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PITT-09-6-025

September 20, 2006

Project Number 0182

Mr. Lonnie Monaco
BRAC Program Management Office Northeast
4911 South Broad Street
Philadelphia, Pennsylvania 19112-1303

Reference: CLEAN Contract No. N62472-03-D-0057
Contract Task Order 041

Subject: Technical Subcommittee Meeting (TSC) Meeting Notes of August 30, 2006
Former Naval Air Warfare Center (NAWC) Warminster, Pennsylvania

Dear Mr. Monaco:

Enclosed please find notes from the TSC meeting held on August 30, 2006. Copies of these notes are being sent to the individuals identified on the distribution list.

Please contact me if you have any questions or comments.

Sincerely,

Jeffrey P. Orient
Project Manager

JPO/sic

Enclosure

c: Distribution list
File 0182

DISTRIBUTION LIST
Ron Sloto (USGS)
April Flipse (PADEP)
Tony Sauder (Pennoni)
Dave Fennimore (Earth Data)
Garth Glenn (TtNUS)
Rich Evans (ECOR)
Pat Schauble (ECOR)
Kathy Davies (U.S. EPA)
Carolyn Ohart (Battelle)
Norm Kelly (RAB Co-Chair)
Dennis Orenshaw (U.S. EPA)
Bob Lewandowski (Navy BRAC PMO)
Michael Nines (Manko, Gold, Katcher & Fox, LLP)

**TECHNICAL SUBCOMMITTEE (TSC) MEETING NOTES**
**FORMER NAVAL AIR WARFARE CENTER (NAWC) WARMINSTER**
**REFERENCE: CLEAN CTO NO. 041**

1. Meeting Date and Time: August 30, 2006, 9:30 AM to 12:20 PM
2. Location: Warminster Municipal Authority Board Room
3. Attendees: See Attachment 1 (attendance list)
4. Summary of Meeting Discussions: See below.

Lonnie Monaco, the Navy's Remedial Project Manager (RPM) for the project, welcomed attendees, handed out an agenda (Attachment 2), and initiated introductions of the people present. Feedback was solicited on the minutes from the June 6, 2006 meeting – no one had any comments.

**Area C Source Assessment**

Jeff Orient (Tetra Tech NUS) presented a brief description of Area C, current issues, and the proposed scope of work for source assessment activities. The presentation was a follow-up to the proposed scope of work sent out via email for review during the week prior to the meeting (Attachment 3). Comments were solicited on the scope of work. The proposed scope was approved by the technical representatives in attendance, with borehole geophysics to be added for the new wells that are to be drilled/installed. A work plan will be finalized and submitted in draft form by mid-September.

**WMA Wells 13 and 26 Update**

Pat DiGangi (CKS Engineers) handed out letter reports addressing alternatives for potential treatment system upgrades for municipal wells WMA 13 and 26 (Attachment 4) and described them briefly. Mr. Monaco asked that the reports be forwarded to Judith Keith (Navy Department of Justice) for their review. Relative to the increasing PCE contaminant levels found along Louis Drive and in WMA 26, Dave Fennimore (Earth Data) indicated that Earth Data did a PADEP file review for Louis Drive and did not find any information that would implicate other properties as potential contaminant sources in the area. April Flipse (PADEP) asked where the file review was performed. Mr. Fennimore indicated that they did an EDR search and visited the local (Norristown) PADEP office. Ms. Flipse stated that the files there were likely incomplete as they only have partial records in the local offices.

Mr. Monaco asked Dennis Orenshaw (USEPA) for an update on EPA efforts to look for potential sources for the PCE contamination in the Louis Drive area. Mr. Orenshaw indicated that Drew Lausch (USEPA) is looking into it and may get a contractor out to do a Preliminary Assessment for the area. He will also send out to the TSC any pertinent data gathered to date by Mr. Lausch in regards to EPA site assessment work in the Louis Drive area.

Jim Burke (PADEP) described a meeting he had with Mike Nines, who is doing a Phase II site evaluation for 905 Louis Drive as part of a potential real estate transaction. Mr. Burke stated that Mr. Nines stated that he found information documenting a railroad tank car containing chlorinated solvents overturning at CRC Chemicals. After a short break, Mr. Nines was contacted and joined the meeting via telecom. Mr. Nines is an environmental engineer working for a law firm that represents the potential buyer of 905 Louis Drive. He clarified the information about the tank car at CRC Chemicals, stating that the information he had was that the car had derailed, not overturned, and referenced an email stating that the derailment had occurred sometime in 2005. He also mentioned that they planned to do some site investigation work at 905 Louis Drive, preferably around September 7-8, and would like to access the Navy wells on the property. Mr. Monaco directed Pat Schauble (ECOR) to arrange for the Area A treatment plant operator to meet with Mr. Nines' representatives and unlock the wells for them.

Mr. Burke asked Mr. Nines to describe 905 Louis Drive and what went on there. Mr. Nines indicated that the building is used as a warehouse for automotive products storage and provided a general overview of the setup and configuration of the building and property. Tony Sauder (Pennoni Associates) asked if Mr. Nines was aware of the high levels of contamination at the HN-52 well cluster location – Mr. Nines indicated that he was aware and that his firm plans to have some monitoring wells installed at 905 Louis Drive to further evaluate groundwater quality conditions on the property. Mr. Monaco asked that Mr. Nines share their plans for well installations with the Technical Evaluation Group (TEG) through Mr. Burke – Mr. Nines indicated that he would do so. Mr. Fennimore pointed out that well permits will be needed from the township prior to drilling any new wells. Mr. Nines also provided his phone number (484/430-2350) for anyone wishing to contact him, and asked for a copy of the TSC meeting minutes. Mr. Monaco indicated that he would arrange for a copy to be sent.

**1,4 Dioxane Discussion**

Mr. Schauble presented background information regarding typical uses and the regulatory status of 1,4 dioxane (see Attachment 5). He suggested that wells HN-52S, HN-16S, WMA 26, and the

groundwater treatment plant influent and effluent be sampled for 1,4 dioxane. The wells recommended for sampling have significant concentrations of 1,1,1 TCA, and 1,4 dioxane is primarily used as a stabilizer for this compound. Mr. Monaco asked Mr. Fennimore if WMA 26 had been sampled for 1,4 dioxane by the Warminster Municipal Authority (WMA) – Mr. Fennimore indicated that he thought so but would check to verify it.

Kathy Davies (USEPA) provided some additional information about 1,4 dioxane. This compound tends to accumulate in the still bottoms of 1,1,1 TCA vats, as it does not volatilize as readily as TCA. The EPA risk-based concentration for 1,4 dioxane is 6.2 ug/L and it does not volatilize, biodegrade, or sorb onto organic carbon readily. Detections of 1,4 dioxane at sites with TCA are hit-or-miss, but where it is found it is always in association with TCA. Mr. Monaco asked if there is any rule of thumb regarding TCA and 1,4 dioxane concentration ratios – Ms. Davies indicated there is not. He also asked if it is seen at sites with PCE or TCE contamination but no TCA – Ms. Davies indicated there is no correlation with PCE or TCE.

Mr. Monaco asked for concurrence with a phased approach to looking into the potential presence of 1,4 dioxane – all meeting attendees agreed with a phased approach. Mr. Sauder suggested including some onsite wells and asked about analytical methods and detection limits. Ms. Davies suggested he contact EPA Region III with any questions about analyses. Mr. Schauble indicated that Method 8270 is typically used for 1,4 dioxane. Mr. Monaco directed ECOR to include 1,4 dioxane sampling in the next (October 2006) sampling round at the site.

**5-Year Review Status**

Mr. Monaco indicated that responses were received from Ron Sloto (USGS) and Mr. Sauder on the draft report. A comment due date of September 20 was set. Mr. Fennimore indicated that he will work with Tim Hagy (WMA) to provide comments.

**Extraction Well near HN-69D**

There was a general discussion regarding the potential addition of an extraction well near HN-69D. The most-contaminated wells in and around Area A are now HN-11I and HN-69D. Mr. Orient suggested adapting existing electrical wiring, piping, and controls from an inactive extraction well for use in the new extraction well (if installed), to minimize the need for rewiring/replumbing and treatment plant modifications and reduce costs. Russ Sirabian (Battelle)

suggested using the piping/electrical controls for EW-18 in the new well. Mr. Monaco tasked the TEG with evaluating this issue and providing recommendations to the TSC.

**Optimization Study**

Mr. Monaco opened discussion by stating that he would like to get consensus on key optimization study topics. A general discussion ensued regarding Area A and the optimization study in general. One issue brought up is that the draft optimization study has been out for an extended time period and is somewhat out of date now. There was a consensus that the recommendations for Areas A and C needed to be revisited in light of the most recent sampling data. Ms. Davies also suggested that Battelle try to obtain historic information related to the original design, setup, and testing of the Area A extraction system and factor that information into the revised/updated study.

For Area D, Ms. Davies pointed out that contaminant concentrations are still dropping but remain above MCLs, and that EPA would not be in favor of switching over to natural attenuation at this time since the data indicates that the only natural attenuation processes that appear to be functioning at the site are dispersion and dilution, not biodegradation. Mr. Sirabian pointed out that the ROD for OU-4 includes monitored natural attenuation (MNA); however Ms. Davies pointed out that the inclusion of MNA in the ROD was predicated on maintaining source control through pump and treat. After some discussion, it was agreed that it would be appropriate to allow the shutdown of individual extraction wells as concentrations in them reach MCLs (consistent with some prior well shutdowns) or the concentration decline in a well flattens out (with continued monitoring to see whether concentrations increase after pumping is stopped).

Mr. Monaco concluded the optimization study discussion by directing Battelle to re-evaluate the data in light of the meeting discussions and prepare a revised draft version of the optimization study for review and comment.

