.39	ER	7.72	ER	ND		6.29	ER	19.80		18.00		21.40		ND		NR		4.45	ER	4.04	ER	4.51	ER
Silver	40	NLE	ND	<10	ND		ND		0.85		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Sodium	50000	NLE	21500	<10000	11500.00		11800.00		11100.00		9850.00		10100.00		8430.00		11200.00		11200.00		10900.00		13100.00		10000.00		11600.00		11700.00		11700.00	
Thallium	2	2	5.50	<2.0	ND		ND		ND		1.55	ER	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Vanadium	60	NLE	108	<50	2.41		2.52		2.01		ND		1.80	ER	1.50	ER	6.79		6.70		9.47		3.94	ER	0.95	ER	1.85	ER	2.65	ER	1.54	ER
Zinc	2000	NLE	233	30.60	15.20		5.60		ND		5.92		10.50	ER	3.54	ER	50.30		19.90	ER	31.10	ER	ND		2.05	ER	4.56	ER	5.03	ER	2.93	ER

Notes:
Shaded cells = concentrations exceed the NJDEP GWQS

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Table 2
Historical Groundwater Analytical Results
Site FTMM-61 Building 283 Gasoline Storage
Annual (Fourth Quarter) 2014 Groundwater Sampling Report
Fort Monmouth, New Jersey

				283MW06			
Round No.	NJDEP GWQS	USEPA MCL	Weston 1995 Background (Main Post)	LF4	LF5	LF5 Dup	LF6
Date Collected				2/22/2011	4/18/2011	4/18/2011	8/18/2011
ANALYTE/Lab ID				11064.06	11152.03	11152.04	11346.06
Volatile Organic Compounds (µg/L)							
Benzene	1	5	--	ND	ND	ND	ND
Bromodichloromethane	1	80	--	ND	ND	ND	ND
Chloroform	70	80	--	ND	ND	ND	ND
Cyclohexane	100.0	NLE	--	NA	NA	NA	ND
Ethylbenzene	700	700	--	ND	ND	ND	ND
Isopropylbenzene	700	NLE	--	NA	NA	NA	ND
Methylcyclohexane	NLE	NLE	--	NA	NA	NA	ND
4-Methyl-2-pentanone	NLE	NLE	--	ND	ND	ND	ND
Styrene	100	100	--	ND	ND	ND	ND
Toluene	600	1000	--	ND	ND	ND	ND
Xylenes (Total)	1000	10,000	--	ND	ND	ND	ND
TICs*	500	NLE	--	ND	ND	ND	ND
Metals (µg/L)							
Aluminum	200	NLE	121000	412.00	507.00	862.00	5940.00
Antimony	6	6	20.70	<6.0	<6.0	<6.0	<6.0
Arsenic	3	10	89.30	<3.0	<3.0	<3.0	9.20
Barium	6000	2000	699.00	<200	<200	<200	<200
Beryllium	1	4	2.10	<1.0	<1.0	<1.0	<1.0
Cadmium	4	5	9.50	<3.0	<3.0	<3.0	<3.0
Calcium	NLE	NLE	45400.00	<5000	<5000	<5000	<5000
Chromium	70	100	191.00	<10	<10	<10	60.30
Cobalt	NLE	NLE	18.30	<50	<50	<50	<50
Copper	1300	1300	65.60	<10	<10	<10	11.00
Iron	300	NLE	431000	747.00	1080.00	2180.00	15900.00
Lead	5	15	22.70	<3.0	<3.0	<3.0	4.20
Magnesium	NLE	NLE	62700	<5000	<5000	<5000	<5000
Manganese	50	NLE	331	<15	<15	<15	23.70
Mercury	2	2	0.26	<0.20	<0.20	<0.20	<0.20
Nickel	100	NLE	187	<10	<10	<10	<10
Potassium	NLE	NLE	137000	<10000	<10000	<10000	<10000
Selenium	40	50	29.60	<10	<10	<10	<10
Silver	40	NLE	ND	<10	<10	<10	<10
Sodium	50000	NLE	21500	<10000	<10000	<10000	21000.00
Thallium	2	2	5.50	<2.0	<2.0	<2.0	<2.0
Vanadium	60	NLE	108	<50	<50	<50	<50
Zinc	2000	NLE	233	<20	21.60	66.80	33.50

Notes:
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Table 3
Groundwater Analytical Results - 2013 and 2014
Site FTMM-61 Building 283 Gasoline Storage
Annual (Fourth Quarter) 2014 Groundwater Sampling Report
Fort Monmouth, New Jersey

Loc ID	NJ Ground Water Quality Criteria	2014-05 USEPA MCL	Weston 1995 Background (Main Post)	283MW01	283MW02		283MW03	283MW04
Sample ID				FTMM-61-GW-283MW01	FTMM-61-GW-283MW02	FTMM-61-GW-283MW02-13.26	FTMM-61-GW-283MW03	FTMM-61-GW-283MW04
Sample Date				8/15/2013	8/16/2013	10/2/2014	8/15/2013	8/16/2013
QA/QC				SA	SA	SA	SA	SA
Study ID				Baseline - August 2013	Baseline - August 2013	2014-Q4 QGW	Baseline - August 2013	Baseline - August 2013
Sampling Method				LFPS	LFPS	LFPS	LFPS	LFPS
Volatile Organic Compounds (µg/l)								
1,1,1,2-Tetrachloroethane	1	NLE	-	< 1	< 1	< 1	< 1	< 1
1,1,1-Trichloroethane	30	200	-	< 1	< 1	< 1	< 1	< 1
1,1,2,2-Tetrachloroethane	1	NLE	-	< 1	< 1	< 1	< 1	< 1
1,1,2-Trichloroethane	3	5	-	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethane	50	NLE	-	< 1	< 1	< 1	< 1	< 1
1,1-Dichloroethene	1	7	-	< 1	< 1	< 1	< 1	< 1
1,1-Dichloropropene	100	NLE	-	< 1	< 1	< 1	< 1	< 1
1,2,3-Trichlorobenzene	100	NLE	-	< 1	< 1	< 1	< 1	< 1
1,2,3-Trichloropropane	0.03	NLE	-	< 1	< 1	< 1	< 1	< 1
1,2,4-Trichlorobenzene	9	70	-	< 1	< 1	< 1	< 1	< 1
1,2,4-Trimethylbenzene	100	NLE	-	**1.2 J**	< 1	< 1	< 1	< 1
1,2-Dibromo-3-chloropropane	0.02	0.2	-	< 1	< 1	< 1	< 1	< 1
1,2-Dibromoethane	0.03	0.05	-	< 1	< 1	< 1	< 1	< 1
1,2-Dichlorobenzene	600	600	-	< 1	< 1	< 1	< 1	< 1
1,2-Dichloroethane	2	5	-	< 1	< 1	< 1	< 1	< 1
1,2-Dichloropropane	1	5	-	< 1	< 1	< 1	< 1	< 1
1,3,5-Trimethylbenzene	100	NLE	-	**0.59 J**	< 1	< 1	< 1	< 1
1,3-Dichlorobenzene	600	NLE	-	< 1	< 1	< 1	< 1	< 1
1,3-Dichloropropane	100	NLE	-	< 1	< 1	< 1	< 1	< 1
1,4-Dichlorobenzene	75	75	-	< 1	< 1	< 1	< 1	< 1
2,2-Dichloropropane	100	NLE	-	< 1	< 1	< 1	< 1	< 1
2-Chlorotoluene	100	NLE	-	< 1	< 1	< 1	< 1	< 1
Acetone	6,000	NLE	-	< 5	**2.1 J**	< 5	**1.4 J**	< 5
Benzene	1	5	-	< 1	< 1	< 1	< 1	< 1
Bromobenzene	100	NLE	-	< 1	< 1	< 1	< 1	< 1
Bromochloromethane	100	NLE	-	< 1	< 1	< 1	< 1	< 1
Bromodichloromethane	1	80	-	< 1	< 1	< 1	< 1	< 1
Bromoform	4	80	-	< 1	< 1	< 1	< 1	< 1
Carbon tetrachloride	1	5	-	< 1	< 1	< 1	< 1	< 1
Chlorobenzene	50	100	-	< 1	< 1	< 1	< 1	< 1
Chlorodibromomethane	1	80	-	< 1	< 1	< 1	< 1	< 1
Chloroethane	5	NLE	-	< 1	< 1	< 1	< 1	< 1
Chloroform	70	80	-	< 1	< 1	< 1	< 1	< 1
Cis-1,2-Dichloroethene	70	70	-	< 1	< 1	< 1	< 1	< 1
Cis-1,3-Dichloropropene	1	NLE	-	< 1	< 1	< 1	< 1	< 1
Cymene	100	NLE	-	< 1	< 1	< 1	< 1	< 1
Dichlorodifluoromethane	1,000	NLE	-	< 1	< 1	< 1	< 1	< 1
Ethyl benzene	700	700	-	**1 J**	< 1	< 1	< 1	< 1
Hexachlorobutadiene	1	NLE	-	< 1	< 1	< 1	< 1	< 1
Isopropylbenzene	700	NLE	-	< 1	< 1	< 1	< 1	< 1
Meta & Para Xylenes	1,000	NLE	-	**1.9 J**	< 2	< 2	< 2	< 2
Methyl bromide	10	NLE	-	< 1	< 1	< 1	< 1	< 1
Methyl butyl ketone	300	NLE	-	< 5	< 5	< 5	< 5	< 5
Methyl chloride	100	NLE	-	< 1	< 1	< 1	< 1	< 1
Methyl ethyl ketone	300	NLE	-	< 1	< 1	< 1	< 1	< 1
Methyl isobutyl ketone	100	NLE	-	< 1	< 1	< 1	< 1	< 1
Methyl Tertbutyl Ether	70	NLE	-	< 1	< 1	< 1	< 1	< 1

