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 D. Wright Date 8-11-99

Approved By Jackie Herman Date 8/11/99
QA Manager / Laboratory Director
Retired 1/28/03

5 EQUIPMENT AND MATERIALS:

5.1 Equipment

5.1.1 Dissolved oxygen meter
5.1.2 HNU photo ionizer
5.1.3 Conductivity/pH/temp meter
5.1.4 Peristaltic well pumps
5.1.5 Pump heads and power cables
5.1.6 Water level meter
5.1.7 Oil/water interface probe
5.1.8 Submersible well pumps
5.1.9 Various batteries
5.1.10 Buckets
5.1.11 Miscellaneous tools, i.e. screwdriver, well wrench, etc.

5.2 Materials:

5.2.1 Thick wall silicone tubing ¼ inch diameter,
5.2.2 Polyethylene (food grade) tubing ¼ inch diameter,
5.2.3 12 inch single sample 1 check stop teflon disposable bailers,
5.2.4 Mason string.

6 STANDARDS/REAGENTS:

6.1 Buffer solutions, calibration gases, decontamination materials, and acids for preservation.

6.1.1 Buffer solutions:

6.1.1.1 7.00 standard buffer solution
6.1.1.2 10.00 standard buffer solution
6.1.1.3 4.00 standard buffer solution
6.1.1.4 Distilled and deionized water
6.1.1.5 Alconox
6.1.1.6 10 % nitric acid rinse (trace metal or higher grade HNO3 diluted with distilled/deionized (ATSM Type II) H2O)
6.1.1.7 Acetone (pesticide grade)
6.1.1.8 Pure nitrogen 100 ppm Isobutylene cal gas.

6.1.2 Acids/materials used in preserving samples:

6.1.2.1 Nitric acid 69, 0-70.0%
6.1.2.2 Sulfuric acid 50% (w/w) solution
6.1.2.3 Hydrochloric acid (trace metal grade)
6.1.2.4 Ice for keeping samples at <4 degrees celcius.

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.

8.1.5 Equipment: Please refer to Equipment section 5.

8.1.6 Before purge activities: Certain instruments and meters are calibrated before use. Also, certain measurements and calculations are obtained before any purge activities take place. The following is a list of information/data/steps required prior to the commencement of purge activities. Pertinent information is recorded in log books or on well sheets.

8.1.7 Date, time and weather conditions: Date and time are needed for holding time purposes and general record keeping. Weather conditions may affect ambient conditions at a particular site, therefore said information is recorded. Tidal influences may also be included here, if wells are in a tidal area.

8.1.8 Well number and permit number: These are prominently displayed on the outside of each well in accordance with NJDEP regulations for well construction.

8.1.9 Meter and instrument calibrations: Meters utilized in the course of site sampling activities are calibrated at this time, and the findings recorded in the appropriate logbook. Refer to section 7 for instrument/meter calibration directions.

8.1.10 PID or FID, HNU reading: This is taken from the well inner casing immediately after the cap is removed, findings are recorded.

8.1.11 Free product check: Using ORS meter for interfaces, the presence or absence of free product is determined. Thickness is measured and recorded.

8.1.11.1 Light Non-Aqueous Phase Liquids (LNAPLs) and Dense Non-Aqueous Phase Liquids (DNAPLs): Measurement of thickness for DNAPLs and LNAPLs are performed prior to well purging. An interface probe is used (ORS meter) for this task. If present, LNAPLs are sampled and analyzed for chemical and physical parameters. Sampling is conducted by using a bottom filling bailer which is lowered into the LNAPL layer. DNAPLs are sampled using a dual check valve bailer. If present, DNAPLs are also tested for chemical and physical properties.

8.1.12 Dissolved oxygen, pH, temperature, and specific conductivity: Readings are obtained and recorded on well sheets.

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.

8.5 Ground water sampling: Following well evacuation procedures, ground water sampling can begin. In most cases, sampling takes place immediately following purge activities. However, due to certain field conditions, well sampling may be postponed for a period not to exceed 2 hours following completion of purge activities. When multiple wells are being sampled, the least contaminated well is sampled first. Subsequent wells are sampled in order of ascending contamination. Sampling is conducted by using a bottom filling teflon bailer, dedicated to each particular monitoring well. The bailer is lowered slowly into water column until submerged, and then slowly retrieved. The sample is then carefully transferred to the appropriate sample containers. Ground water collected in the first bailing sequence is always used for sampling purposes, it is never discarded.