**Miscellaneous Topics and Issues**

Mr. Monaco suggested that action items be identified in future meetings and included in the meeting minutes. These action items would then form the basis for subsequent meeting topics and discussions.

**Next Meeting Date**

A date and time of November 1 at 9:30 AM was established, with the meeting to be held in the WMA Board Room.

The meeting was adjourned at approximately 12:20 P.M.

**ATTACHMENT 1**

**ATTENDANCE LIST**

Former NAWC Warminster
Technical Meeting 8/30/06

| NAME | AFFILIATION | PHONE/EMAIL |
|---|---|---|
| JEFF ORIENT | TETRA TECH NUS | 412/921-8778 Jeff.Orient@tetrtus.com |
| Kathy Davies | USEPA Reg III | 215-814-3315 davies.kathy@epa.gov |
| LONNIE MONACO | NAVY | (215) 897-4911 orlando.monaco@navy.mil |
| Matt Lapp | ECOR Solutions | 610-431-8731 lapp@ecor-solutions.com |
| Amanda Bell | ECOR Solutions | 610-431-8731 (ex117) bell@ecor-solutions.com |
| Patrick Schanbic | ECOR Solutions | 610 431 8731 schanbic@ecor-solutions.com |
| James R BURKE | PA DEP - ECP | 484 250 5999 |
| DENNIS ORENSHAW | USEPA | 215-814-3361 Jaburke@state.pa.us |
| Carolyn Scala | Battelle | 215-504-5003 scalac@battelle.org |
| Russell Sirabian | Battelle | 914-576-7713 sirabianr@battelle.org |
| PATRICK D. GANGI | CKS ENGINEERS | 215 340 0600/pdigangi@cksengineers.com |
| TIM HAGEY | WMA | 215 675 3301 timH@warminsterauthority.com |
| Tony Sander | Pennoni/Warminster Twp. | 215-222-3000 tsander@pennoni.com |
| JOHN EPPS | EARTH DATA NE | 610-524-9466 JEPPS@EARTHDATANE.com |
| Dave Fennimore | EDN | 610 524-9466 dfennimore@earthdatane.com. |
| NORM KELLY | RAB (CO-CHAIR) | (215) 675-1155 |
| Ron Sloto | US Geological Survey | 610-321-2343 x212 rasloto@usgs.gov |
| April Flipse | PADEP | 484-250-5721 aflipse@state.pa.us |
| Mike Nines (Conf call) | | |

**ATTACHMENT 2**

**MEETING AGENDA**

# NAWC WARMINSTER
# TECHNICAL SUBCOMMITTEE/RAB MEETING

**30 August 2006 9:30 AM**
**WMA Board Room**
**415 Gibson Ave**
**Warminster, PA**

## MEETING AGENDA

**Administrative Update**
Minutes of the Last Meeting

**Area C Source Assessment**

**Update on Status of Wells #13 and #26**

**1,4 Dioxane**

**5-Year Review Status**

**Act II – 905 Louis Drive**

**Extraction Well near 69D**

**Optimization Study**

**Tech Support to Site Assessment Group**

**Miscellaneous Topics and Issues**

**Time and Location of Next Meeting: - Date to be determined**

**Directions to the WMA Board Room:**

**From County Line Rd** - instead of turning north (right) onto Jacksonville, continue west on County Line to York Rd. Turn north (right) onto York Rd. Continue to Henry Ave. Turn west (left) onto Henry Ave. Continue to Gibson Ave. Turn right into the parking lot shared by the Warminster Township and WMA. The WMA building in located towards the rear.

**From the former NAWC** - proceed to the intersection of Street and Jacksonville Rd. Turn west (right) onto Street Rd. Continue west to York Rd. Turn south (left) onto York Rd. Continue to Henry Ave. Turn west (right) onto Henry Ave. Follow directions as above to the WMA building.

**ATTACHMENT 3**

**AREA C SOURCE ASSESSMENT SCOPE OF WORK**

# AREA C SOURCE ASSESSMENT
# SCOPE OF WORK
# FORMER NAWC WARMINSTER
**August 2006**

## SITE DESCRIPTION

Area C includes Sites 4 and 8, and the surrounding areas. Figure 1 is a historic map of Area C, showing the locations of Sites 4 and 8. Ann's Choice Retirement Community has been built over much of Area C (in particular Site 8) since the closure of the base. Scattered single-family houses and two local parks are located across Kirk Road immediately north of Area C.

Area C has been divided into four OUs. OU-2 addresses contamination of domestic well water for nearby residents, OU-3 consists of contaminated Area C groundwater, OU-5 addresses soils, surface water, and sediment associated with Site 8, and OU-6 addresses soil, sediment, and surface water associated with Site 4.

### Site 4

Site 4 is a 7-acre grassy area located north of the former main runway and south of Kirk Road. A number of trenches at the site were used to dispose of non-industrial solid waste, paints, waste oils, waste metals, construction debris, solvents, and sludge from the sewage treatment plant.

### Site 8

Site 8 was used as a fire-training area. The fire training activities were conducted at the northeastern end of the old runway located in Area C and involved pouring contaminated jet fuels onto a runway area that was contained by berms, then igniting and extinguishing the fuels to simulate fire-fighting procedures. In addition, an area of the runway immediately south of the fire-training area was used to test the resistance of aviation suits to fire.

### Current Conditions

The Navy transferred the property west of Site 8 for use as a residential neighborhood by Ivyland Borough, as well as property associated with Ann's Choice Retirement Community and a multi-purpose business park near Site 8, and for the park land property in the vicinity of Site 4. A stormwater detention/sedimentation basin has been constructed in the area between Sites 8 and 4 (Figure 2).

## GEOLOGY/HYDROGEOLOGY

Soils (silt, clay, and sand) within Area C range from approximately 2 to 15 feet in thickness. The Area C soils lie over highly weathered bedrock that gradually transitions into competent bedrock consisting of alternating lithologic units of predominantly fine-grained gray to brown arkosic sandstone and red-brown siltstone/mudstone (Stockton Formation). Bedrock strikes north 70 degrees east and dips approximately 9 degrees to the northwest. The direction of the ground slope across Area C generally mimics the direction of dip of the underlying bedrock, however the beds dip more steeply than the slope of the ground surface. As a result, individual geologic units tend to decrease in depth moving from north-northwest to south-southeast.

The Stockton Formation comprises a multi-aquifer system of fracture-controlled water-bearing zones separated by thicker, less fractured/permeable zones. In general, the coarser-grained (sandstone) rock units yield water more than the finer-grained (siltstone and shale) units, although water-yielding fractures were encountered in all rock types. Minor quantities of

groundwater are also encountered within the lower portions of the thin veneer of soils and weathered rock overlying competent bedrock.

The ambient groundwater flow direction in shallow bedrock (to a depth of approximately 100 feet) across Area C is slightly west of due north. The flow direction and gradient are generally similar to the slope of the ground surface. In addition, the groundwater flow direction is subparallel to the bedrock dip direction, and is in the direction of overall surface water drainage towards Little Neshaminy Creek. Deeper groundwater flow directions (> 120 feet) trend generally to the north-northwest, based on water level measurements from the intermediate depth wells.

There is a marked upward vertical gradient between the deep and shallow portions of the bedrock aquifer. Hydraulic head differentials of over 15 feet have been measured at several well cluster locations where shallow and deeper wells were installed. The confined conditions are apparently due to the presence of a thick, predominantly fine-grained, interbedded mudstone-siltstone unit.

## BACKGROUND REVIEW

RI activities addressing Area C were conducted in several studies. Field work included soil gas sampling, geophysical surveys, surface soil sampling and analysis, subsurface soil sampling and analysis, and a wetlands assessment. In addition, surface water and sediment sampling and analysis were conducted. Groundwater investigations were also performed as part of Phase I and Phase II RI work and as part of the focused RI for Area C groundwater.

The following sections briefly summarize the major investigations and response actions for Area C at NAWC Warminster. Details regarding the scope and results of these investigations can be found in the referenced reports that are included in the Administrative Record for the facility.

### Area C Investigations

**Phase I RI (1989 – 1991; SMC Martin):** SMC Martin performed a limited Phase I remedial investigation at Area C (and at other portions of the base). Included were EM and soil gas surveys, several well installations, and groundwater, soil, surface water, and sediment sampling.

**Phase II RI (1992 – 1993; Halliburton NUS):** For Area C groundwater, the Phase II RI included the installation of additional monitoring wells, a soil gas survey, sampling of groundwater, surface water, sediment, and soil, and aquifer testing.

**Focused RI for Groundwater (1993 – 1994; Halliburton NUS):** Groundwater conditions were further investigated within and downgradient of Sites 4 and 8. Based on this work, separate RI and FS reports were submitted for Area C groundwater. A schematic design for shallow groundwater remediation was completed in July 1994.

**Site 4 EE/CA and RI Report (1995 and 2000; Halliburton NUS and Tetra Tech NUS):** An Engineering Evaluation/Cost Analysis (EE/CA) was prepared to help support a removal action for Site 4. The removal action included the excavation and removal of all wastes from the series of trenches used for waste disposal. Confirmation sampling was performed to verify that cleanup goals had been met. An RI Report for Site 4 was prepared which was primarily a compilation of previously-prepared documents related to Site 4 investigations and the removal action.

**Phase III RI and OU-5 RI (1995 – 1999; Brown and Root Environmental, Tetra Tech NUS):** The Phase III RI included several phases of further investigation of soils, buried wastes, surface water, and sediment associated with this area. Soil gas surveys, soil borings, test pit excavations, soil, surface water, and sediment sampling, and a wetlands assessment were included in the scope of work. A Phase III RI Report was prepared and submitted in 1996 and, following some additional site investigation work at Site 8, a follow-on OU-5 RI Report focused on soils, surface water, and sediment was prepared and submitted in 1999.

## Nature and Extent of Contamination

The following summarizes the findings of the various site investigations relative to the nature and extent of contamination found in environmental media at Area C.