Table 3
Groundwater Analytical Results - 2013 and 2014
Site FTMM-61 Building 283 Gasoline Storage
Annual (Fourth Quarter) 2014 Groundwater Sampling Report
Fort Monmouth, New Jersey

Loc ID	NJ Ground Water Quality Criteria	2014-05 USEPA MCL	Weston 1995 Background (Main Post)	283MW01	283MW02		283MW03	283MW04
Sample ID				FTMM-61-GW-283MW01	FTMM-61-GW-283MW02	FTMM-61-GW-283MW02-13.26	FTMM-61-GW-283MW03	FTMM-61-GW-283MW04
Sample Date				8/15/2013	8/16/2013	10/2/2014	8/15/2013	8/16/2013
QA/QC				SA	SA	SA	SA	SA
Study ID				Baseline - August 2013	Baseline - August 2013	2014-Q4 QGW	Baseline - August 2013	Baseline - August 2013
Sampling Method				LFPS	LFPS	LFPS	LFPS	LFPS
Methylene chloride	3	5	-	< 1	< 1	< 1	< 1	< 1
Naphthalene	300	NLE	-	**0.25 J**	< 1	< 1	< 1	< 1
n-Butylbenzene	100	NLE	-	< 1	< 1	< 1	< 1	< 1
Ortho Xylene	1,000	NLE	-	**0.23 J**	< 1	< 1	< 1	< 1
p-Chlorotoluene	100	NLE	-	< 1	< 1	< 1	< 1	< 1
Propylbenzene	100	NLE	-	< 1	< 1	< 1	< 1	< 1
sec-Butylbenzene	100	NLE	-	< 1	< 1	< 1	< 1	< 1
Styrene	100	100	-	< 1	< 1	< 1	< 1	< 1
Tert Butyl Alcohol	100	NLE	-	NA	NA	< 20	NA	NA
tert-Butylbenzene	100	NLE	-	< 1	< 1	< 1	< 1	< 1
Tetrachloroethene	1	5	-	< 1	< 1	< 1	< 1	< 1
Toluene	600	1,000	-	< 1	< 1	< 1	< 1	< 1
Total Xylenes	1,000	10,000	-	**2.13 J**	< 3	NA	< 3	< 3
Trans-1,2-Dichloroethene	100	100	-	< 1	< 1	< 1	< 1	< 1
Trans-1,3-Dichloropropene	1	NLE	-	< 1	< 1	< 1	< 1	< 1
Trichloroethene	1	5	-	< 1	< 1	< 1	< 1	< 1
Trichlorofluoromethane	2,000	NLE	-	< 1	< 1	< 1	< 1	< 1
Vinyl chloride	1	2	-	< 1	< 1	< 1	< 1	< 1
TIC VOCs (µg/l)								
Total TIC, Volatile	500	NLE	-	**5.2 JN**	ND	ND	ND	ND
Inorganics (µg/l)								
Lead	5	15	22.7	< 2	< 2	NA	< 2	< 2

Table 3
Groundwater Analytical Results - 2013 and 2014
Site FTMM-61 Building 283 Gasoline Storage
Annual (Fourth Quarter) 2014 Groundwater Sampling Report
Fort Monmouth, New Jersey

Footnote:
1) All historical data collected prior to 2013 are reported as provided by others.
2) Number of Analyses is the number of detected and non-detected results excluding rejected results. Sample duplicate pairs have not been averaged.
3) NLE = no limit established.
4) ND = not detected in any background sample, no background concentration available.

5) Chemical result qualifiers are assigned by the laboratory and is typically evaluated and modified (if necessary) by during data validation.
[blank] = detect, i.e. detected chemical result value.
B = Compound detected in the sample and its associated blank sample.
R = Rejected, data validation rejected the results.
U = non-detect, i.e. not detected equal to or above this value.
U-DL = Elevated sample detection limit due to difficult sample matrix.
U-ND = Analyte not detected in sample, but no detection or reporting limit provided.
J = estimated (detect or non-detect) value.
E (or ER) = Estimated result.
D = Results from dilution of sample.
J-DL = Elevated sample detection limit due to difficult sample matrix.
JN = Tentatively identified compound, estimated concentration.

6) Chemical results greater than or equal to the action level (depending on criteria) are highlighted based on the Criteria that are present.
- Cell Shade values represent a result that is above the NJ Ground Water Quality Criteria ####

NJDEP Interim Specific GWQC values are presented for the NJ GWQS where there is not a Specific Ground Water Quality Criteria. A full list of compounds is available at (http://www.nj.gov/dep/wms/bwqsa/gwqs_interim_criteria_table.htm).

NJDEP Interim Generic GWQC values are presented for the NJ GWQS where there is not a XXXXX or a NJDEP Interim Specific GWQC. Available at (http://www.nj.gov/dep/wms/bwqsa/gwqs_interim_criteria_table.htm).

- Bold Outline represent a result that is above the USEPA 2014-05 MCL. ###
- Cell Style values represent a result that is above the Weston 1995 Background (Main Post). ###

n/a = all concentrations were less than the detection limit, therefore, no location of maximum value identified.
Dash (-) = only background concentrations for metals are being used as comparison criteria.

7) Criteria action level source document and web address.
- The NJ Ground Water Quality Criteria refers to the NJDEP Groundwater Quality Standards - Adopted July 22, 2010
  http://www.state.nj.us/dep/wms/bwqsa/docs/njac79C.pdf
- The 2014-05 USEPA MCL refers to the USEPA's Region 9 Regional Screening Levels (HQ=1.0) - 5/31/2014 (Last revised)
  http://www.epa.gov/region9/superfund/prg/
- The Weston 1995 Background (Main Post) refers to the FTMM reports.
  NA

8) Wells sampled in the fourth quarter are highlighted in yellow. Sample ID

Table 4
Review of Historical Groundwater Sampling Results
Site FTMM-61 Building 283 Gasoline Storage
Annual (Fourth Quarter) 2014 Groundwater Sampling Report
Fort Monmouth, New Jersey

Site Name/ Well ID	Interpretation of Historical and 2014 Results [1]			2014 Evaluation				Retain Analyte/Well (Yes or No)	Rationale
	Chem Class / Analyte	Does it Exceed NJDEP GWQS (Yes or No) (If Yes, identify compound)	Do Metals Exceed FTMM Background Concentration (Yes or No) (If Yes, identify Metal)	Seasonal Effect?[2] (Y/N)	Anomaly? (Y/N)	Exceedance part of overall trend? (Y/N)	Well needed for sentinel purposes? (Y/N)		
FTMM-61, B283									
283MW02	VOC	Benzene	No	N/A	No	N/A	N/A	No	Benzene non-detect 2013 and 2014. The confirmation of the 2013 results in 2014 (using LFPS methods) is consistent with the NJDEP's July 3, 2014 comment letter, which specifies acceptance of one additional round of sampling in well 283MW02. Recommend discontinuing well. Sb is attributed to background conditions and not associated with historical site operations.

Notes

1. Has any of the analyte compounds exceeded the NJDEP GWQS in the 2014 data and the 4 previous quarterly data rounds or two previous annual rounds?
   a. If yes then keep analyte in LTM list
   b. If no then remove this analyte from LTM list
   c. a and b above may be occasionally superseded on a case-by-case basis, depending on site conditions.
2. Has any of the analyte compounds exceeded the NJDEP GWQS seasonally (winter spring vs. summer fall)?
3. N/A - Not applicable
4. Per the 2/5/15 NJDEP approval letter of the Final 2013 Baseline Groundwater Report, groundwater monitoring wells 283MW01, 283MW01 and 283MW04 were removed from the long term monitoring sampling program and lead were discontinued in 2014.

