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TECHNICAL MEMORANDUM NATURAL ATTENUATION MONITORING WORK PLAN FOR
BUILDING G82 TANK G82 AND BP WELLS NAS CECIL FIELD FL
5/29/2008
CH2MHILL CONSTRUCTORS INC

Natural Attenuation Monitoring Work Plan, Building G-82 (Tank G-82) and BP Wells Sites, Former Naval Air Station Cecil Field, Jacksonville, Florida

PREPARED FOR: Cecil Field Base Cleanup Team
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1.0 Introduction

This technical memorandum outlines the long-term monitored natural attenuation (MNA) program requirements to be implemented at the Building G-82 (Tank G-82) and the BP Wells Sites at the former Naval Air Station (NAS) Cecil Field, Jacksonville, Florida. Figure 1 shows the location of the sites within NAS Cecil Field.

CH2M HILL Constructors, Inc. (CH2M HILL) conducted a site-wide groundwater sampling event during November 2006. Geochemical data were evaluated to determine if natural attenuation was occurring in groundwater at the two sites and if parameter concentrations were decreasing in response to naturally occurring degradation processes. The evaluation involved comparing geochemical data from source area and downgradient monitoring wells to background values measured in upgradient wells. Based on these results, a long-term monitoring program for natural attenuation parameters was developed for implementation, as described below.

1.1 Site Background

The MNA program focuses on the Building G-82 and BP Wells Sites.

1.1.1 Building G-82 Site

The Building G-82 Site comprised an air traffic control tower and underground storage tank (UST) G-82 located at the former NAS Cecil Field in Jacksonville, Florida. Tank G-82 was used to store diesel fuel for emergency generators. Tank G-82 was removed in June 1997. Soil and groundwater have been impacted near the UST as a result of leaks originating from Tank G-82. The leaking tank released an unknown volume of fuel to the environment.

Following the removal of Tank G-82, a piezometer (CEF-G-82-1S, see Figure 2) was installed near the former location of the tank in January 1998. The hydrocarbon compounds 1-methylnaphthalene and 2-methylnaphthalene were detected in groundwater samples collected from CEF-G-82-1S at concentrations that exceeded Florida Department of Environmental Protection (FDEP) Groundwater Cleanup Target Levels (GCTLs). In January 1999, Harding Lawson Associates (HLA) performed additional sampling and prepared a

Confirmatory Sampling Report (CSR) recommending the completion of additional site assessment (SA) to determine the extent of hydrocarbons in the soil and groundwater.

Between October 1999 and July 2000, Tetra Tech NUS, Inc. (TtNUS) conducted the SA at Building G-82. Five shallow monitoring wells (CEF-G-82-2S through 6S) and one intermediate monitoring well (CEF-G-82-2I) were installed, and samples were collected to determine the extent of hydrocarbons in the soil and groundwater. TtNUS recommended excavation of 280 cubic yards (yd³) of soil that contained volatile organic compounds (VOCs) and polynuclear aromatic hydrocarbons (PAHs) that exceeded FDEP Soil Cleanup Target Levels (SCTLs). Following soil removal, TtNUS recommended MNA as the remedial approach for groundwater.

During 2001, CH2M HILL was contracted by Southern Division Naval Facilities Engineering Command (NAVFAC) to perform the soil excavation work. The objective of the work was to excavate and dispose of the soil exceeding the FDEP SCTLs. Soil removal continued until either headspace readings using an organic vapor analyzer (OVA) were below 10 parts per million (ppm) or predetermined excavation boundaries (foundation boundaries and concrete aircraft apron) were reached. Approximately 148 tons of petroleum-impacted soil was removed. Following completion of the excavation activities, confirmation samples were collected from the north and south excavation walls to verify that remaining soil met the SCTLs. The analytical results from these samples indicated that the north and south excavation extent was complete. However, OVA readings from the east and west excavation walls indicated headspace concentrations exceeded 10 ppm, suggesting petroleum-impacted soil with concentrations above the SCTLs likely remained outside the limits of excavation. However, due to the close proximity of the excavation to the foundation of Building G-82 and the aircraft apron, excavation activities were terminated to prevent potential damage to the infrastructure.