### Site 4

Chemicals associated with Site 4 soils included a variety of organic and inorganic contaminants, including Aroclor 1248, TCE, pentachlorophenol, several PAHs, and several inorganics. Minimal (if any) groundwater impacts were attributed to Site 4. The soil- and groundwater-related findings regarding post-removal action conditions included the following:

- The remaining contaminant concentrations in soils were less than soil cleanup levels established prior to the action.
- Site 4 did not appear to be a past or current source of Area C groundwater contamination.

### Site 8

Chemicals associated with Site 8 soils included a variety of organic and inorganic contaminants, including PCBs, BTEX, CVOCs, several SVOCs, pesticides, dioxins/furans, and several inorganics. Groundwater within Site 8 was contaminated with PCE. The RI Report for OU-5 characterized the nature of the soils at the site prior to and after the removal action. Relative to groundwater, primary findings of the RI were as follows:

- Soil sampling results suggested that Site 8 is not a past or present source of Area C groundwater contamination.

## Other Potential Sources Within Area C

In addition to Sites 4 and 8, several other areas were investigated as potential sources for soil and/or groundwater contamination. The maintenance area located immediately east of Site 8 was the focus of soil and groundwater investigation activities as it resides within the area of the PCE groundwater plume. The leach field associated with the former base commander's residence (now Gilda's Club) was also investigated as a potential source due to its proximity to the PCE plume. An old pistol firing range was also investigated – the concern at this site was primarily lead contamination of soils, although a monitoring well cluster was also installed. None of these discrete investigations found significant levels of contamination or turned up evidence suggesting a potential source for the PCE contamination in groundwater.

## Area C Groundwater

The findings of RI activities with respect to Area C groundwater were detailed in the OU-3 RI Report. The pertinent findings relative to PCE were as follows:

- PCE was detected in 10 of 34 monitoring wells sampled at concentrations ranging from 1 to 29 ug/L. These were the only organics detected at significant concentrations or frequencies.
- PCE had migrated north to residential wells along Kirk Road. In addition, 2 ug/L of PCE was detected in a monitoring well located 800 feet north of Area C (HN-25I). Affected residences were provided with water treatment systems and were connected to a public water supply under remedial actions conducted by the Navy and USEPA.

- The specific locations of the releases of organic groundwater contaminants and elevated concentrations of inorganics were unknown.

## Area C Response Actions Performed to Date

### Soil-Related Response Actions

**OU-5:** The Navy determined that lead concentrations in surface soil at Site 8 presented an unacceptable risk to human health. In response, the Navy completed a removal action at Site 8 in February 1999, eliminating the unsafe risk associated with lead-contaminated soils. Based on the results of this sampling a NFA ROD for OU-5 was signed in September 1999.

**OU-6:** The Navy performed a removal action for Site 4 wastes in 1996. More than 22,000 tons of soil and debris were excavated and disposed of offsite. Waste/soil characterization and confirmation sampling and analysis were performed. The excavated areas at Site 4 were backfilled with clean fill material and revegetated. A NFA ROD for OU-6 was signed in 2000.

### Groundwater-Related Response Actions

**OU-2:** In 1994, USEPA and the Navy connected homes along Kirk Road to the Warminster Municipal Authority water supply system.

**OU-3:** A ROD for OU-3 was issued in 1995, selecting pumping and treatment of Area C groundwater as the remedy to address PCE-contaminated groundwater. Pumping and treatment of Area C groundwater was initiated in 1996. The groundwater remediation system includes six extraction wells. Two of the extraction wells, EW-C16 and EW-C17, are currently inactive because the contaminant concentrations in these two extraction wells have decreased to less than the MCL for PCE and have remained consistently low.

Significantly higher PCE concentrations (up to approximately 300 µg/L) have recently been found in a new monitoring well in Area C (HN-23A). HN-23A is screened from 40-60 feet below ground, with a fracture zone encountered at a depth of approximately 52 feet the primary water-yielding zone. Extraction well concentrations have not increased, however, and the new monitoring well is within the capture zone of the extraction system.

## Summary of Potential Source Area Investigations

For Site 4, the wastes found within the trenches contained low levels of various contaminants. All of the wastes were removed and disposed of offsite, with confirmation sampling of the remaining soils confirming attainment of target cleanup goals. None of the wastes encountered within Site 4 appear to be related to the PCE groundwater plume located further west within Area C, as evidenced by the Site 4 and Site 8 groundwater monitoring data, groundwater flow directions, and the contaminant types and concentrations found in the landfill wastes.

For Site 8, the primary environmental issue identified was soil contamination associated with petroleum hydrocarbons. No significant concentrations of PCE were found that could be attributed to historic Site 8 activities.

Limited investigations of the maintenance area and the tile field associated with the former base commander's residence did not turn up any evidence of significant levels of contamination, although trace levels of PCE were detected in soil gas samples from both areas. It should be noted, however, that the soil gas survey for the maintenance area reached near but not to the area where replacement monitoring well HN-23A is located, as shown in Figure 3.

The most promising areas to focus on for identifying and delineating the source of the PCE contamination recently discovered in HN-23A (and likely responsible for the PCE contamination in

groundwater across Area C) appear to be the eastern peripheral area associated with the historic maintenance area (in the immediate vicinity of HN-23A) and extending upgradient (southeast) across an area of formerly disturbed ground noted in historic EPIC photos. Accordingly, the scope of work focuses on these areas, with flexibility built in to the field investigation to shift the focus should the evaluation of preliminary data suggest modification of the planned approach.

## SCOPE OF WORK

The objective of this scope of work (SOW) is to attempt to identify and characterize the source of the high levels of PCE contamination recently found in HN-23A, which may be indicative of the presence of a residual source near this well. The SOW focuses primarily upon the area around and immediately upgradient of HN-23A, building off the historic site investigation data. The work will be performed in phases, with preliminary data evaluation performed following each activity used to refine and more precisely focus the approach to subsequent activities. The following field activities constitute the scope of work:

- Phase I monitoring well drilling/sampling.
- Soil gas survey.
- Short-term pumping test of HN-23A.
- Phase II monitoring well drilling/sampling.
- Source characterization activities (as/if appropriate).
- Round 2 groundwater sampling.

Following completion of field activities the data will be evaluated and a Source Assessment Investigation Report prepared.

### Phase I Monitoring Well Drilling/Sampling

Four shallow bedrock monitoring wells will be drilled adjacent to, upgradient, and sidegradient of HN-23A to better delineate the extent of contamination (Figure 4). A fracture zone encountered at a depth of approximately 52 feet is the primary water-yielding zone for HN-23A (screened from 40-60 feet below ground) based on boring log information. Based on this, the new wells will target water-yielding fractures within the 15-60 foot depth zone, depending on location. The wells will be completed as two-inch diameter PVC monitoring wells screened across the selected water-yielding zone. The following provides the rationale for the four Phase I monitoring wells:

- **HN-101S** – This well will be installed adjacent to HN-23A and will monitor the uppermost portion of the bedrock flow system (or possibly the saturated overburden). This well will be used to evaluate whether the source of the PCE contamination is likely to be in the immediate vicinity of HN-23A (i.e. HN-101S is more contaminated than HN-23A) or further away (i.e. HN-101S has significantly lower PCE concentrations). The target monitoring interval is approximately 10 to 30 feet.

- **HN-102S** – This well will be installed east-northeast of HN-23A, approximately ½ way from HN-23A to the tile field associated with Gilda's Club. HN-102S is aligned approximately on strike relative to HN-23A and will be used to check for contamination migrating along strike from the vicinity of the tile field towards HN-23A. The 40-60 foot depth interval will be targeted for this well, similar to HN-23A.

- **HN-103S and HN-104S** – These wells will be located near the western and southern corners of the large parking area that currently exists southeast of HN-23A. They are positioned to be upgradient of HN-23A and provide coverage of groundwater flow in the area between monitoring wells HN-23S (now abandoned, but formerly clean) and HN28S. Both wells are updip of HN-23A; the target monitoring zone for HN-103S will be

approximately 20-45 feet below ground, while the target monitoring zone for HN-104S will be from the top of bedrock to a depth of approximately 25 feet.

The new wells (and HN-23A) will be sampled both immediately before and immediately after completion of the pumping test described below, using sampling techniques consistent with the current sampling approach to groundwater monitoring. Samples will be analyzed for VOCs. The results will be used to focus subsequent site investigation activities, including a second phase of well installations.

**Soil Gas Survey**

Following completion of Phase I well installation/sampling and evaluation of the results, a soil gas survey will be performed to attempt to locate residual source(s) of PCE contamination. The preliminary layout for the soil gas survey consists of a grid pattern across the area located immediately around, south, and southeast of HN-23A. This encompasses the area surrounding and upgradient of HN-23A and has not been included to any significant degree in past site investigations at the former NAWC. The location and/or size of the soil gas grid may be adjusted based on the results of the initial round of well installation/sampling (i.e. if one or more of the new wells have higher PCE concentrations than HN-23A, the grid may be shifted to that area or expanded in size). As conceptualized, the grid will be approximately 200 feet by 300 feet in area, with soil gas points spaced at 25 foot intervals (approximately 117 points total, see Figure 5). A direct-push drill rig will be used to push shallow soil borings to the top of bedrock or a depth of 8 feet, whichever is encountered first, then a soil gas sample will be withdrawn and field-analyzed for VOCs using a photoionization or flame ionization detector (PID or FID). Any locations where high VOC readings are obtained will be rechecked by pulling air samples through colorimetric tubes calibrated for CVOCs/PCE, to determine whether the high VOC reading is PCE-related. Should significantly elevated levels of CVOCs/PCE be detected in an area, the grid pattern will be locally refined to more precisely delineate the potential source area.