8.6 Sample order: Samples are collected in the following order:

- 8.6.1 volatile organics (VOA)
- 8.6.2 purgeable organic carbons (POC)
- 8.6.3 purgeable organic halogens (POX)
- 8.6.4 total organic halogens (TOX)
- 8.6.5 total organic carbon (TOC)
- 8.6.6 base neutrals/acid extractables
- 8.6.7 TPHC/oil and grease
- 8.6.8 PCB's/pesticides
- 8.6.9 total metals
- 8.6.10 dissolved metals
- 8.6.11 phenols, cyanide
- 8.6.12 sulfate and chloride
- 8.6.13 turbidity
- 8.6.14 nitrate and ammonia,
- 8.6.15 preserved inorganics
- 8.6.16 radionuclides
- 8.6.17 non-preserved inorganics
- 8.6.18 bacteria

8.7 Dupes and matrix spikes/matrix spike duplicates: These samples are taken in same order at same time. Refer to section 10.2.1.2.

8.8 After sampling: The following data is recorded on well sheets: Start and end time of sampling, dissolved oxygen, pH, temperature, specific conductivity, and sampling method.

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

9.3 Purge rate: The purge rate is determined by calculating the length of time it takes for a pump to fill a 1 gallon bucket with water. The time is then 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)

10 QUALITY CONTROL:

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 from 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.

10.1 Sample Containers: Before sample collection can begin consideration must be given as to what type 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 the laboratory's internal QA/QC requirements. They are selected upon review of the following:

10.1.1 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.

10.1.2 Volume of the container. The volume of sample needed is dictated by the analytical method and the sample matrix. The laboratory supplies bottles that allow for sufficient volumes of sample matrix to be collected.

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

is collected, containerized and secured in a single locale. Subsequently, the water is properly characterized and processed for offsite disposal.

10.2 QA/QC samples: These samples are intended to provide control over the collection of environmental measurements and subsequent validation, review, and interpretation of analytical data. Trip blanks are used exclusively for volatile organic analysis, (aqueous sampling only) and their purpose is to measure possible cross contamination of samples during shipment to and from a site. Trip blanks are never opened and travel to a site with the empty sample bottles and back from a site with the collected samples. Contaminated trip blanks may indicate bottle cleaning or blank water of questionable quality. Trip blanks are collected at the rate of one per day. Likewise, the purpose of a field blank is to place a mechanism of control on sample equipment handling, preparation, storage and shipment. Field blanks travel and are stored with the sample bottles. Field blanks are collected in the following manner. Two identical sets of bottles are prepared. One set is filled with laboratory demonstrated analyte free water (same water used for trip and method blanks). All of the filled bottles are shipped with the other empty sample containers. At the field location, in an area where contamination is suspected, the water is passed from the full set of like-bottles through the dedicated or field decontaminated sampling device and into the empty set of like-bottles. Field blanks are preserved identically to samples receiving the same analyses. Field blanks are collected and analyzed for all of the same parameters as the samples collected that day.

10.2.1 Additional QA/QC samples:

10.2.1.1 Duplicate samples: Collection of a dupe provides for evaluation of laboratory performance by comparing the analytical data of two samples from the same location. They are included 1 for every 20 samples (5% or 1 a day/site) and submitted as blind samples. They are obtained by alternately filling sample bottles from the same source/device for each parameter. VOA samples are same bailer and first set filled.

10.2.1.2 Matrix spike/Matrix spike duplicate analyses or MS/MSDS sample: The laboratory is supplied with triple volume in order to perform matrix spike and matrix spike dupes. This does not include trips or field blanks. Additional sample volume for MS/MSDS is taken within every set of 20 field samples.

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.

Retrieved 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:
7.1 Equipment:
7.1.1 Dissolved oxygen meter

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

7.1.2 HNU photo ionizer
7.1.3 Conductivity/pH/temp meter
7.1.4 Peristaltic well pumps
7.1.5 Pump heads and power cables
7.1.6 Water level meter
7.1.7 Oil/water interface probe
7.1.8 Submersible well pumps
7.1.9 Various batteries
7.1.10 Buckets
7.1.11 Miscellaneous tools, i.e. screwdriver, well wrench, etc.

7.2 Materials:
7.2.1 Thick wall silicone tubing ¼ inch diameter,
7.2.2 Polyethylene (food grade) tubing ¼ inch diameter,
7.2.3 12 inch single sample 1 check stop Teflon disposable bailers,
7.2.4 Mason string.

8 STANDARDS/REAGENTS:

8.1 Buffer solutions, calibration gases, decontamination materials, and acids for preservation.
8.1.1 Buffer solutions:
8.1.1.1 7.00 standard buffer solution.
8.1.1.2 10.00 standard buffer solution.
8.1.1.3 4.00 standard buffer solution.
8.1.2 Distilled and deionized water.
8.1.3 Alconox.
8.1.4 10 % nitric acid rinse (trace metal or higher grade HNO3 diluted with distilled/deionized (ATSM Type II) H2O).
8.1.5 Acetone (pesticide grade).
8.1.6 Pure nitrogen 100-ppm Isobutylene cal gas.
(Refer to NJDEP Field Sampling Procedure Manual Table 2-1 Aqueous Sampling Equipment Decontamination (Lab and Field) for further information)

8.2 Acids/materials used in preserving samples:
8.2.1 Nitric acid 69.0-70.0%.
8.2.2 Sulfuric acid 50% (w/w) solution.
8.2.3 Hydrochloric acid (trace metal grade).