Following the removal action in October 2001, TtNUS performed a supplemental assessment of the site. The results of the supplemental assessment and the associated sampling were presented in the Site Assessment Report Addendum (SARA) (TtNUS, 2001).

As part of the SARA, subsurface soil samples were collected from six locations along Building G-82 and along the flightline apron. These samples were collected outside the excavation area to evaluate residual contamination following the removal action. The samples were collected at a depth of 5 to 6 feet below land surface and were analyzed for VOCs, PAHs, and Total Recoverable Petroleum Hydrocarbons (TRPH). Based on the results of the original six samples, Synthetic Precipitation Leaching Procedure (SPLP) analyses were also performed. The SARA concluded that approximately 49 yd³ of contaminated soil remained along Building G-82 and the flightline apron. TRPH was present above its SCTLs. Xylenes, naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene were detected in the leachate of the SPLP samples at concentrations that exceed their respective GCTLs.

In April, 2002, the Base Realignment and Closure (BRAC) team (BCT) recommended sampling of subsurface soil for the purpose of identifying the TRPH subclassification. Three samples were collected; however, one sample contained TRPH below the SCTLs and was not subclassified. Of the two samples that were analyzed for TRPH hydrocarbon-chain speciation, one sample contained concentrations of one fraction (C12 - C16, aliphatic) that exceeded its subclassification SCTLs. Based on these results, TtNUS recommended a

pilot-scale air sparging treatability study for the site. These findings were presented to the BCT at the May 15, 2002, meeting. The BCT agreed that an air sparging treatability pilot study should be performed.

No action was taken until a site-wide groundwater sampling event in November 2006. The results of the sampling event (discussed in Section 1.2) indicated that natural attenuation was occurring and the concentration of the contaminants of concern had been decreasing in the absence of active remediation.

A technical memorandum presenting the groundwater sampling results was prepared by CH2M HILL and presented to FDEP (CH2M HILL, 2007). A copy of this technical memorandum is included in Attachment 1. During the September 2007 BCT meeting, FDEP agreed that, based on the 2006 site-wide groundwater sampling results, no active remediation, such as air sparging, was needed at the Building G-82 Site.

1.1.2 BP Wells Site

The BP Wells Site is located on the north-south flightline, southeast of Building 880, on the west edge of the flightline apron. From 1999 to 2000, assessment activities were performed to determine the extent of hydrocarbons in soil and groundwater beneath the BP Wells Site. A due diligence investigation was conducted by Golder Associates, Inc. (1999) for the new property tenants (Jacksonville Airport Authority and Air Kaman). Four shallow wells (CEF-BP-1S through 4S, and CEF-BP-6S) and one intermediate well (CEF-BP-5I) were installed at the site (Figure 2). The reported results indicated the presence of hydrocarbons in groundwater beneath the site.

Subsequently, the Navy directed TtNUS to conduct an SA. The SA confirmed the presence of contaminated groundwater and identified the groundwater flow direction to the southeast. A Site Assessment Report (SAR) (2000) was submitted to the FDEP recommending that a natural attenuation monitoring plan be implemented at the site. The FDEP approved the plan and issued a Natural Attenuation Monitoring Plan Approval Order (NAMPAO) on August 31, 2000. In accordance with the NAMPAO, TtNUS performed the first two semiannual groundwater sampling events in April and October of 2001. Because the hydrocarbon concentrations at the source well were greater than the applicable natural attenuation default concentrations (NADCs) and because the contaminant concentrations appeared to be increasing, the second monitoring report recommended that the semiannual monitoring program be suspended and that a Remedial Action Plan (RAP) be prepared for the site. On February 20, 2002, the FDEP agreed that a RAP was warranted. Subsequently, TtNUS recommended that a treatability study be performed to evaluate the effectiveness of in-situ enhanced bioremediation at the site. In-situ Submerged Oxygen Curtain (iSOC™) technology was to be evaluated to perform this test. In April 2004, TtNUS submitted an Enhanced Natural Attenuation Treatability Study (ENATS) Work Plan for the BP Wells Site.