FIGURES

Figure 1 Layout of FTMM-61 Building 283 Gasoline Storage

Figure 2 FTMM-61 Shallow Groundwater Contours - September 29, 2014

283MW01
UST-283-59
Former 10,000 Gallon
No. 2 Fuel Oil UST
283MW03
288
283
283MW04
UST-283-58
283MW05
283MW02
UST-283-229
Former 3,000 Gallon
Gasoline UST
FTMM-61
283MW06
295

LEGEND:

- Shallow Monitoring Well
- Removed Gasoline UST associated with FTMM-61
- Removed Steel UST associated with FTMM-61 (Building 283)
- FTMM-61 Boundary
- Municipal Boundary
- Installation Boundary
- W Water Line
- S Sanitary Sewer Line
- SW Storm Sewer Line
- G Gas Line

N

1 inch = 30 feet

0 15 30 60 Feet

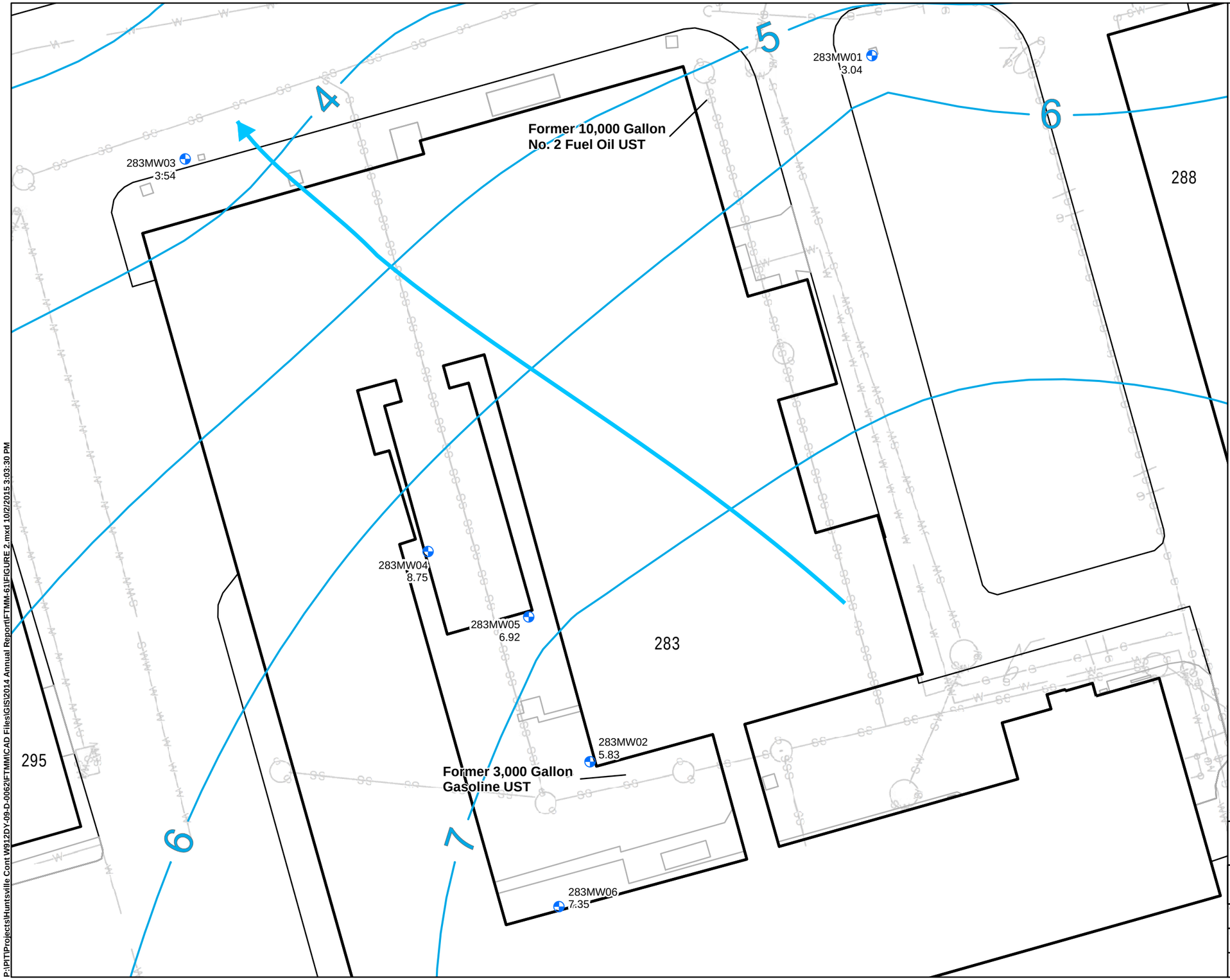
Source: FTMM Supplied CAD, 2013.

PARSONS 401 Diamond Drive NW, Huntsville AL	Fort Monmouth New Jersey

LAYOUT OF FTMM-61
B37 BUILDING 283 GASOLINE STORAGE

CREATED BY: RR	REVIEWED BY: ME
DATE: OCT. 2015	FIGURE NUMBER: FIGURE 1
PROJECT NUMBER: 748810-01000	FILE: FIGURE 1.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\2014 Annual Report\FTMM-61\FIGURE 1.mxd 10/2/2015 2:46:20 PM



LEGEND:

- Shallow Monitoring Well
- W Water Line
- S Sanitary Sewer Line
- SW Storm Sewer Line
- G Gas Line
- Groundwater Elevation Contour
- Inferred Groundwater Flow Direction

NOTE:

The groundwater elevation at monitoring well 283MW04 was considered anomalous compared to the fluid levels at neighboring wells.

N

1 inch = 30 feet

0 15 30 60 Feet

Source: FTMM Supplied CAD, 2013.

PARSONS 401 Diamond Drive NW, Huntsville AL	Fort Monmouth New Jersey
FTMM-61 SHALLOW GROUNDWATER CONTOURS - SEPTEMBER 29, 2014	
CREATED BY: RR	REVIEWED BY: ME
DATE: OCT. 2015	FIGURE NUMBER: FIGURE 2
PROJECT NUMBER: 748810-01000	FILE: FIGURE 2.mxd

P:\PIT\Projects\Huntsville Cont W912DY-09-D-0062\FTMM\CAD Files\GIS\2014 Annual Report\FTMM-61\FIGURE 2.mxd 10/2/2015 3:03:30 PM