8.3 Ice for keeping samples at <4 degrees Celsius.

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).

9.4 Tubing decontamination: ASTM drinking water grade polyethylene tubing is used and discarded after each use. Avoid pump and tubing contact with ground surface. All tubing is rinsed/wiped with distilled and deionized water to remove any possible residual materials on it before entering well.

9.5 QA/QC samples: These samples are intended to provide control over the collection of measurements, and subsequent validation, review, and interpretation of analytical data. A trip blank is used for volatile organics and its purpose is to measure possible cross contamination of samples in transit and at a site. It is **never** opened and travels to the site or sites **with** empty sample bottles and back **with** samples. They may also indicate poor cleaning. Like wise, a field blank is used to determine a control on the equipment handling, preparation, storage and shipment. It travels with the samples and is a representative of shipment effects on sample quality. By being opened in the field, transferred over a cleaned sampling device, the blank is indicative of ambient and equipment conditions that may affect quality of associated samples. It also serves as an additional check on possible sources of contamination. Blank water is demonstrated analyte free, and is from the same common source and physical locale in lab.

9.5.1 Aqueous matrix QA/QC blank requirements:

9.5.1.1 Field blanks: They are preserved/analyzed for all the same parameters as samples collected that day. They may be required in order to detect cross contamination from ambient air during a potable sampling if known sources are within proximity or monitoring equipment indicates their presence as background. Field blanks must also be taken once every day during sampling.

9.5.1.2 Trip blanks: Consists of a set of bottles each filled at the lab with analyte free water. They accompany the bottles both to and from each site. They are never opened in field. They are also returned in same bottles they were sent out in. At minimum, a trip blank must be analyzed for volatile organics. Inclusion of additional parameters is at the discretion of the NJDEP. Trip blanks and the samples they accompany are not held on site more than 2 calendar days. A trip blank is included in each sample shipment or trip to field, not to exceed 2 consecutive field days.

9.5.2 Additional QA/QC samples:

9.5.2.1 Duplicate samples: Collection of a dupe provides for evaluation of lab performance by comparing the analytical data of two samples from the same location. They are included 1 for every 20 samples (5% or 1 a day/site) and submitted as blind samples. They are obtained by

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.

11.1.4 Well number and permit number: These are to be prominently displayed on outside of well according to NJDEP regulations for well construction. They also help to identify a particular well more exactly at a site.

11.1.5 Meter and instrument calibrations: Any meter utilized in the course of site sampling activities should be calibrated at this time, and then findings recorded in log books. Refer to section 7 and appropriate instrument/meter calibration directions.

11.1.6 PID or FID, HNU reading. This is taken from well inner casing immediately after the cap is removed, and findings recorded.

11.1.7 Free product check: Using ORS meter for interfaces, the presence or absence of product is determined. Thickness is measured and recorded also.

11.1.7.1 Light Non-Aqueous Phase Liquids (LNAPLs) and Dense Non-Aqueous Phase Liquids (DNAPLs): Measurement of thickness of DNAPLs and LNAPLs must be performed prior to purging wells. An interface probe may be used (ORS meter). Each layer of LNAPLs are sampled and analyzed for chemical and physical parameters. Sampling is by using a bottom filling bailer, lowered through LNAPL layer but not significantly down into next phase. DNAPLs are sampled using a dual check valve bailer or bladder pump. Both then are tested for chemical and physical properties. If both are present, it may be necessary to purge well of one casing volume of water prior to sampling DNAPL provided layer is not disturbed. This is done by setting a submersible pump or suction lift pump several feet above DNAPL.

11.2 Dissolved oxygen, pH, temperature, and specific conductivity: Readings should be obtained and recorded on well sheets.

11.3 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 surveyor's mark. All are recorded on well sheets.

11.4 Calculations: Calculations are then done as stated in section 12.

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

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

11.7 Pre-entry to well: Before tubing (refer to materials section) is inserted in well, it must be wiped down and rinsed with DI water. Then inserted into well leaving at maximum six feet of distance below water surface. Tubing is then lowered as depth drops, or as needed.

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

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TITLE: Monitor Well Sampling for IRP sites at Fort Monmouth

non-preserved inorganics
bacteria.

This order must be followed.

11.13 Dupes and matrix spikes/matrix spike duplicates: These samples are taken in the same order and at the same time as samples. Refer to sections 9.5.2 and 11.12.

11.14 After sampling: The following data is recorded on well sheets: Start and end time of sampling, dissolved oxygen, pH, temperature, specific conductivity, and sampling method.