Similar to the Building G-82 Site, no action was taken until a site-wide groundwater sampling event was conducted in November 2006. The results of the sampling event, discussed in Section 1.2, indicate that natural attenuation was occurring at the site and the concentration of the contaminants of concern had been decreasing.

1.1.3 Remedial Action Objectives

The remedial action objective for the Building G-82 and BP Wells Sites is to achieve cleanup of groundwater contaminant concentrations to levels below the Florida GCTLs with a short-term remedial action objective to achieve reduction of contaminant concentrations to below the Florida NADCs.

1.2 Natural Attenuation Monitoring

1.2.1 Groundwater Contamination Summary

In November 2006, the following monitoring wells were sampled for contaminant characterization:

- Building G-82 Site: CEF-G82-1S, CEF-G82-2I, CEF-G82-2S, CEF-G82-3S, CEF-G82-4S, CEF-G82-5S, and CEF-G82-6S.
- BP Wells Site: CEF-BP-1S, CEF-BP-2S, CEF-BP-3S, CEF-BP-4S, CEF-BP-5I, and CEF-BP-6S.

Groundwater samples from both sites were analyzed for VOCs (U.S. Environmental Protection Agency [EPA] Method 8260B), PAHs (EPA Method 8310), and TRPH (Florida Petroleum Residual Organic [FL-PRO] Method).

Building G-82 Site

In November 2006, the following compounds were detected at concentrations exceeding the GCTLs: isopropylbenzene (cumene), naphthalene, and 1-methylnaphthalene in wells CEF-G82-1S and CEF-G82-2S; 2-methylnaphthalene in well CEF-G82-2S; and benzo(a)pyrene and dibenz(a,h)anthracene in well CEF-G82-1S. The benzo(a)pyrene detection of 7.95 micrograms per liter ($\mu\text{g}/\text{L}$) and the dibenz(a,h)anthracene detection of 35.9 $\mu\text{g}/\text{L}$ in well CEF-G82-1S also exceeded NADC criteria of 2 $\mu\text{g}/\text{L}$ and 0.05 $\mu\text{g}/\text{L}$, respectively.

Only groundwater sampled from wells CEF-G82-1S and CEF-G82-2S contained constituents at levels exceeding GCTLs during the November 2006 sampling event. Groundwater sampled from the surrounding monitoring wells (CEF-G82-3S, CEF-G82-4S, CEF-G82-5S, and CEF-G82-6S) and the well screened below the shallow monitoring wells (CEF-G82-2I) did not contain constituents of concern at elevated levels.

The following parameters were historically detected at concentrations above the GCTLs in well CEF-BP-2S: benzene, ethylbenzene, total xylenes, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene. In general, the concentrations of VOCs (benzene, ethylbenzene, and total xylenes) in well CEF-G82-2S decreased in concentration when compared to previous sampling events, suggesting that biodegradation of these compounds is occurring. Concentrations of the PAH compounds 1-methylnaphthalene, 2-methylnaphthalene, benzo(a)pyrene, and dibenz(a,h)anthracene increased slightly compared to historical results. However, because PAHs are less mobile and tend to be more persistent than VOCs, it is expected that future monitoring will indicate that PAHs decrease over time, similarly to the VOCs, at this site. A summary of the historical analytical results from the Building G-82 Site is presented as the third attachment in Attachment 1.

BP Wells Site

In November 2006, the following compounds were detected at concentrations exceeding the GCTLs: isopropylbenzene (cumene), ethylbenzene, total xylenes, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene. All exceedances occurred in well CEF-BP-1S; however, one of these detections exceeded NADC criteria. The remaining wells at the BP Wells Site did not show any exceedances of either the GCTLs or NADC criteria.

Comparison of the November 2006 test data with historical sampling data collected in 2003 (2003 data is presented as the second attachment in Attachment 1) indicates that hydrocarbon concentrations in groundwater beneath the BP Wells Site have decreased in concentration.