**Short Term Pumping Test**

A short term pumping test will be performed to evaluate the drawdown pattern related to HN-23A and identify any preferential drawdown trends. This data will be used in combination with sampling and water level data to identify the likely direction from which the contamination in HN-23A may be originating from. The pumping test will be approximately 8 hours in duration. Drawdowns will be measured periodically in the pumping well and in the four new monitoring wells installed during Phase I of the field investigation, and the wells will be sampled for VOCs immediately before and after the pumping test. As the focus of the short term pumping test is on identifying preferential drawdown patterns and water quality changes (if any), determination of other hydraulic characteristics of the shallow bedrock flow system will be a secondary objective.

**Phase II Monitoring Well Drilling/Sampling**

A second phase of monitoring well drilling/sampling will be performed to further delineate the extent of the plume and to determine source area contaminant concentrations should a viable source area be identified. The number, locations, and depths of the wells will be determined based on the results of preceding site investigation activities. At a minimum, an additional well is envisioned for adjacent to HN-23A, to serve as a potential groundwater extraction well at this plume "hot spot" (HN-23A is a 2-inch diameter PVC well not suitable for use as an extraction well). This well will be an open borehole well six inches in diameter, to accommodate installation of a submersible pump and the associated piping/wiring. Other potential well locations include within potential source area(s) identified; and/or further upgradient from the Phase I wells should they be found to have comparable or higher contaminant levels than HN-23A.

**Source Characterization**

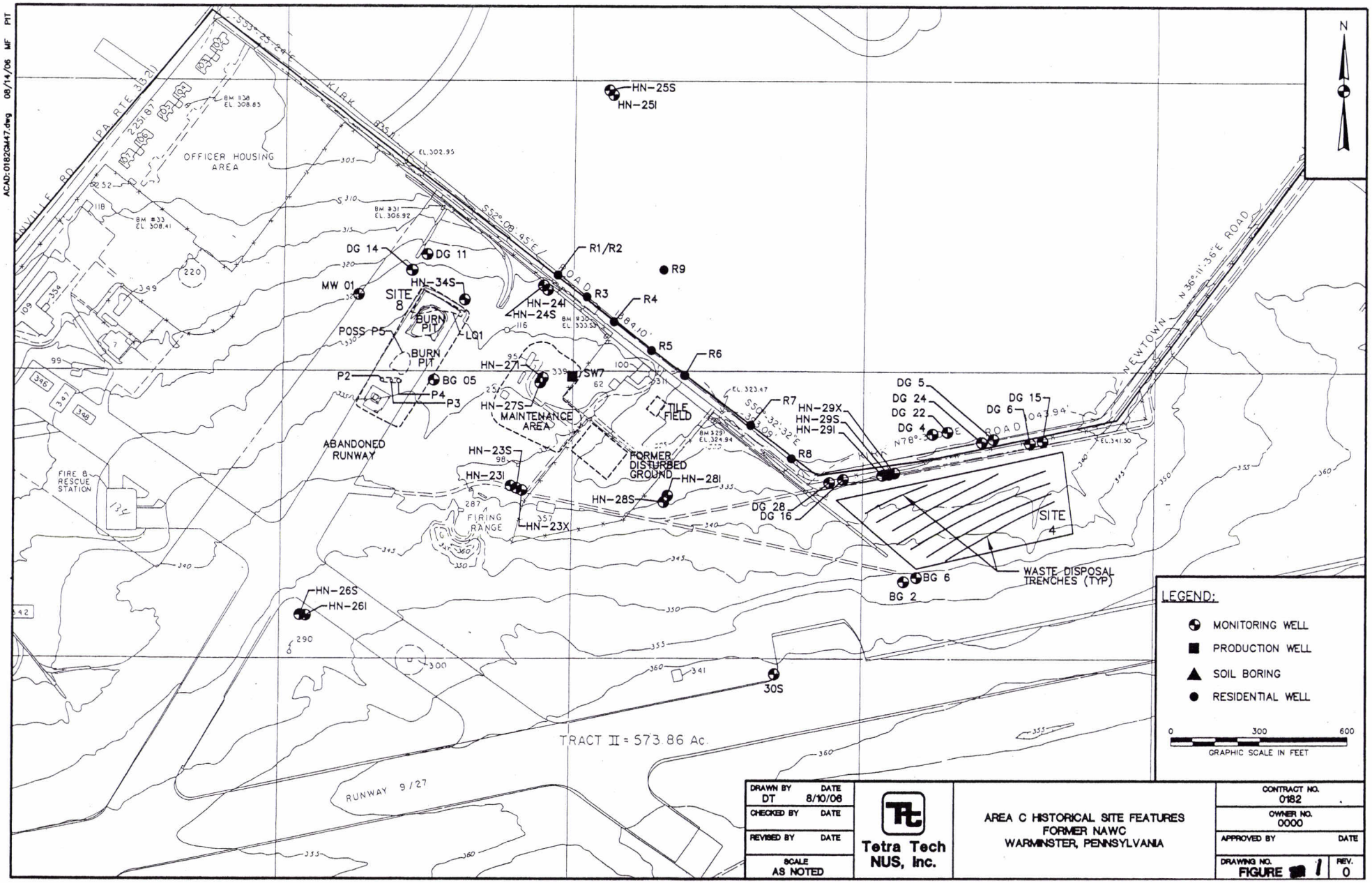
Potential sources for the PCE contamination that are identified will be investigated through the collection and analysis of soil samples from the suspected source area(s). Soil borings will be drilled using Direct Push or hollow stem auger/split barrel sampling techniques, with PID/FID screening of the soil samples used to field-identify contaminated soils. Up to two samples per boring will be submitted for VOC analysis based on the results of the PID/FID field screening.

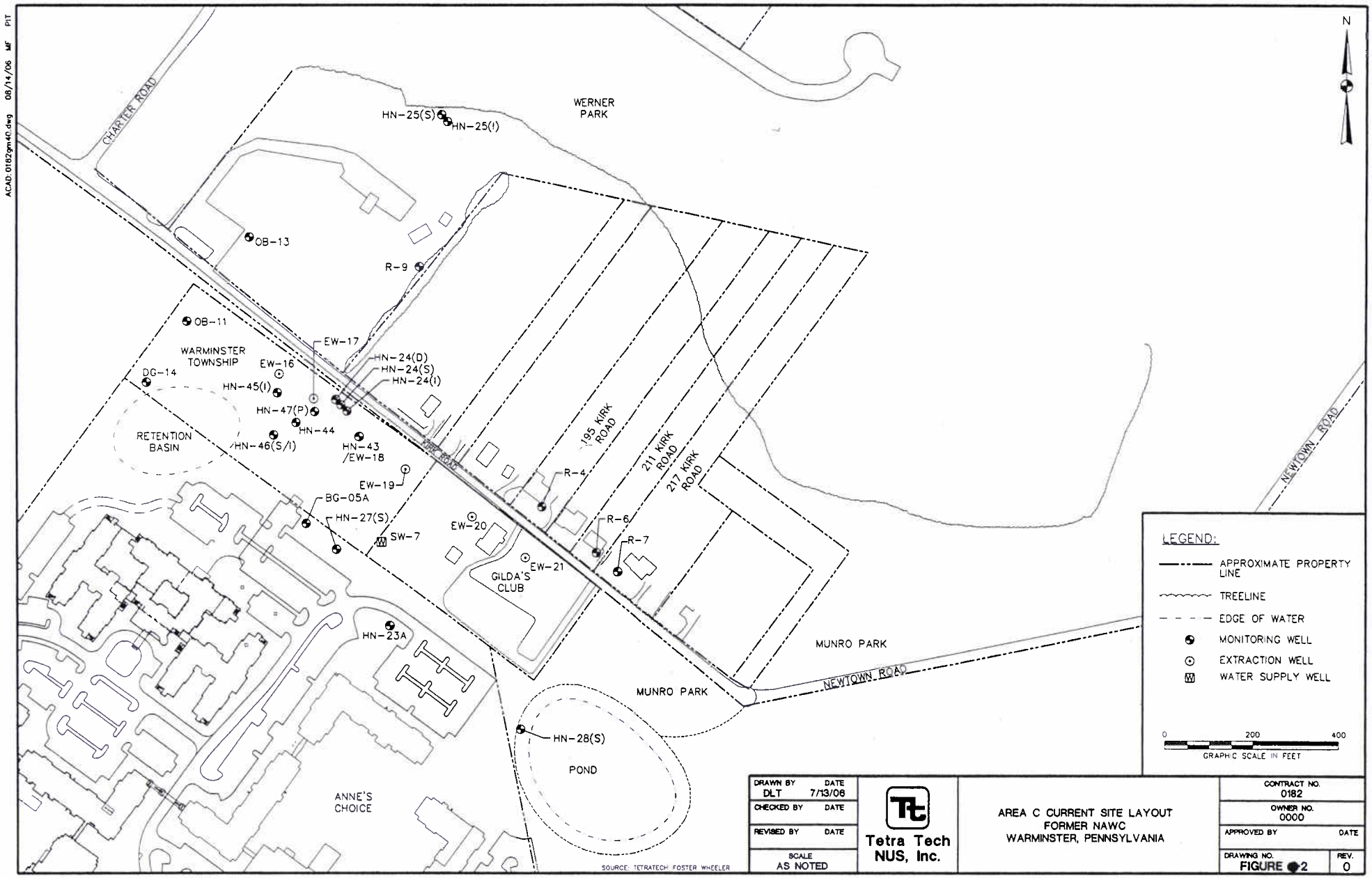
**Supplemental Groundwater Sampling**

A comprehensive round of groundwater samples will be collected from all of the new wells to confirm the results of the initial round of sampling associated with each phase of well installation. In addition, HN-23A will be sampled so that a comprehensive snapshot of groundwater conditions within the area of investigation can be obtained. Prior to collection of the groundwater samples, a round of water levels will be collected from all monitoring wells associated with Area C so that an updated perspective of groundwater flow patterns across the area can be developed.