ATTACHMENTS

Attachment A LFPS Field Sheets

LOW FLOW PURGE AND SAMPLING (LFPS) RECORD - GROUNDWATER

PARSONS | **CLIENT:** ACOE | **WELL #:** 383MW02

PROJECT: FTMM 4Q GW | **WELL PERMIT #:** 39-40687

AOC # (AREA): FTMM-61 | **DATE:** 10/2/14

SCREENED INTERVAL (TOC): 5-20 | **SAMPLING PERSONNEL NAME:** D. Lizos

WELL DIAMETER (in.): 4 | **SAMPLING PERSONNEL NAME:**

BOREHOLE DIAMETER FACTORS

DIAMETER (INCHES):	1	1.5	2	3	4	5	6	7	8	9	10
GALLONS/FOOT:	0.041	0.092	0.163	0.367	0.654	1.02	1.47	2	2.61	3.3	5.87

WELL HEAD VOC CONCENTRATION (ppm): 0.0

WELL DEPTH (TOC): 19.90

FEET OF WATER IN WELL (ft): 13.38

FEET OF SATURATED SCREEN (ft): 13.38

DEPTH TO WATER BEFORE PUMP INSTALLATION (ft below TOC): 6.67

PUMP INTAKE DEPTH (ft below TOC): 13.26

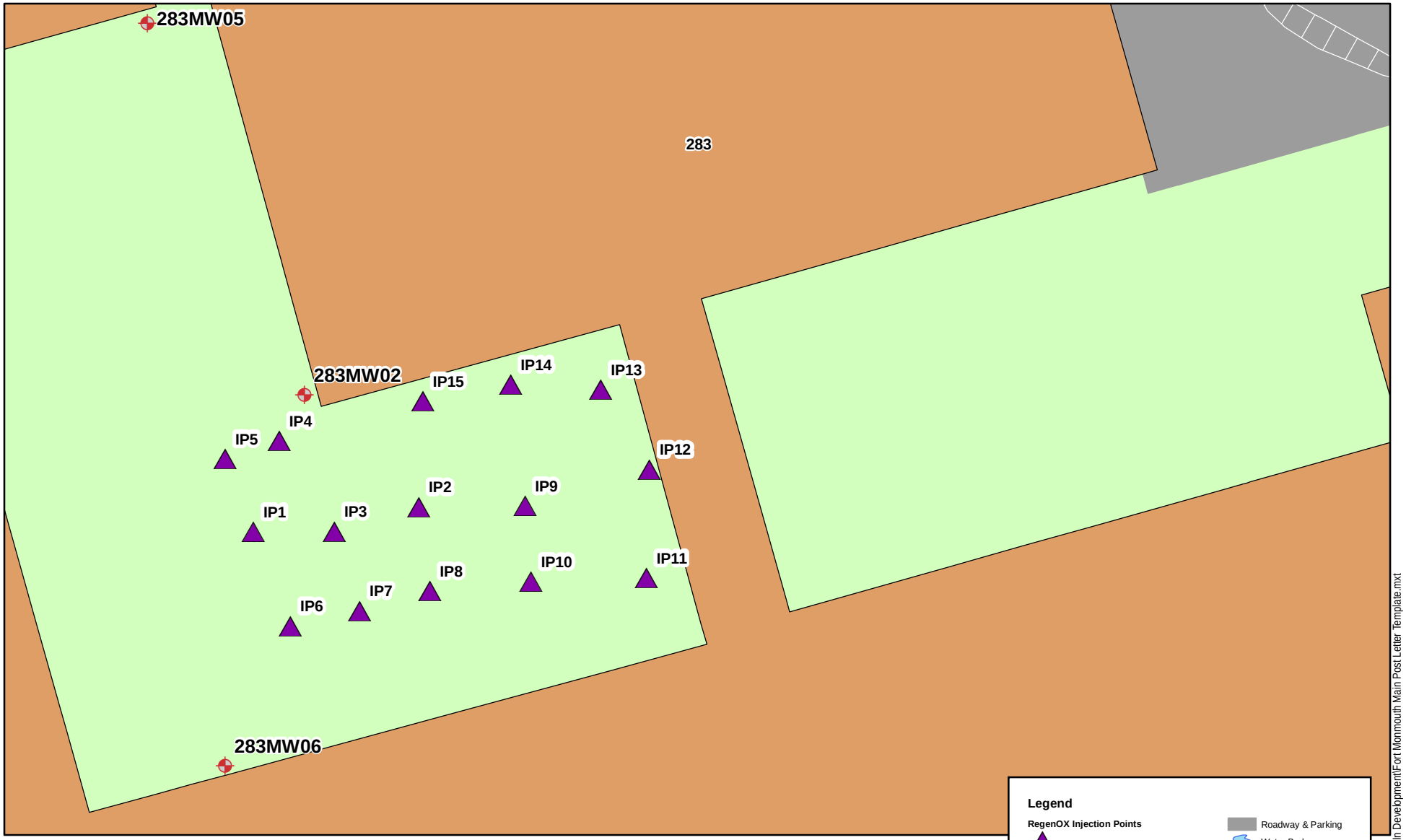
PURGING AND SAMPLING

TIME	PURGING	SAMPLING	pH (pH units)		SPECIFIC CONDUCTIVITY (mS/cm)		REDOX POTENTIAL (mv)		DISSOLVED OXYGEN (mg/L)		TURBIDITY (NTU)		TEMPERATURE (degrees C)		PUMPING RATE (ml/min)	DEPTH TO WATER (ft below TOC)
			READING	CHANGE*	READING	CHANGE*	READING	CHANGE*	READING	CHANGE*	READING	CHANGE*	READING	CHANGE*		
1105	X		7.22	NA	0.501	NA	74.7	NA	2.84	NA	9.5	NA	17.81	NA	350	6.64
1110	X		4.11	3.11	0.468	.033	180.7	106.0	2.10	.74	5.5	4.0	17.95	.14	350	6.72
1115	X		3.99	0.12	0.470	.002	209.1	28.4	2.47	.37	5.2	0.3	17.93	.02	350	6.75
1120	X		3.96	0.03	0.470	0	225.2	16.1	2.63	.16	4.6	0.6	17.85	.08	350	6.78
1125	X		3.95	0.01	0.470	0	237.6	12.4	2.85	.22	4.6	0	17.83	.02	350	6.79
1130	X		3.94	0.01	0.468	.002	239.1	1.5	2.79	.06	4.3	0.3	17.76	.07	350	6.78
1135		X	3.94	0	0.468	0	245.0	5.9	2.65	.10	4.2	0.1	17.80	.04	350	6.78

*Indicator readings have stabilized when 3 consecutive readings are within: +/- 0.1 for pH; =+/- 3% for Specific Conductivity and Temperature; +/- 10 mv for Redox Potential; and +/- 10% for Dissolved Oxygen and Turbidity

ATTACHMENT C

2010 to 2011 Regenox Injection Locations and Field Forms



Injection Point Location Map
First Injection Event
Site 283; Main Post
Fort Monmouth, New Jersey
FOUO

0 5 10 20 Feet

N W E S

Legend

RegenOX Injection Points

(December 8, 2010 - December 10, 2010)

Monitoring Well

Existing Building

Roadway & Parking

Water Body

Post Boundaries

Map Created by:
Fort Monmouth Installation GIO, Environmental Division
Fort Monmouth, New Jersey
Date: May 6, 2011
All drawings must be field verified.
New Jersey State Plane Feet, NAD83

June 29, 2010 U:\GIS\GIS Maps\JT\Templates - In Development\Fort Monmouth Main Post Letter Template.mxt

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: BLDG. 283		
Site Address:		
Zip Code:	Geoprobe Operator: FRANK ACCORSI	Phone:
Weather Conditions:		Date: 12 - 8-10
Subsurface Utilities: ☐ Water; ☐ Telephone; ☐ Storm Sewer; ☐ Sanitary Sewer; ☐ Natural Gas; ☐ Electric; ☐ Cable		

Equipment Information

Drilling Method: GEOPROBE	Pump Manufacturer: RUPE

Injectant Information

Regenesis Product: REGENOX	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP1			15	25	10 lb. PART A / 10 lb. PART B
			14		
			13		
			12		
			11		
			10		
			9		
			8		
			7		

Relinquished by (signature):_____ **Date Submitted:**_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: BLD6.283		
Site Address:		
Zip Code:	Geoprobe Operator: FRANK ACCORSI	Phone:
Weather Conditions: SUNNY, WINDY 30'S		Date: 12-9-10
Subsurface Utilities: ☐ Water; ☐ Telephone; ☒ Storm Sewer; ☒ Sanitary Sewer; ☐ Natural Gas; ☐ Electric; ☐ Cable		

Equipment Information

Drilling Method: GEOPROBE	Pump Manufacturer: RUPE

Injectant Information

Regenesis Product: REGENOX	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP-2			15	25	10 LBS. PART A / 10 LBS PART B
↓			14	↓	↓
			13		
			12		
			11		
			10		
			9		
			8		
			7		

Relinquished by (signature):_____ **Date Submitted:**_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: 283		
Site Address:		
Zip Code:	Geoprobe Operator: George Boyce	Phone:
Weather Conditions:		Date:
Subsurface Utilities: □ Water; □ Telephone; □ Storm Sewer; □ Sanitary Sewer; □ Natural Gas; □ Electric; □ Cable		

Equipment Information

Drilling Method:	Pump Manufacturer:

Injectant Information

Regenesis Product:	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP3	12/7/10		15	24	10 lbs A 10 lbs B
			14	24	
			13	24	
			12	24	
			11	24	
			10	24	
			9	24	
			8	24	
			7	24	

Relinquished by (signature):_____ **Date Submitted:**_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: 283		
Site Address:		
Zip Code:	Geoprobe Operator: George Boyce	Phone:
Weather Conditions:		Date:
Subsurface Utilities: ☐ Water; ☐ Telephone; ☐ Storm Sewer; ☐ Sanitary Sewer; ☐ Natural Gas; ☐ Electric; ☐ Cable		

Equipment Information

Drilling Method:	Pump Manufacturer:

Injectant Information

Regenesis Product:	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP4	12/8/10		15	24	10 lbs A 10 lbs B
			14		
			13		
			12		
			11		
			10		
			9		
			8		
			7		

Relinquished by (signature):_____ **Date Submitted:**_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: 283		
Site Address:		
Zip Code:	Geoprobe Operator: George Boyce	Phone:
Weather Conditions:		Date:
Subsurface Utilities: □ Water; □ Telephone; □ Storm Sewer; □ Sanitary Sewer; □ Natural Gas; □ Electric; □ Cable		

Equipment Information

Drilling Method:	Pump Manufacturer:

Injectant Information

Regenesis Product:	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP5	2/8/10		15	24	10 lbs A 10 lbs B
	↓		14	↓	↓ ↓
			13		
			12		
			11		
			10		
			9		
			8		
	↓		7	↓	

Relinquished by (signature):_____ **Date Submitted:**_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: BLDG. 283		
Site Address:		
Zip Code:	Geoprobe Operator: FRANK ACCORSI	Phone:
Weather Conditions: CLOUDY, 30'S		Date: 12-10-10
Subsurface Utilities: ☐ Water; ☐ Telephone; ☐ Storm Sewer; ☒ Sanitary Sewer; ☐ Natural Gas; ☐ Electric; ☐ Cable		

Equipment Information

Drilling Method: GEOPROBE	Pump Manufacturer: RUPE

Injectant Information

Regenesis Product: REGENOX	Percent Solution Injected: 4

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP-6			15	25	10LB. PART A / 10LB. PART B
↓			14	↓	↓
			13		
			12		
			11		
			10		
			9		
			8		
			7		

Relinquished by (signature):_____ **Date Submitted:**_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: BLDG. 283		
Site Address:		
Zip Code:	Geoprobe Operator: FRANK ACCORSI	Phone:
Weather Conditions: SUNNY, WINDY, 30's		Date: 12-9-10
Subsurface Utilities: ☐ Water; ☐ Telephone; ☐ Storm Sewer; ☐ Sanitary Sewer; ☐ Natural Gas; ☐ Electric; ☐ Cable		