1.2.2 Future Remedial Action

Future remedial action at the Building G-82 and BP Wells Sites includes long-term monitoring of natural attenuation in groundwater for an initial period of 3 years. Additional monitoring requirements will be evaluated at the end of the third year of monitoring.

1.3 Long-Term Monitoring for Natural Attenuation

1.3.1 Objectives

The objective of long-term monitoring for natural attenuation at the Building G-82 and BP Wells Sites is to collect the physical and chemical data necessary to monitor changes in dissolved hydrocarbon concentrations and verify that conditions continue to be favorable for natural attenuation to occur. Remediation for groundwater will be complete when dissolved hydrocarbon concentrations naturally attenuate to concentration below the Florida GCTLs.

1.3.2 Significance of Natural Attenuation Parameters for Long-Term Monitoring

Monitoring key natural attenuation parameters will help determine if water quality conditions remain favorable for biological degradation of hydrocarbons to occur and if parameter concentrations continue to decrease in response to the degradation processes. The following parameters will be evaluated during each sampling event: dissolved oxygen (DO), Oxidation Reduction Potential (ORP), pH, nitrates/nitrite, sulfate, sulfide, and methane. Groundwater quality in background wells will be compared to wells containing parameters in exceedance of GCTLs. A discussion of the MNA measurements made during the November 2006 sampling event is provided below.

Dissolved Oxygen (DO)

DO measurements were made to determine the distribution of DO in groundwater relative to the distribution of dissolved hydrocarbons. In the absence of hydrocarbons, DO concentrations in groundwater typically range from 1.0 to 1.5 milligrams per liter (mg/L) depending on water temperature (i.e., DO concentrations are higher in cold water and lower in warm water). DO is often depleted in groundwater contaminated with hydrocarbons as a result of in-situ biodegradation. Oxygen is consumed and carbon dioxide is produced in the biodegradation process.

In groundwater beneath the Building G-82 Site, DO concentrations ranged from 0.36 mg/L (CEF-G82-2I) to 0.84 mg/L (CEF-G82-5S). The DO concentrations measured in wells CEF-G82-1S, CEF-G82-2I, CEF-G82-2S, CEF-G82-4S, and CEF-G82-6S were below those in the background well CEF-G82-3S. These data suggest that subsurface conditions are

suboptimal for aerobic hydrocarbon biodegradation. However, general reductions in VOC concentrations over time suggest that anaerobic biodegradation of contaminants may be occurring.

DO concentrations at the BP Wells Site ranged from 0.6 mg/L (CEF-BP-1S) to 1.50 mg/L (CEF-BP-3S) as measured using the Chemetrics® field test kits during the November 2006 sampling event. The DO concentration of 0.6 mg/L in well CEF-BP-1S was slightly below the DO measured in the upgradient (background) well CEF-BP-2S at 0.8 mg/L. With the exception of well CEF-BP-1S, which showed slightly elevated VOCs, the DO readings at the site were generally similar to background levels. These data suggest that subsurface conditions are suboptimal for aerobic hydrocarbon biodegradation. However, contaminant concentration reductions suggest that anaerobic biodegradation of contaminants may be occurring.

Oxidation Reduction Potential (ORP)

ORP is a measure of the relative tendency of ions in solution to transfer electrons. As electron acceptors are utilized, the ORP of the groundwater decreases. As DO is consumed, the ORP will decline and perhaps become negative.

ORP across the BP Wells Site ranged from -126.0 millivolts (mV) to 186.7 mV. Negative ORP levels were measured at only two well locations: CEF-BP-1S (-117.9 mV) and CEF-BP-6S (-126.0 mV). The negative ORP detected in groundwater sampled from these locations suggests that reducing conditions are prevalent in the vicinity of well CEF-BP-1S. This was the only well with parameter concentrations above GCTLs.