**Source Assessment Investigation Report**

Following completion of all field investigation activities, the data collected will undergo final evaluation and a source assessment report will be prepared and submitted. Analytical results will undergo a baseline QA review, however since the data will not be used for risk assessment purposes, full validation is not necessary and will not be performed.


ACAD:01820M47.dwg 08/14/06 MF PIT
N
HN-25S
HN-25I
OFFICER HOUSING AREA
KLAK ROAD
S32°-09'-45"E
1884.10'
R1/R2
R3
R4
R5
R6
R7
R8
R9
DG 14
DG 11
MW 01
HN-34S
SITE 8
BURN PIT
HN-24I
HN-24S
POSS-P5
LQ1
P2
BG 05
P4
P3
HN-27I
SW7
HN-27S
MAINTENANCE AREA
TILE FIELD
ABANDONED RUNWAY
FORMER DISTURBED GROUND
HN-23S
HN-23I
HN-28I
HN-28S
HN-23X
FIRE & RESCUE STATION
FIRING RANGE
HN-26S
HN-26I
30S
TRACT II = 573.86 Ac.
RUNWAY 9/27
DG 5
DG 24
DG 22
DG 4
DG 15
DG 6
HN-29X
HN-29S
HN-29I
DG 28
DG 16
SITE 4
WASTE DISPOSAL TRENCHES (TYP)
BG 6
BG 2
NEWTOWN ROAD
N36°-11'-36"E
LEGEND:
MONITORING WELL
PRODUCTION WELL
SOIL BORING
RESIDENTIAL WELL
0
300
600
GRAPHIC SCALE IN FEET
DRAWN BY DT
DATE 8/10/06
CHECKED BY
DATE
REVISED BY
DATE
SCALE AS NOTED
Tetra Tech NUS, Inc.
AREA C HISTORICAL SITE FEATURES
FORMER NAWC
WARMINSTER, PENNSYLVANIA
CONTRACT NO. 0182
OWNER NO. 0000
APPROVED BY
DATE
DRAWING NO. FIGURE 1
REV. 0




ACAD: 0182gm40.dwg 08/14/06 MF PIT

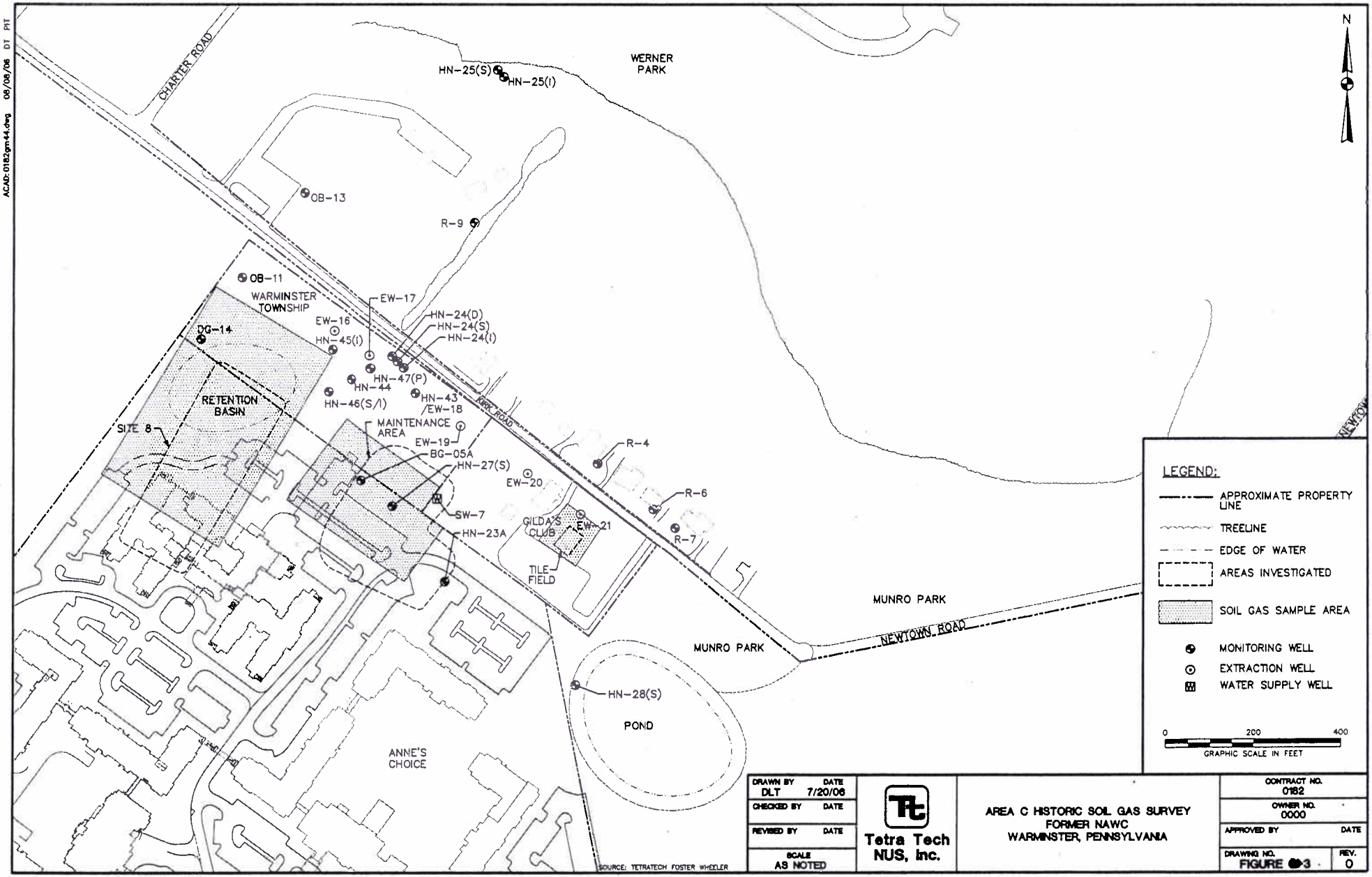
| | |
|---|---|
| DRAWN BY DLT | DATE 7/13/06 |
| CHECKED BY | DATE |
| REVISED BY | DATE |
| SCALE AS NOTED | |

Tetra Tech NUS, Inc.

AREA C CURRENT SITE LAYOUT
FORMER NAWC
WARMINSTER, PENNSYLVANIA

| | |
|---|---|
| CONTRACT NO. 0182 | |
| OWNER NO. 0000 | |
| APPROVED BY | DATE |
| DRAWING NO. FIGURE 2 | REV. 0 |

FORM CADD NO. TTNUS-BH.DWG - REV 1 - 9/10/98

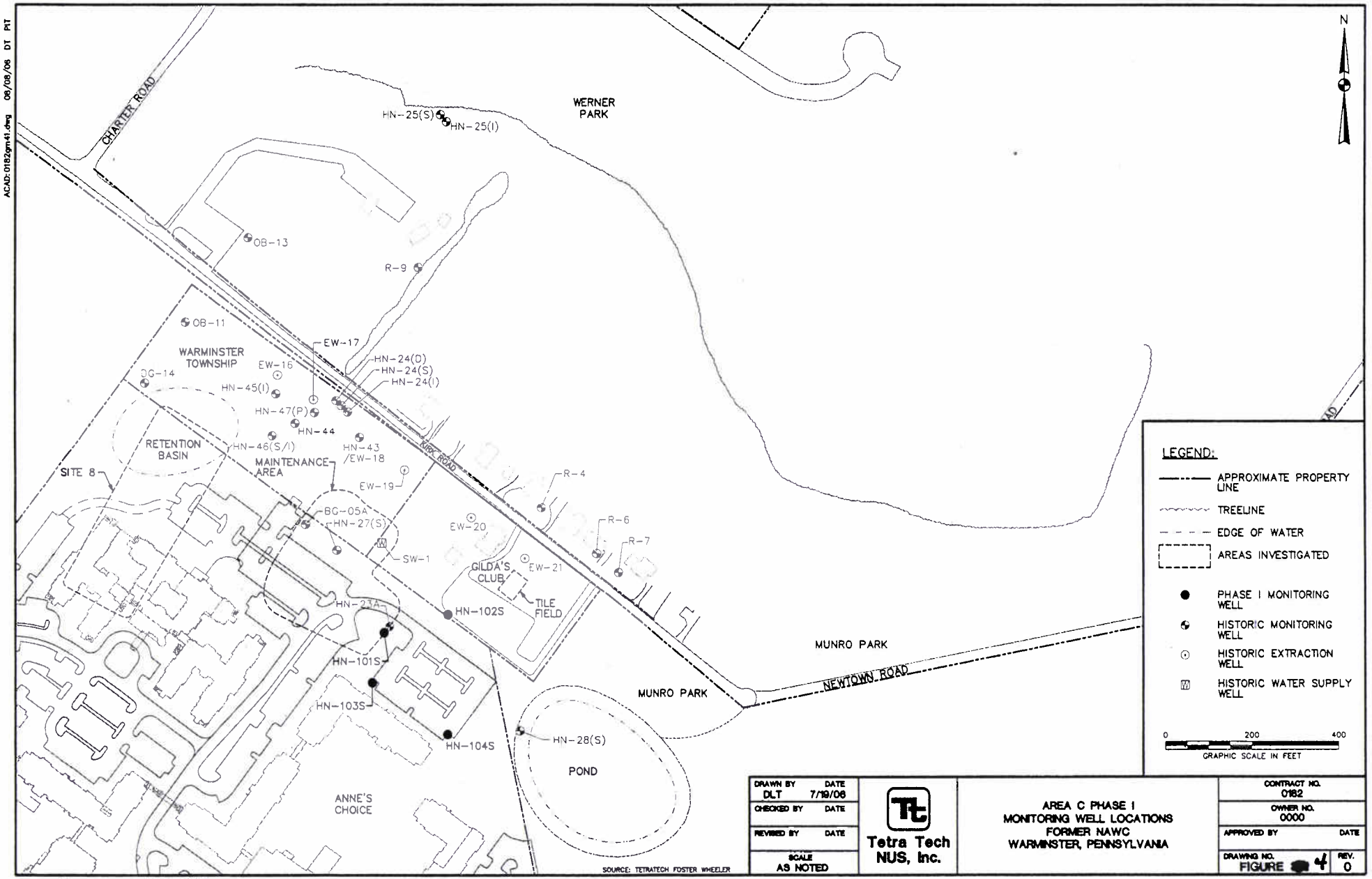



| | |
|---|---|
| DRAWN BY: DLT | DATE: 7/20/06 |
| CHECKED BY | DATE |
| REVISED BY | DATE |
| SCALE: AS NOTED | |

Tetra Tech NUS, Inc.