Equipment Information

Drilling Method: GEOPROBE	Pump Manufacturer: RUPE

Injectant Information

Regenesis Product: REGENOX	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP-7			15	25	10 LB. PART A / 10 LB. PART B
			14		
			13		
			12		
			11		
			10		
			9		
			8		
			7		

Relinquished by (signature):_____ Date Submitted:_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: BLDG B3		
Site Address:		
Zip Code:	Geoprobe Operator: FRANK ACCORSI	Phone:
Weather Conditions: CLOUDY, 30'S		Date: 12-10-10
Subsurface Utilities: ☐ Water; ☐ Telephone; ☐ Storm Sewer; ☐ Sanitary Sewer; ☐ Natural Gas; ☐ Electric; ☐ Cable		

Equipment Information

Drilling Method: GEOPROBE	Pump Manufacturer: RUPE

Injectant Information

Regenesis Product: REGENOX	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP-8			15	25	10 LB. PART A / 10 LB. PART B
			14		
			13		
			12		
			11		
			10		
			9		
			8		
			7		

Relinquished by (signature):_____ Date Submitted:_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: 283		
Site Address:		
Zip Code:	Geoprobe Operator: George Boyce	Phone:
Weather Conditions:		Date:
Subsurface Utilities: ☐ Water; ☐ Telephone; ☐ Storm Sewer; ☐ Sanitary Sewer; ☐ Natural Gas; ☐ Electric; ☐ Cable		

Equipment Information

Drilling Method:	Pump Manufacturer:

Injectant Information

Regenesis Product:	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP9	12/10/10		15	24	10 lbs A 10 lbs B
			14		
			13		
			12		
			11		
			10		
			9		
			8		
			7		

Relinquished by (signature):_____ Date Submitted:_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: 283		
Site Address:		
Zip Code:	Geoprobe Operator: George Boyce	Phone:
Weather Conditions:		Date:
Subsurface Utilities: □ Water; □ Telephone; □ Storm Sewer; □ Sanitary Sewer; □ Natural Gas; □ Electric; □ Cable		

Equipment Information

Drilling Method:	Pump Manufacturer:

Injectant Information

Regenesis Product:	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP 10	2/8/10		15	24	10 lbs A 10 lbs B
			14		
			13		
			12		
			11		
			10		
			9		
			8		
			7		

Relinquished by (signature):_____ Date Submitted:_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: BL04,283		
Site Address:		
Zip Code:	Geoprobe Operator: FRANK ACCORSI	Phone:
Weather Conditions: SUNNY, WINDY, 30's		Date: 12-7-10
Subsurface Utilities: ☐ Water; ☐ Telephone; ☐ Storm Sewer; ☒ Sanitary Sewer; ☐ Natural Gas; ☐ Electric; ☐ Cable		

Equipment Information

Drilling Method: GEOPROBE	Pump Manufacturer: RUPE

Injectant Information

Regenesis Product: REGENOX	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP-11	12-7-10		15	24	10165 PART A / 10165 PART B
			14		
			13		
			12		
			11		
			10		
			9		
			8		
			7		

Relinquished by (signature):_____ Date Submitted:_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: BLOG. 283		
Site Address:		
Zip Code:	Geoprobe Operator: FRANK ACCORSI	Phone:
Weather Conditions:		Date: 12-8-10
Subsurface Utilities: ☐ Water; ☐ Telephone; ☐ Storm Sewer; ☒ Sanitary Sewer; ☐ Natural Gas; ☐ Electric; ☐ Cable		

Equipment Information

Drilling Method: GEOPROBE	Pump Manufacturer: RUPE

Injectant Information

Regenesis Product: REGENOX	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP 12			15	25	10 lb. PART A / 10 lb. PART B
			14	↓	↓
			13		
			12		
			11		
			10		INJECTION DISCONTINUED DUE TO SHORT CIRCUITING TO PREVIOUS INJECTION POINT

Relinquished by (signature):_____ **Date Submitted:**_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: 283		
Site Address:		
Zip Code:	Geoprobe Operator: George Boyce	Phone:
Weather Conditions:		Date:
Subsurface Utilities: □ Water; □ Telephone; □ Storm Sewer; □ Sanitary Sewer; □ Natural Gas; □ Electric; □ Cable		

Equipment Information

Drilling Method:	Pump Manufacturer:

Injectant Information

Regenesis Product:	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP13	12/9/10		15	24	10 lbs A 10 lbs B
			14		
			13		
			12		
			11		
			10		
			9		
			8		
			7		

Relinquished by (signature):_____ **Date Submitted:**_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: 283		
Site Address:		
Zip Code:	Geoprobe Operator: George Boyce	Phone:
Weather Conditions:		Date:
Subsurface Utilities: ☐ Water; ☐ Telephone; ☐ Storm Sewer; ☐ Sanitary Sewer; ☐ Natural Gas; ☐ Electric; ☐ Cable		

Equipment Information

Drilling Method:	Pump Manufacturer:

Injectant Information

Regenesis Product:	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP 14	12/9/10		15	24	10 lbs A 10 lbs B
			14		
			13		
			12		
			11		
			10		
			9		
			8		
			7		

Relinquished by (signature):_____ **Date Submitted:**_____

Injection Data Field Log Sheet

Site & Personnel Information

Site Name: 283		
Site Address:		
Zip Code:	Geoprobe Operator: George Boyce	Phone:
Weather Conditions:		Date:
Subsurface Utilities: ☐ Water; ☐ Telephone; ☐ Storm Sewer; ☐ Sanitary Sewer; ☐ Natural Gas; ☐ Electric; ☐ Cable		

Equipment Information

Drilling Method:	Pump Manufacturer:

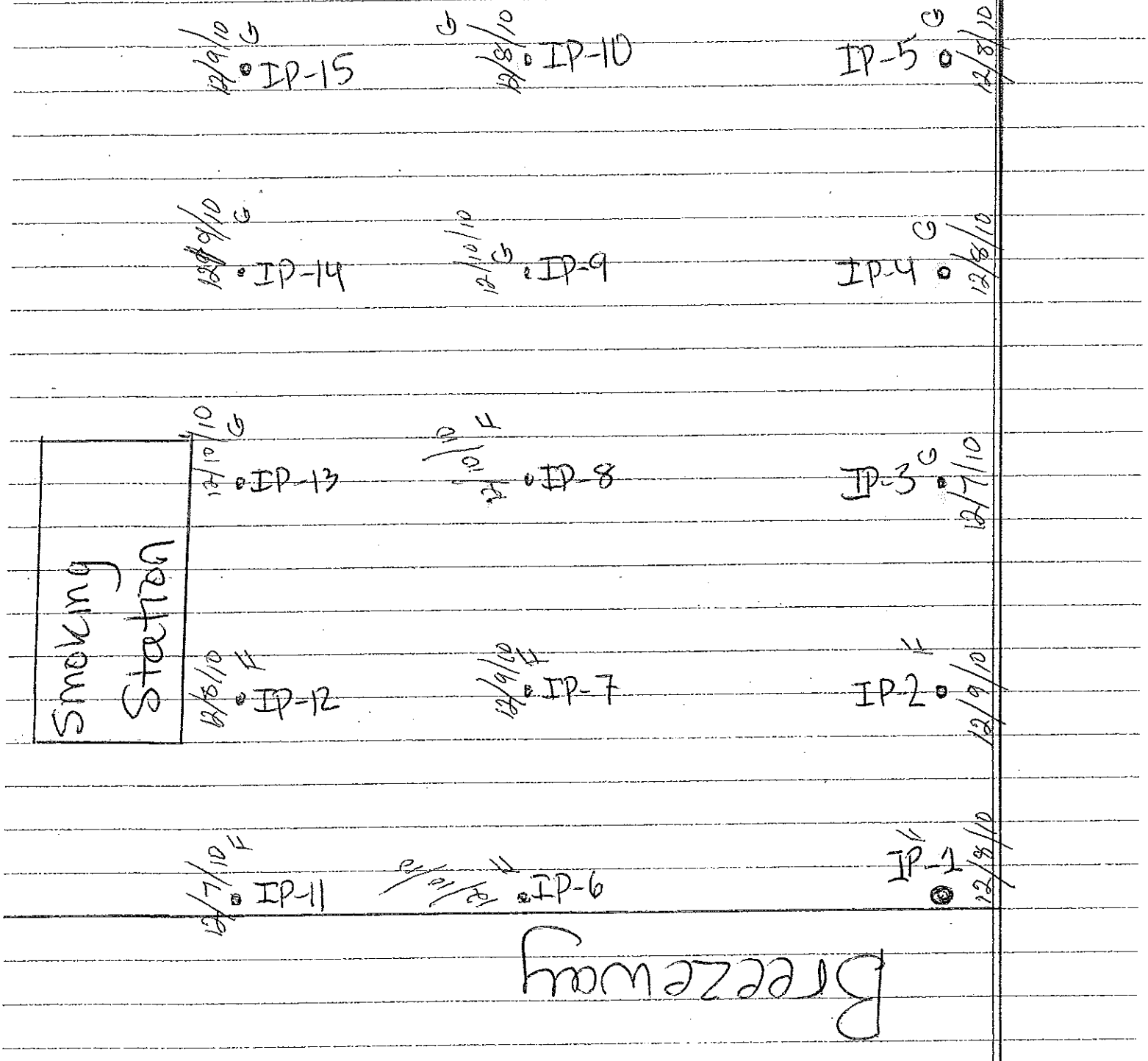
Injectant Information

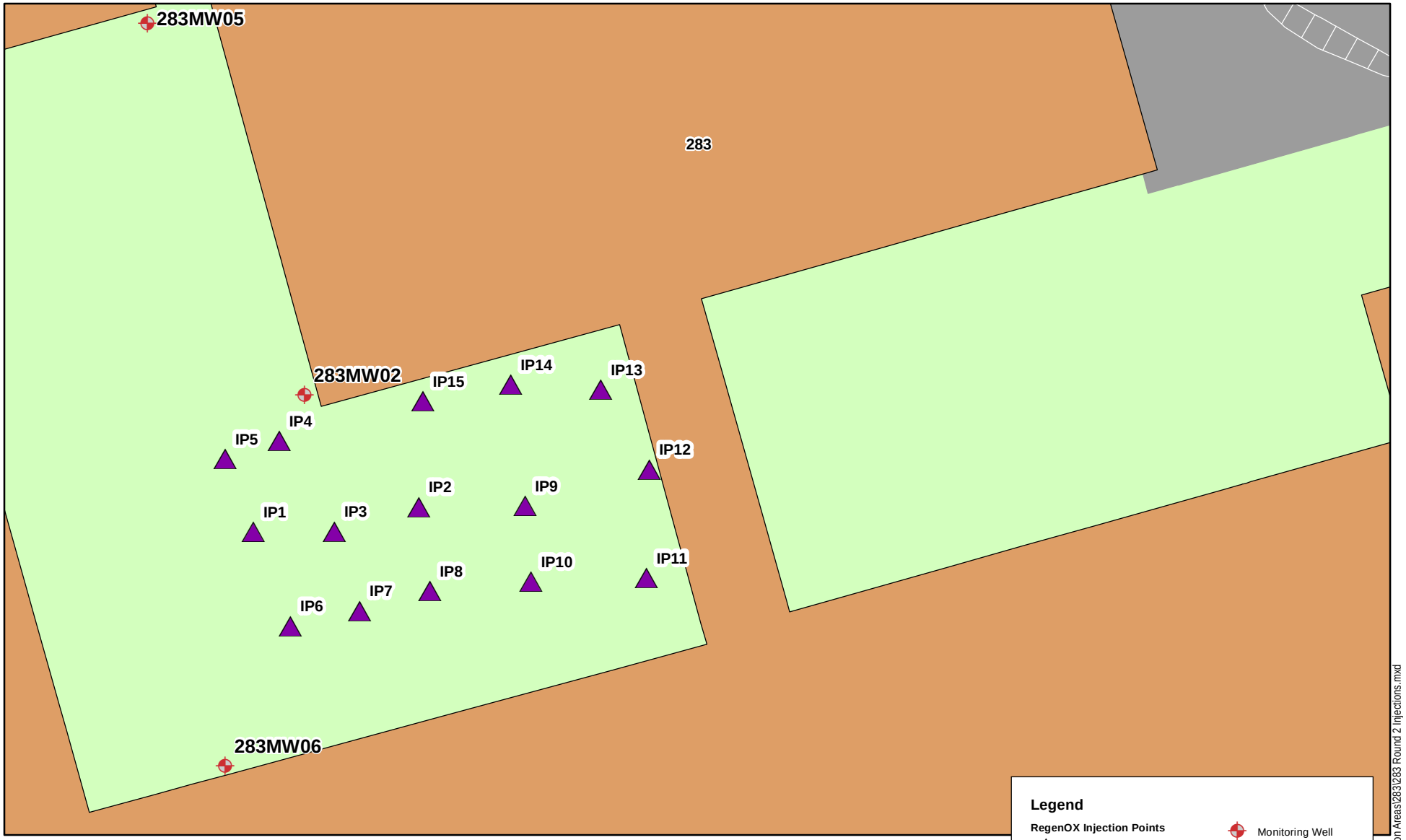
Regenesis Product:	Percent Solution Injected:

Injection Information

Injection Point ID	Time	Elapsed Time (minutes)	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
IP15	12/9/10		15	24	10 lbs A 10 lbs B
			14		
			13		
			12		
			11		
			10		
			9		
			8		
			7		

Relinquished by (signature):_____ Date Submitted:_____


IP-15
12/9/10 G
IP-10
12/8/10 G
IP-5
12/8/10 G
IP-14
12/9/10 G
IP-9
12/10/10 G
IP-4
12/6/10 G
IP-13
12/10/10 G
IP-8
12/10/10 H
IP-3
12/7/10 G
Smoking Station
IP-12
12/6/10 H
IP-7
12/9/10 H
IP-2
12/9/10 H
IP-11
12/7/10 H
IP-6
12/9/10 H
IP-1
12/8/10 H
Breezeway



Legend

RegenOX Injection Points

(April 27, 2011 - May 02, 2011)

Monitoring Well

Existing Building

Roadway & Parking

Water Body

Post Boundaries

0 5 10 20 Feet

N W E S

Injection Point Location Map
Second Injection Event
Building 283; Main Post
Fort Monmouth, New Jersey
FOUO

Map Created by:
Fort Monmouth Installation GIO, Environmental Division
Fort Monmouth, New Jersey
Date: May 6, 2011
All drawings must be field verified.
New Jersey State Plane Feet, NAD83

May 6, 2011 H:\GIS\GIS Maps\CH\PR16-Injection Areas\283\283 Round 2 Injections.mxd

Summary of Injection Data

Site & Personnel Information

Site Name: Building 283

Site Address: Sherrill Avenue, Fort Monmouth, NJ 07703

Geoprobe Operators: George Boyce and Frank Accorsi

Equipment Information

Drilling Method: Direct push

Pump Manufacturer: Rupp

Injectant Information 3 Pails A 3 Pails B each hole

Regenesis Product: RegenOx

Percent Solution Injected: 4%

Injection Information

Injection Point ID	Date	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
	4/27/11	15		10 lbs Part A + 10 lbs Part B injected at approximately 6 gpm
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
	4/27/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
	4/27/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
	4/27/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		

Summary of Injection Data

Site & Personnel Information

Site Name: Building 283

Site Address: Sherrill Avenue, Fort Monmouth, NJ 07703

Geoprobe Operators: George Boyce and Frank Accorsi

Equipment Information

Drilling Method: Direct push

Pump Manufacturer: Rupp

Injectant Information

Regenesis Product: RegenOx

Percent Solution Injected: 4%

Injection Information

Injection Point ID	Date	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
	4/28/11	15		10 lbs Part A + 10 lbs Part B injected at approximately 6 gpm
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
	4/28/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
	4/28/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
	4/28/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		

Summary of Injection Data

Site & Personnel Information

Site Name: Building 283

Site Address: Sherrill Avenue, Fort Monmouth, NJ 07703

Geoprobe Operators: George Boyce and Frank Accorsi

Equipment Information

Drilling Method: Direct push

Pump Manufacturer: Rupp

Injectant Information

Regenesis Product: RegenOx

Percent Solution Injected: 4%

Injection Information

Injection Point ID	Date	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
	4/29/11	15		10 lbs Part A + 10 lbs Part B injected at approximately 6 gpm
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
	4/29/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
	4/29/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
		15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
		15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		