12 CALCULATIONS:

12.1 Four calculations must be done 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.

12.1.1 Linear feet of water: This is calculated by knowing the total depth of the well and subtracting the depth to water measured by a depth meter. These two numbers should be 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)

12.1.2 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. By multiplying the amount of water within a casing by 3 equals the total minimum volume to be purged. It should be noted here that the amount purged should not exceed 5x the amount of standing water in a well.

Equation:

linear ft of water x volume per ft 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

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.

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	BN+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/m³)

			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
Chemical	RAL[3]	IA Non-residential[2]	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 3.11-3
Fort Monmouth ECP Site Investigation, Parcel 50
Summary of Analytical Parameters Detected in Indoor Air (µg/m³)

Chemical	RAL[3]	IA Non-residential[2]	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 3.11-4
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.

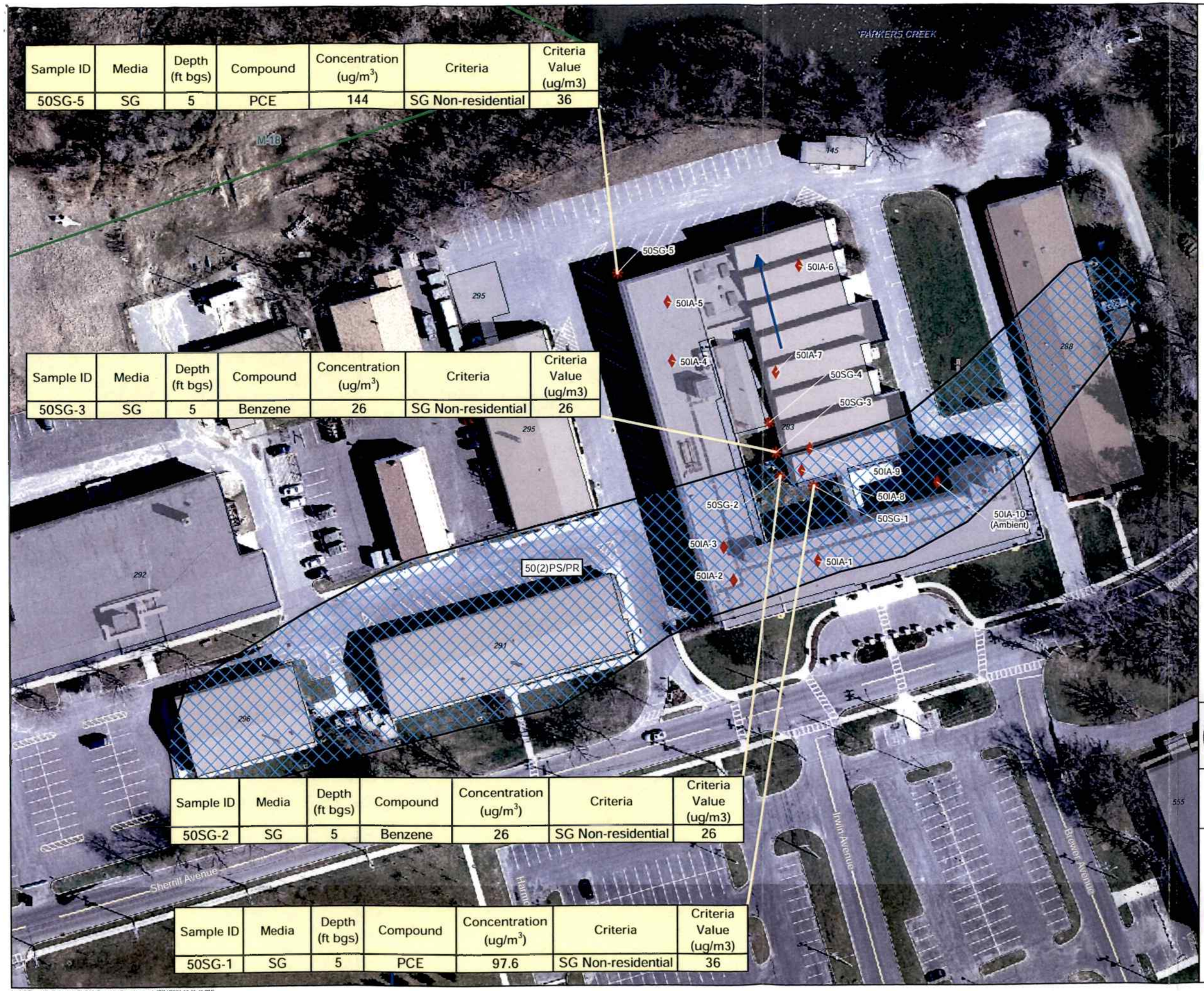
J = Indicates an estimated value.

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)