AREA C HISTORIC SOIL GAS SURVEY
FORMER NAWC
WARMINSTER, PENNSYLVANIA

| | |
|---|---|
| CONTRACT NO. 0182 | |
| OWNER NO. 0000 | |
| APPROVED BY | DATE |
| DRAWING NO. FIGURE 3 | REV. 0 |

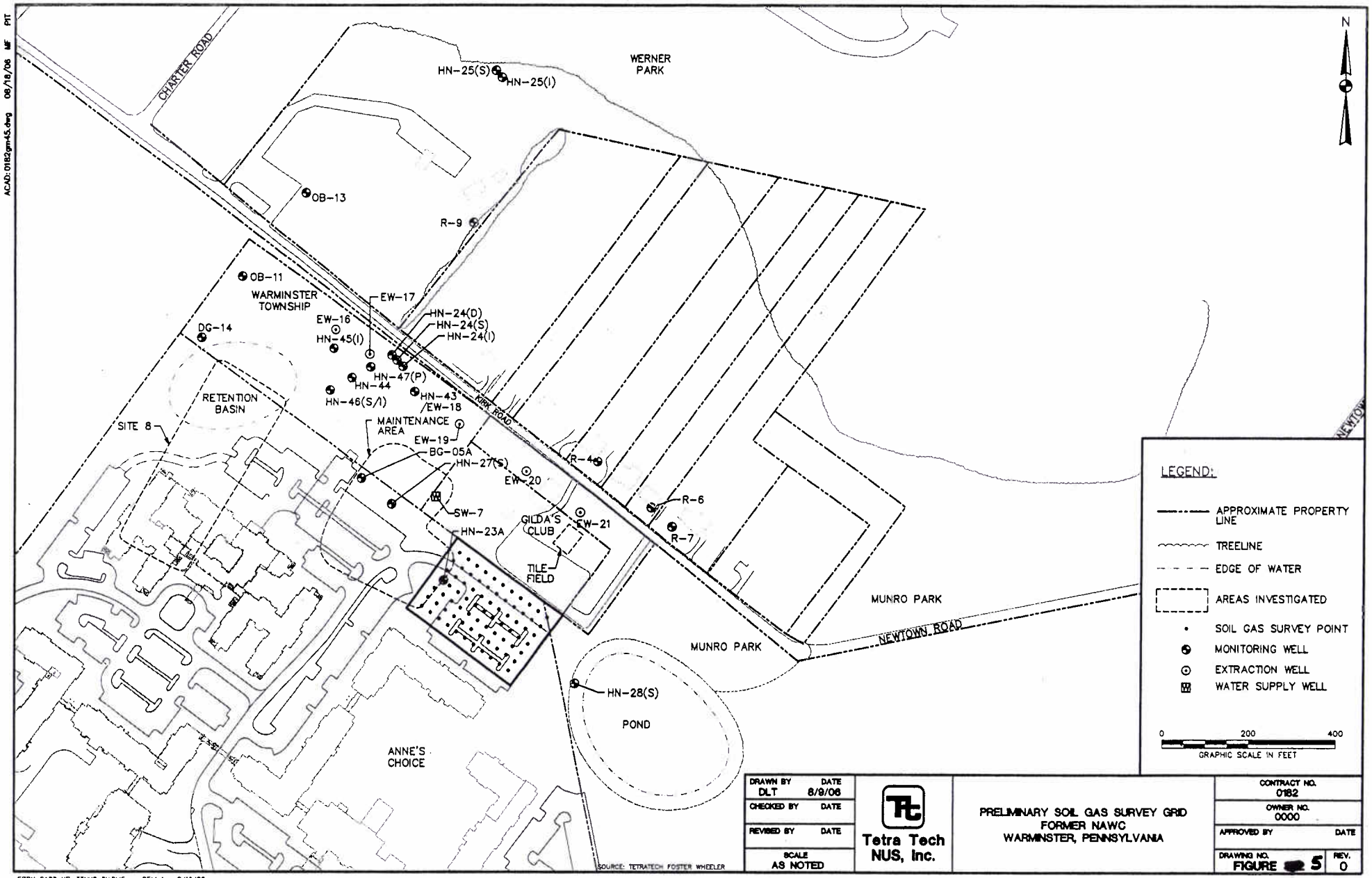



| | |
|---|---|
| DRAWN BY: DLT | DATE: 7/19/06 |
| CHECKED BY: | DATE: |
| REVISED BY: | DATE: |
| SCALE: AS NOTED | |

Tetra Tech NUS, Inc.

AREA C PHASE I
MONITORING WELL LOCATIONS
FORMER NAWC
WARMINSTER, PENNSYLVANIA

| | |
|---|---|
| CONTRACT NO. | 0182 |
| OWNER NO. | 0000 |
| APPROVED BY | DATE |
| DRAWING NO. | FIGURE 4 |
| REV. | 0 |


ACAD: 0182gm45.dwg 08/18/06 MF PIT
CHARTER ROAD
WERNER PARK
HN-25(S)
HN-25(I)
OB-13
R-9
OB-11
WARMINSTER TOWNSHIP
EW-17
EW-16
HN-24(D)
HN-24(S)
HN-24(I)
DG-14
HN-45(I)
HN-47(P)
HN-44
HN-46(S/I)
HN-43
/EW-18
KIRK ROAD
RETENTION BASIN
SITE 8
MAINTENANCE AREA
EW-19
BG-05A
HN-27(S)
EW-20
R-4
R-6
R-7
SW-7
HN-23A
GILDA'S CLUB
EW-21
TILE FIELD
MUNRO PARK
NEWTOWN ROAD
HN-28(S)
POND
ANNE'S CHOICE
N
LEGEND:
APPROXIMATE PROPERTY LINE
TREELINE
EDGE OF WATER
AREAS INVESTIGATED
SOIL GAS SURVEY POINT
MONITORING WELL
EXTRACTION WELL
WATER SUPPLY WELL
0
200
400
GRAPHIC SCALE IN FEET
SOURCE: TETRATECH FOSTER WHEELER
DRAWN BY DLT
DATE 8/9/06
CHECKED BY
DATE
REVISED BY
DATE
SCALE AS NOTED
Tetra Tech NUS, Inc.
PRELIMINARY SOIL GAS SURVEY GRID
FORMER NAWC
WARMINSTER, PENNSYLVANIA
CONTRACT NO. 0182
OWNER NO. 0000
APPROVED BY
DATE
DRAWING NO. FIGURE 5
REV. 0
FORM CADD NO. TTNUS-BH.DWG - REV 1 - 9/10/98

# ATTACHMENT 4

## MUNICIPAL WELL TREATMENT SYSTEM ALTERNATIVES EVALUATIONS

CKS ENGINEERS, INC.
25th
ANNIVERSARY
1981 2006

David W. Connell, P.E.
Joseph J. Nolan, P.E.
Thomas F. Zarko, P.E.
James F. Weiss
Patrick P. DiGangi, P.E.
Ruth Cunnane

July 20, 2006
Ref: #6281

Warminster Municipal Authority
P.O. Box 2279
Warminster, PA 18974

Attention: Timothy D. Hagey, General Manager

Reference: Well No. 26 - Treatment System Alternative

Dear Tim:

CKS Engineers, Inc. has completed our evaluation of the Treatment System Alternative for Well No. 26. Attached to this letter please find the summary of our evaluation, including the recommended treatment system design, preliminary design requirements (Table 1), and an estimated project cost (Table 2). This information is being submitted in conjunction with the pending design of a treatment system on Well No. 26 to handle increased levels of PCE. This initial evaluation and cost estimate can be submitted to the Navy for their initial review and comment. I am also providing a copy of this information to our internal consultants for their information. Please contact me if you have any questions or need any further assistance on this issue.

Very truly yours,
CKS ENGINEERS, INC.
Authority Engineers

Joseph J. Nolan, P.E.

JJN/mdm

Enclosures

cc: Robert Nemeroff, Esq., Authority Solicitor (w/encl.)
W. David Fennimore, P.G., President, Earth Data Northeast, Inc. (w/encl.)
Timothy J. Bergere, Esq. (w/encl.)
File (w/encl.)

Ref: #6281

## WARMINSTER MUNICIPAL AUTHORITY

## WELL NO. 26

## EVALUATION OF TREATMENT ALTERNATIVES

---

Increased PCE levels in Well No. 26 (raw water) and adjacent test wells require additional treatment capabilities on Well No. 26.

**Current Treatment System:** Stripping Tower; 4' Diameter; 22' Packing Height. Design Flow: 300 gpm

**New System Design Parameters:** Design Flow: 300 gpm; Raw Water PCE Concentration - 16,000 ppb; Treated Water MCL-PCE: <5 ppb

| SYSTEM DESIGN MATRIX WELL NO. 26 | |
|---|---|
| PACKING DEPTH (FT.) | TREATED WATER - PCE (ppb) |
| | 8' Diameter Tower |
| 25 | 1.553 |
| 26 | 1.076 |
| 27 | 0.746 |
| 28 | 0.517 |
| 29 | 0.359 |
| 30 | 0.249 |

**Recommendation:** Recommend design based on a 8-ft. diameter tower and a packing depth of 27 feet. Overall tower height would be 35 ft., which is the height limitation according to the Township Zoning Ordinance.