Summary of Injection Data

Site & Personnel Information

Site Name: Building 283

Site Address: Sherrill Avenue, Fort Monmouth, NJ 07703

Geoprobe Operators: George Boyce and Frank Accorsi

Equipment Information

Drilling Method: Direct push

Pump Manufacturer: Rupp

Injectant Information

Regenesis Product: RegenOx

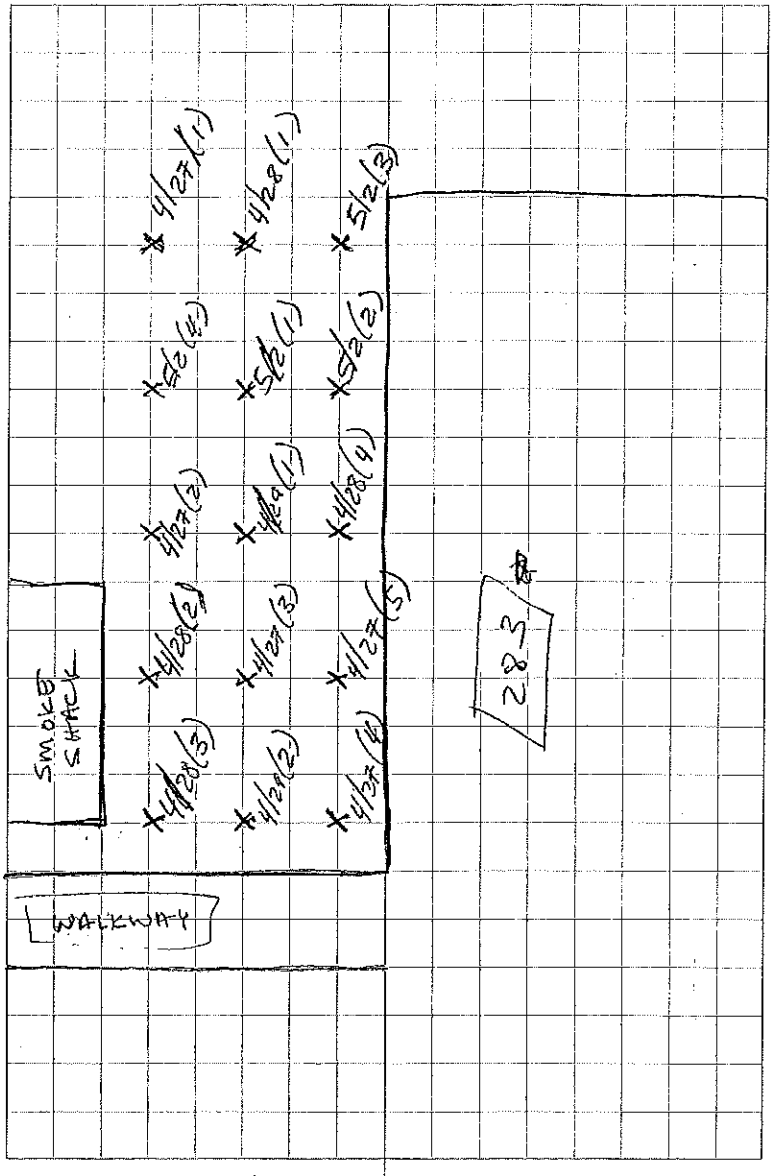
Percent Solution Injected: 4%

Injection Information

Injection Point ID	Date	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
	5/2/11	15		10 lbs Part A + 10 lbs Part B injected at approximately 6 gpm
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
	5/2/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
	5/2/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
	5/2/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
		15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		

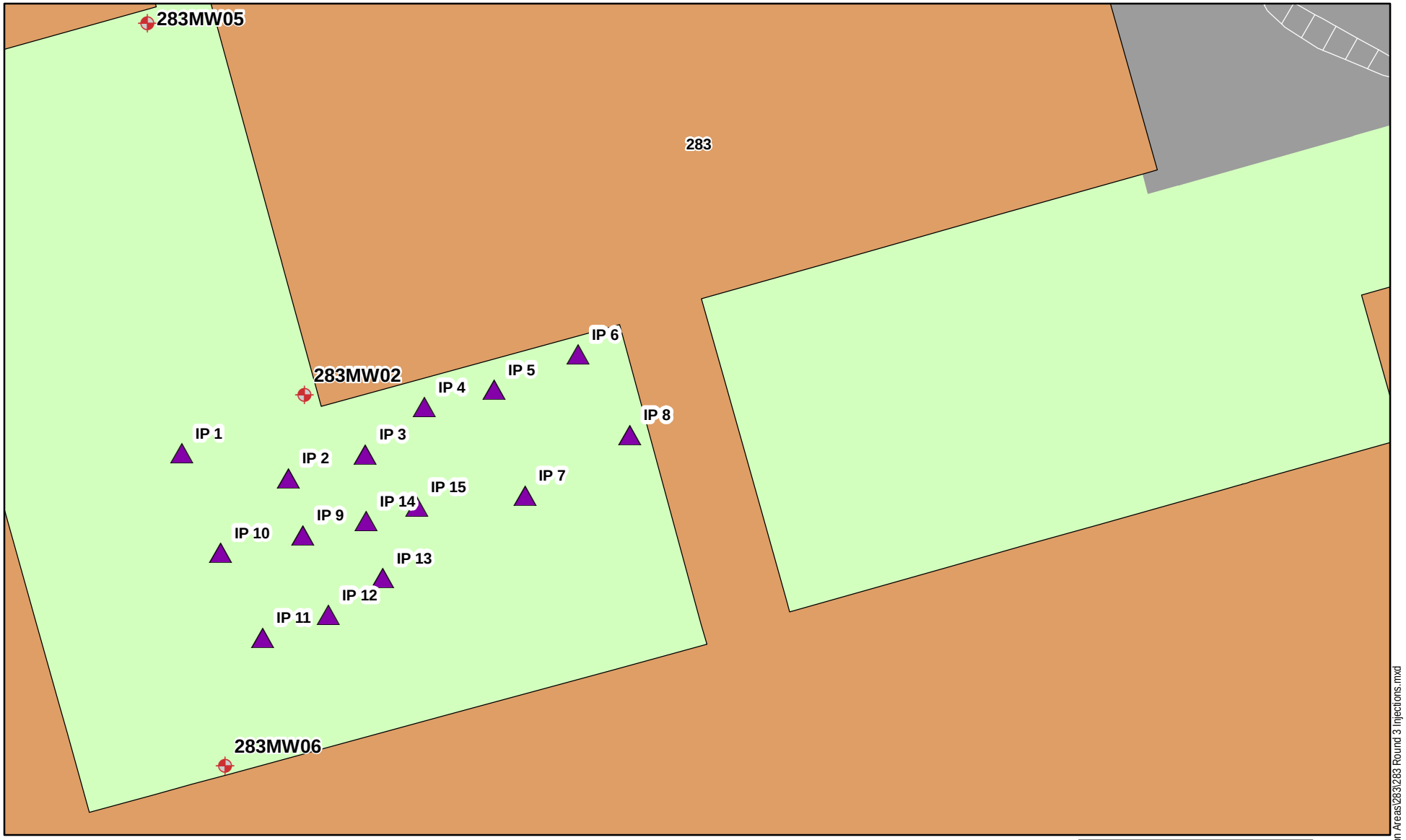
Location 283 Date

Project / Client INFECTION POINTS



283 Round 2 Injection Point Loc

Comment	Northing_Y	Easting_X
4-27-11/1	540294.534871	618944.493627
4-27-11/2	540298.759781	618961.302055
4-27-11/3	540308.99161	618972.714906
4-27-11/4	540322.956135	618981.868047
4-27-11/5	540323.598774	618971.015186
4-28-11/1	540305.892937	618940.052372
4-28-11/2	540299.864932	618973.467291
4-28-11/3	540300.33049	618987.343683
4-28-11/4	540321.591316	618960.475414
4-29-11/1	540308.875267	618959.955787
4-29-11/2	540313.344851	618987.709794
5-2-11/1	540305.944477	618949.774752
5-2-11/2	540316.795651	618943.203697
5-2-11/3	540314.645407	618936.706504
5-2-11/4	540296.386807	618952.842898



Injection Point Location Map
Third Injection Event
Building 283, Main Post
Fort Monmouth, New Jersey
FOUO

0 5 10 20 Feet

N W E S

Legend

RegenOX Injection Points (June 28, 2011 - July 1, 2011)

- Monitoring Well
- Existing Building
- Roadway & Parking
- Water Body
- Post Boundaries

Map Created by:
Fort Monmouth Installation GIO, Environmental Division
Fort Monmouth, New Jersey
Date: July 6, 2011
All drawings must be field verified.
New Jersey State Plane Feet, NAD83

July 6, 2011 H:\GIS\GIS Maps\CH\PR16-Injection Areas\283\283 Round 3 Injections.mxd

Summary of Injection Data

Site & Personnel Information

Site Name: Building 283

Site Address: Sherrill Avenue, Fort Monmouth, NJ 07703

Geoprobe Operators: George Boyce and Frank Accorsi

Equipment Information

Drilling Method: Direct push

Pump Manufacturer: Rupp

Injectant Information

Regenesis Product: RegenOx

Percent Solution Injected: 4%

Injection Information 4 Pails A 4 Pails B each hole

Injection Point ID	Date	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
1	6/28/11	15		10 lbs Part A + 10 lbs Part B injected at approximately 6 gpm
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
2	6/28/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
3	6/28/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
4	6/28/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
5	6/28/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		

Summary of Injection Data

Site & Personnel Information

Site Name: Building 283

Site Address: Sherrill Avenue, Fort Monmouth, NJ 07703

Geoprobe Operators: George Boyce and Frank Accorsi

Equipment Information

Drilling Method: Direct push

Pump Manufacturer: Rupp

Injectant Information

Regenesis Product: RegenOx

Percent Solution Injected: 4%

Injection Information

Injection Point ID	Date	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
6	6/28/11	15		10 lbs Part A + 10 lbs Part B injected at approximately 6 gpm
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
7	6/29/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
8	6/29/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
9	6/29/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
11	6/29/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		