Ref: #6281

| TABLE 1<br>PRELIMINARY DESIGN REQUIREMENTS<br>WARMINSTER MUNICIPAL AUTHORITY<br>WELL NO. 26 - PCE TREATMENT SYSTEM | |
|---|---|
| Basis of Design | Flow - 300 gpm<br>PCE Level - Influent Concentration = 16,000 ppb;<br>Effluent Concentration = <5 ppb |
| 1. Diameter of FRP Tower:<br>Required Packing Height:<br>Overall Tower Height: | 84 inches<br>27' - 0"<br>35' - 0" |
| 2. Packing Material:<br>Internals:<br><br>Support Plate: | Jaeger Tri-Packs - 1" Units<br>Liquid Distributor - Vee Notch, Trough Type, 1 Parting Box and 3 Troughs (min.)<br>Plastic Grid type or equivalent, 70% void space minimum |
| 3. Blower and Air Requirements: | 1,200 cfm, pressure drop of less than 4" through system. Utilize opposed blade damper to control air flow. |
| 4. Clear Well Volume: | Preliminary sizing based on minimum required pumping time, desired reserve capacity, and adequate space for equipment placement. Utilize a 12' square x 10' deep precast concrete chamber with base and slab top. |
| 5. Preliminary Transfer Pump Selection: | Design for 300 gpm. Assume Goulds Pump Co., Model 10 RAHC, with 25 Hp, 1,800 rpm motor. |
| 6. Control Requirements: | Transfer pump operation shall be controlled by a liquid level pressure transducer in the clear well. Control for shutdown of well pump shall be tied into operation of fan. Control valving shall also be provided to maintain constant output of both pumps. |
| 7. Replacement or Modification of Existing Well Pump: | As a result of the new treatment system installation, the total dynamic head (TDH) on the well pump will change, therefore, replacement or modification of the existing well pump will be required. New well pump shall be designed for 300 gpm. |

Ref: #6281

**TABLE 2**
**ESTIMATED PROJECT COST**
**WARMINSTER MUNICIPAL AUTHORITY**
**WELL NO. 26 - PCE TREATMENT SYSTEM**

| | | |
|---|---|---|
| A. | ESTIMATED CONSTRUCTION COST | |
| 1 | Addition and Modifications to Existing Well House | $ 35,000 |
| 2 | Cast-in-Place Concrete Tower Pad and Precast Concrete Clearwell | $ 40,000 |
| 3 | FRP Air Stripping Tower and Intervals | $ 120,000 |
| 4 | Well Pump Modifications | $ 30,000 |
| 5 | Transfer Pump Assembly | $ 40,000 |
| 6 | Fan, Ductwork and Appurtenances | $ 25,000 |
| 7 | System Piping, Fittings, Valves, etc. | $ 60,000 |
| 8 | Instrumentation | $ 60,000 |
| 9 | Electrical | $ 50,000 |
| 10 | Site Work | $ 40,000 |
| 11 | Demolition Work | $ 20,000 |
| | Subtotal | $ 520,000 |
| 12 | Construction Contingency (10%) | $ 52,000 |
| | Subtotal | $ 572,000 |
| B. | ESTIMATED ENGINEERING DESIGN | $ 57,200 |
| C. | ESTIMATED CONSTRUCTION MANAGEMENT AND INSPECTION | $ 57,200 |
| | ESTIMATED TOTAL PROJECT COSTS | $ 686,400 |

CKS ENGINEERS, INC.
25th
ANNIVERSARY
1981 2006

David W. Connell, P.E.
Joseph J. Nolan, P.E.
Thomas F. Zarko, P.E.
James F. Weiss
Patrick P. DiGangi, P.E.
Ruth Cunnane

JUL 24 2006

July 20, 2006
Ref: #6280

Warminster Municipal Authority
P.O. Box 2279
Warminster, PA 18974

Attention: Timothy D. Hagey, General Manager

Reference: Well No. 13 - Treatment System Alternative

Dear Tim:

CKS Engineers, Inc. has completed our evaluation of the Treatment System Alternative for Well No. 13. Attached to this letter please find the summary of our evaluation, including the recommended treatment system design, preliminary design requirements (Table 1), and an estimated project cost (Table 2). This information is being submitted in conjunction with the pending design of a treatment system on Well No. 13 to handle increased levels of PCE. This initial evaluation and cost estimate can be submitted to the Navy for their initial review and comment. I am also providing a copy of this information to our internal consultants for their information. Please contact me if you have any questions or need any further assistance on this issue.

Very truly yours,
CKS ENGINEERS, INC.
Authority Engineers

Joseph J. Nolan, P.E.

JJN/mdm

Enclosures

cc: Robert Nemeroff, Esq., Authority Solicitor (w/encl.)
W. David Fennimore, P.G., President, Earth Data Northeast, Inc. (w/encl.)
Timothy J. Bergere, Esq. (w/encl.)
File (w/encl.)

Ref: #6280

# WARMINSTER MUNICIPAL AUTHORITY

## WELL NO. 13

## EVALUATION OF TREATMENT ALTERNATIVES

---

Increased PCE levels in well and surrounding test wells require a treatment system on Well No. 13.

**Treatment System Design Parameters:** Design Flow: 180 gpm; Raw Water PCE Concentration - 300 ppb; Treated Water MCL-PCE: <5 ppb

| SYSTEM DESIGN MATRIX<br>WELL NO. 13 | |
|---|---|
| PACKING DEPTH (FT.) | TREATED WATER - PCE (ppb)<br>4' Diameter Tower |
| 17 | 1.288 |
| 18 | 0.937 |
| 19 | 0.682 |
| 20 | 0.496 |
| 21 | 0.361 |
| 22 | 0.263 |

**Recommendation:** Recommend design based on a 4-ft. diameter tower and a packing depth of 22 ft. Overall tower height would be approximately 30 ft.

Ref: #6280

| TABLE 1<br>PRELIMINARY DESIGN REQUIREMENTS<br>WARMINSTER MUNICIPAL AUTHORITY<br>**WELL NO. 13 - PCE TREATMENT SYSTEM** | |
|---|---|
| Basis of Design | Flow - 180 gpm<br>PCE Level - Influent Concentration = 300 ppb;<br>Effluent Concentration = <5 ppb |
| 1. Diameter of FRP Tower:<br>Required Packing Height:<br>Overall Tower Height: | 48 inches<br>22' - 0"<br>30' - 0" |
| 2. Packing Material:<br>Internals:<br><br>Support Plate: | Jaeger Tri-Packs - 1" Units<br>Liquid Distributor - Vee Notch, Trough Type, 1 Parting Box and 3 Troughs (min.)<br>Plastic Grid type or equivalent, 70% void space minimum |
| 3. Blower and Air Requirements: | 1,200 cfm, pressure drop of less than 4" through system. Utilize opposed blade damper to control air flow. |
| 4. Clear Well Volume: | Preliminary sizing based on minimum required pumping time, desired reserve capacity, and adequate space for equipment placement. Utilize a 6' square x 10' deep precast concrete chamber with base and slab top. |
| 5. Preliminary Transfer Pump Selection: | Design for 180 gpm. Assume Goulds Pump Co., Model 10 RAHC, with 25 Hp, 1,800 rpm motor. |
| 6. Control Requirements: | Transfer pump operation shall be controlled by a liquid level pressure transducer in the clear well. Control for shutdown of well pump shall be tied into operation of fan. Control valving shall also be provided to maintain constant output of both pumps. |
| 7. Replacement of Existing Well Pump: | As a result of the new treatment system installation, the total dynamic head (TDH) on the well pump will significantly change, therefore, replacement of the existing well pump will be required. New well pump shall be designed for 180 gpm. |

Ref: #6280

| TABLE 2<br>ESTIMATED PROJECT COST<br>WARMINSTER MUNICIPAL AUTHORITY<br>WELL NO. 13 - PCE TREATMENT SYSTEM | | |
|---|---|---|
| A. | ESTIMATED CONSTRUCTION COST | |
| 1 | Addition and Modifications to Existing Well House | $ 35,000 |
| 2 | Cast-in-Place Concrete Tower Pad and Precast Concrete Clearwell | $ 25,000 |
| 3 | FRP Air Stripping Tower and Intervals | $ 60,000 |
| 4 | Well Pump Modifications | $ 30,000 |
| 5 | Transfer Pump Assembly | $ 25,000 |
| 6 | Fan, Ductwork and Appurtenances | $ 10,000 |
| 7 | System Piping, Fittings, Valves, etc. | $ 40,000 |
| 8 | Instrumentation | $ 50,000 |
| 9 | Electrical | $ 50,000 |
| 10 | Site Work | $ 10,000 |
| 11 | Demolition Work | $ 10,000 |
| | Subtotal | $ 345,000 |
| 12 | Construction Contingency (10%) | $ 34,500 |
| | Subtotal | $ 379,500 |
| B. | ESTIMATED ENGINEERING DESIGN | $ 38,000 |
| C. | ESTIMATED CONSTRUCTION MANAGEMENT AND INSPECTION | $ 38,000 |
| | ESTIMATED TOTAL PROJECT COSTS | $ 455,500 |

**ATTACHMENT 5**

**ECOR PRESENTATION**

# ECOR Solutions, Inc.

# Restoration Advisory Board Meeting for NAWC Warminster

# August 30, 2006

*Delivering environmental construction, operations and remediation solutions to industry and government*

ECOR Solutions, Inc.

# Topics for Discussion

- Administrative Update
- Area C Source Assessment (Tetra tech NUS)
- Update on Status of WMA Wells #13 and #26 (WMA/Navy)
- 1,4-Dioxane Discussion (ECOR)
- ACT II at 905 Louis Drive
- Extraction Well Near MW-69D
- Optimization Study
- Miscellaneous Topics, Issues, and Discussion

# 1,4 Dioxane Discussion

## Background

- Primarily used as stabilizer for 1,1,1-TCA.
- Not currently analyzed for during O&M or LTM sampling.
- Miscible in water.
- Not effectively treated by air stripping or carbon adsorption. Common treatment technologies are chemical oxidation (ozone, peroxide) or UV oxidation.

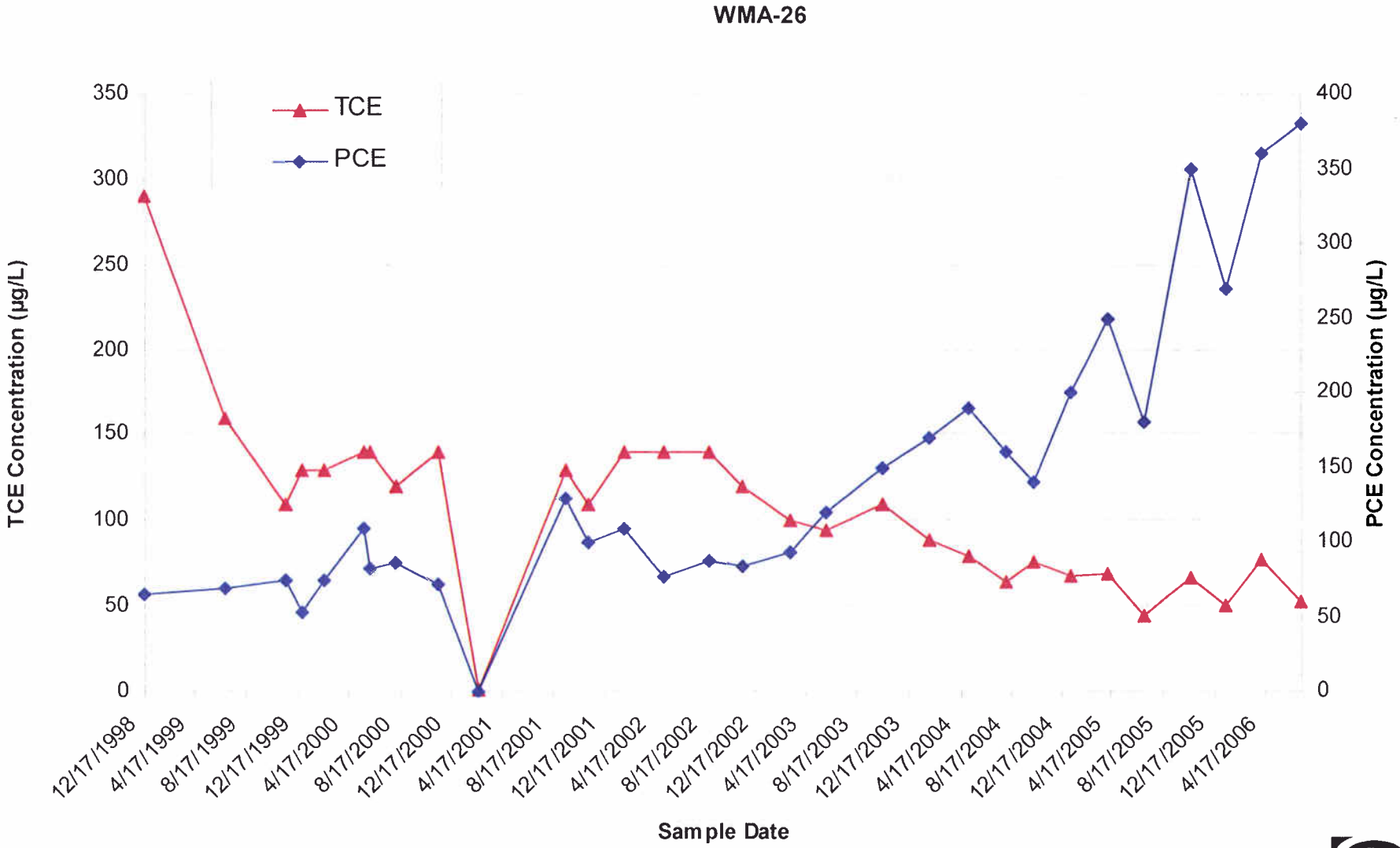
## Regulatory Standards

- No EPA MCL has been established.
- The PADEP Medium Specific Concentration (MSC) in groundwater is 5.6 ug/L (residential, non use).
- CAL EPA has adopted an public health protective concentration of 3 ug/L in drinking water.

# 1,4 Dioxane Discussion (cont)

Screening for 1,4 Dioxane

- Because 1,4 dioxane is expected to occur with TCA, existing groundwater data was reviewed to determine which wells showed the highest TCA concentrations.
- A targeted evaluation of groundwater at these locations in addition to sampling influent and effluent of the GWTP for 1,4 dioxane may be prudent.
- Based on elevated TCA concentrations, the following wells would be likely candidates for 1,4 dioxane sampling: HN-52S, HN-16S, WMA-26. In addition the GWTP influent should also be sampled if 1,4 dioxane is a concern. A phased approach may be the most reasonable (i.e. sample influent to see if additional sampling is warranted).
- Currently used Method 8260 for VOCs is not appropriate for detection of low concentrations (<200 ug/L) of 1,4 dioxane. Method 8270 is more appropriate for detecting 1,4 dioxane at low concentrations.


WMA-26
TCE
PCE
TCE Concentration (µg/L)
PCE Concentration (µg/L)
350
300
250
200
150
100
50
0
400
350
300
250
200
150
100
50
0
12/17/1998
4/17/1999
8/17/1999
12/17/1999
4/17/2000
8/17/2000
12/17/2000
4/17/2001
8/17/2001
12/17/2001
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8/17/2002
12/17/2002
4/17/2003
8/17/2003
12/17/2003
4/17/2004
8/17/2004
12/17/2004
4/17/2005
8/17/2005
12/17/2005
4/17/2006
Sample Date

TCA Concentrations over time
in OU-1A

| Sampling Event | Well ID | 1,1,1-TCA (µg/L) | 1,1,2-TCA (µg/L) |
|---|---|---|---|
| Q3 FY04 | HN-16S | 67 | |
| | HN-19S | 2.5,2.4 | |
| | EW-A9 | | 16 |
| | HN-52S | 100 | |
| | HN-55I | 0.46 J | |
| | WMA-26 | 6.5 J | |
| Q4 FY04 | WMA-26 | 3.6 J | |
| Q1 FY05 | EW-A8 | 0.80 J | |
| | EW-A11 | 0.59 J | |
| | EW-A15 | 0.24 J | |
| | HN-52S | 160 | |
| | HN-19I2 | 2.0 | |
| | WMA-26 | 4.0 | |
| Q2 FY05 | HN-14I | | 0.62 B |
| Q3 FY05 | HN-16S | 38 | |
| | HN-19S | 0.60 J | |
| | HN-100S | | 0.35 J |
| | HN-16I | | 0.30 J |
| | HN-19I2 | 1.6 | |
| | HN-52I | | 0.65 J |
| | HN-55I | 0.79 J | |
| Q4 FY05 | EW-A11 | 0.46 J | |
| Q1 FY06 | EW-A11 | 0.38 J | |
| Q2 FY06 | EW-A3 | | 0.35 J |
| | EW-A8 | 0.46 J | |
| | EW-A11 | 0.43 J | |
| Q3 FY06 | EW-A1 | 0.33 J | 0.27 J |
| | EW-A11 | 0.82 J | |
| | HN-16S | 33 | |
| | HN-19S | 1.4 | |
| | HN-19I2 | 1.4 | |
| | HN-55I | 0.69 J | |
| Q4 FY06 | EW-A1 | 0.26 J | 0.24 J |
| | EW-A2 | | 0.27 J |
| | EW-A3 | 0.36 J | 0.48 J |
| | EW-A9 | | 27 J |
| | EW-A10 | | 2.9 J |
| | EW-A13 | 0.28 J | |
| | WMA-26 | 1.8 | |

Above MCL

TCA Concentrations over time
in OU-3

| Sampling Event | Well ID | 1,1,1-TCA (µg/L) | 1,1,2-TCA (µg/L) |
|---|---|---|---|
| Q3 FY04 | HN-25S | 0.27 J | |
| | HN-25I | 0.28 J | |

TCA Concentrations over time
in OU-4

| Sampling Event | Well ID | 1,1,1-TCA (µg/L) | 1,1,2-TCA (µg/L) |
|---|---|---|---|
| Q3 FY04 | EW-D7 | 0.48 J | |
| | EW-D8 | 0.83 J | |
| | HN-33S | 0.88 J | |
| | HN-53I | 0.69 J | |
| | HN-75S | 0.58 J | |
| | OW-D10 | 0.83 J | |
| | HN-57S | 0.28 J | |
| | HN-73I | 0.92 J | |
| Q4 FY04 | EW-D2 | 0.25 J | |
| | EW-D7 | 0.50 J | |
| Q1 FY05 | EW-D3 | 0.23 J | |
| | EW-D4 | 0.34 J | |
| | EW-D5 | 0.52 J | |
| | EW-D7 | 0.47 J | |
| Q3 FY05 | EW-D7 | 0.28 J | |
| | HN-33S | 0.76 J | |
| Q4 FY05 | EW-D5 | 0.31 J | |
| | EW-D7 | 0.64 J | |
| | EW-D8 | 0.67 J | |
| Q1 FY06 | EW-D5 | 0.27 J | |
| | EW-D8 | 0.54 J | |
| Q2 FY06 | EW-D5 | 0.35 J | |
| Q4 FY06 | EW-D7 | 0.51 J | |
| | EW-D8 | 0.47 J | |