Summary of Injection Data

Site & Personnel Information

Site Name: Building 283

Site Address: Sherrill Avenue, Fort Monmouth, NJ 07703

Geoprobe Operators: George Boyce and Frank Accorsi

Equipment Information

Drilling Method: Direct push

Pump Manufacturer: Rupp

Injectant Information

Regenesis Product: RegenOx

Percent Solution Injected: 4%

Injection Information

Injection Point ID	Date	Injection Depth (feet below grade)	Volume Injected (gallons)	Comments
12	6/29/11	15		10 lbs Part A + 10 lbs Part B injected at approximately 6 gpm
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
13	6/30/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
14	6/30/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
15	6/30/11	15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		
		15		
		14		
		13		
		12		
		11		
		10		
		9		
		8		
		7		

ATTACHMENT D

2016 UST 283 A Soil Boring Logs

PARSONS

Soil Boring Log

CLIENT: USACE
PROJECT NAME: FTMM - ECP
PROJECT LOCATION: FTMM Parcel
PROJECT NUMBER: 748810-

GROUNDWATER OBSERVATIONS
WATER LEVEL: ~7
DATE: 8/8/16
TIME: 1000
MEAS. FROM: BGS

INSPECTOR: P. Watson
DRILLER: J. BARNAK
WEATHER: 80°F O.C.
CONTRACTOR: East Coast Drilling, Inc. (ECDI)
RIG TYPE: Geoprobe(R) 7822DT
DATE/TIME START: 0950
DATE/TIME FINISH: 1000
WEIGHT OF HAMMER: N/A
DROP OF HAMMER: N/A
TYPE OF HAMMER: N/A

BORING/WELL ID: 283A-SB02
LOCATION DESCRIPTION: AM61
LOCATION PLAN: Oceanport, New Jersey

DEPTH (feet)	SAMPLE I.D.	BLOWS per 6"	ADV/ REC.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL	STRATA	COMMENTS
0			60/51	0	0-25" Dry, loose, Brown, mf SAND, little silt, trace f gravel		
1							
2					25"-35" Moist, SAA		
3					35"-51" Moist, Brown/orange/tan, mottled f SAND, little clay		
4							
5	5-5.5		60/60	0	0-5" SAA		
6					5"-60" Moist, Brown/gray/orange, f SAND, mottled, little clay trace silt		
	6.5-7						
7							
8					Saturated @ 23"		
9							
10							

Remarks:

Sample Types
S -- Split-Spoon
U -- Undisturbed Tube
C -- Rock Core
A -- Auger Cuttings

Consistency vs. Blowcount / Foot

Granular (Sand & Gravel)			Fine Grained (Silt & Clay)	
V. Loose: 0-4	Dense: 30-50		V. Soft: <2	Stiff: 8-15
Loose: 4-10	V. Dense: >50		Soft: 2-4	V. Stiff: 15-30
M. Dense: 10-30			M. Stiff: 4-8	Hard: > 30

and - 35-50%
some - 20-35%
little - 10-20%
trace - <10%
moisture, density, color, gradation

Soil Boring Log

CLIENT: USACE	INSPECTOR:	BORING/WELL ID: 283A-SB02
PROJECT NAME: FTMM - ECP	DRILLER:	LOCATION DESCRIPTION
PROJECT LOCATION: FTMM Parcel	WEATHER:	
PROJECT NUMBER: 748810-	CONTRACTOR: East Coast Drilling, Inc. (ECDI)	
GROUNDWATER OBSERVATIONS	RIG TYPE: Geoprobe(R) 7822DT	LOCATION PLAN
WATER LEVEL: ~7	DATE/TIME START:	Oceanport, New Jersey
DATE:	DATE/TIME FINISH:	
TIME:	WEIGHT OF HAMMER: N/A	
MEAS. FROM:	DROP OF HAMMER: N/A	
	TYPE OF HAMMER: N/A	

DEPTH (feet)	SAMPLE I.D.	BLOWS per 6"	ADV/ REC.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL	STRATA	COMMENTS
0			12/12	0	0-12" SAA		
				0			
1							
2							
3							
4							
5							
6							
7							
8							
9							
0							

Remarks:

Sample Types	Consistency vs. Blowcount / Foot				
S – Split-Spoon	Granular (Sand & Gravel)		Fine Grained (Silt & Clay)		and - 35-50%
U – Undisturbed Tube	V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15	some - 20-35%
C – Rock Core	Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30	little - 10-20%
A – Auger Cuttings	M. Dense: 10-30		M. Stiff: 4-8	Hard: > 30	trace - <10%
					moisture, density, color, gradation

PARSONS

Page 1 of 2

Soil Boring Log

CLIENT: USACE
PROJECT NAME: FTMM - ECP
PROJECT LOCATION: FTMM Parcel
PROJECT NUMBER: 748810-

GROUNDWATER OBSERVATIONS
WATER LEVEL: ~7'
DATE: 8/8/16
TIME:
MEAS. FROM:

INSPECTOR: C. Watson
DRILLER: J. Barnak
WEATHER: 80f D.C.
CONTRACTOR: East Coast Drilling, Inc. (ECDI)
RIG TYPE: Geoprobe(R) 7822DT
DATE/TIME START: 0920
DATE/TIME FINISH: 0936
WEIGHT OF HAMMER: N/A
DROP OF HAMMER: N/A
TYPE OF HAMMER: N/A

BORING/WELL ID: 2839-SB-01
LOCATION DESCRIPTION: Parcel 61 FTMM -
LOCATION PLAN: Oceanport, New Jersey

DEPTH (feet)	SAMPLE I.D.	BLOWS per 6"	ADV/ REC.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL	STRATA	COMMENTS
0			60/50	0	0-22" Dry, loose, Brown, Mf SAND, little silt, trace f gravel		
1							
2					22"-37" Moist, M. Dense, light Brown/TAN, MC SAND, trace silt, trace f gravel		
3							
4					37"-50" Wet, M. Dense, TAN/Brown/orange, f SAND, little clay		
5	5-5.5		60/60	0	0-10" SAA		
6					10"-60" Moist, Dense, Brown/grey/orange, f SAND, Mottled, trace clay, trace silt Saturated @ 24"		
	6.5-7						
7							
8							
9							
10							

Remarks:

Sample Types
S – Split-Spoon
U – Undisturbed Tube
C – Rock Core
A – Auger Cuttings

Consistency vs. Blowcount / Foot

Granular (Sand & Gravel)			Fine Grained (Silt & Clay)	
V. Loose: 0-4	Dense: 30-50		V. Soft: <2	Stiff: 8-16
Loose: 4-10	V. Dense: >50		Soft: 2-4	V. Stiff: 16-30
M. Dense: 10-30			M. Stiff: 4-8	Hard: > 30

and - 35-50%
some - 20-35%
little - 10-20%
trace - <10%
moisture, density, color, gradation

PARSONS

Soil Boring Log

CLIENT: USACE
PROJECT NAME: FTMM - ECP
PROJECT LOCATION: FTMM Parcel
PROJECT NUMBER: 748810-

GROUNDWATER OBSERVATIONS
WATER LEVEL: ~7
DATE: 8/5/16
TIME:
MEAS. FROM: bgs

INSPECTOR:
DRILLER:
WEATHER:
CONTRACTOR: East Coast Drilling, Inc. (ECDI)
RIG TYPE: Geoprobe(R) 7822DT
DATE/TIME START:
DATE/TIME FINISH:
WEIGHT OF HAMMER: N/A
DROP OF HAMMER: N/A
TYPE OF HAMMER: N/A

BORING/WELL ID: 283A-SB01
LOCATION DESCRIPTION: on Parcel 6
LOCATION PLAN: Oceanport, New Jersey

DEPTH (feet)	SAMPLE I.D.	BLOWS per 6"	ADV/ REC.	PID (ppm)	FIELD IDENTIFICATION OF MATERIAL	STRATA	COMMENTS
0			60/60	0	0-8" SAA, saturated		
1					8"-42" moist, Dense, mf pale brown/orange/gray mottled SAND, little silt, trace clay		
2							
3					42"-60" Wet, M. Dense, Dark gray mf SAND, little silt, trace clay		
4							
5					end of Boring		
6							
7							
8							
9							
10							

Remarks:

Sample Types
S – Split-Spoon
U – Undisturbed Tube
C – Rock Core
A – Auger Cuttings

Consistency vs. Blowcount / Foot

Granular (Sand & Gravel)		Fine Grained (Silt & Clay)	
V. Loose: 0-4	Dense: 30-50	V. Soft: <2	Stiff: 8-15
Loose: 4-10	V. Dense: >50	Soft: 2-4	V. Stiff: 15-30
M. Dense: 10-30		M. Stiff: 4-8	Hard: > 30

and - 35-50%
some - 20-35%
little - 10-20%
trace - <10%
moisture, density, color, gradation