ORP across the Building G-82 Site ranged from -127.2 mV to 233.8 mV. ORP levels were similar in wells CEF-G82-1S (-127.2 mV) and CEF-G82-2S (-126.0 mV). These were the only monitoring wells with significantly negative ORP, and they were also the only wells with contaminant concentrations above GCTLs. Similar to the BP Wells Site, these results suggest that reducing conditions are prevalent in the vicinity of the wells showing elevated contaminant concentrations in groundwater.

pH

The pH of groundwater has an effect on the presence and activity of microbial populations in groundwater. Microbes capable of degrading petroleum hydrocarbons generally prefer pH values varying from 6 to 8 standard units.

At the BP Wells Site, groundwater pH values ranged from 5.13 (CEF-BP-5I) to 6.49 (CEF-BP-1S) with a background value of 6.37 (CEF-BP-2S), generally within the preferred range of values for microbial activity. Further, pH in groundwater sampled from monitoring well CEF-BP-1S, the only well with parameter concentrations above GCTLs, was 6.49.

At the Building G-82 Site, the pH values ranged from 4.97 (CEF-G82-4S) to 6.02 (CEF-G82-2S) with a background value of 5.81 (CEF-G82-3S), indicating that optimal pH conditions for microbial activity were not present at all locations at this site. However, pH values in the vicinity of CEF-G82-1S and CEF-G82-2S (the two wells with contaminant concentrations exceeding GCTLs) were 5.96 and 6.02, respectively, indicating that in this area of the site, pH is generally within the range optimal for microbial activity.

Nitrates/Nitrite

After DO has been depleted, biodegradation of hydrocarbons may continue anaerobically using total nitrate/nitrite as electron acceptors (denitrification). Nitrate/nitrite concentrations will be lower in the wells containing hydrocarbons (such as benzene, toluene, ethylbenzene, and xylenes [BTEX]), if biodegradation is occurring. Nitrate and nitrite were detected in seven of the eight monitoring wells in which the parameters were analyzed.

At the BP Wells Site, nitrate and nitrite were detected in three of the four monitoring wells in which the parameter was analyzed. The nitrate and nitrite concentrations, ranging from non-detect to 561 µg/L in the downgradient wells, were lower than the concentration of the background well CEF-BP-2S (733 µg/L). No nitrate/nitrite was detected in groundwater sampled from CEF-BP-1S, the only monitoring well with contaminant concentrations exceeding GCTLs, suggesting that reducing conditions are favorable for denitrification in this area.

At the Building G-82 Site, the nitrate and nitrite concentrations ranging from 44 to 66 µg/L in the downgradient wells were similar to the concentration in background well CEF-G82-3S (72 µg/L). The presence of nitrate and nitrite in the areas of impacted groundwater suggests that conditions are unfavorable for denitrification..

Sulfate/Sulfide

After DO and total nitrogen have been depleted in the aquifer, sulfate may be used as an electron acceptor for anaerobic biodegradation. This process is termed sulfate reduction, and results in the production of sulfide. Portions of the hydrocarbon plume undergoing anaerobic biodegradation may have depleted sulfate concentrations and caused elevated sulfide concentrations. Sulfate reducing conditions are favorable at redox potentials of -200 mV and pH of 7.

Sulfate was detected in each of the four wells that were monitored for the parameter at the BP Wells Site. The concentrations of sulfate were higher in the downgradient wells than in the background well. The presence of sulfate in the areas of impacted groundwater at concentrations higher than background and low sulfide concentrations suggest that conditions favorable for sulfate reduction are not present.

Sulfate was detected in two of the four wells that were monitored for the parameter at the Building G-82 Site. The concentrations of sulfate were lower in the downgradient wells than the background well. Sulfate was not present in groundwater sampled from CEF-G82-1S, (the area of highest levels of contaminants of concern) and was detected at levels below those detected in the background sample in groundwater sampled from CEF-G82-2S (the only other site monitoring well to contain contaminants at levels exceeding GCTLs); additionally, sulfide was detected in groundwater sampled from CEF-G82-1S and CEF-G82-2S at levels exceeding those detected in the background sample. The absence or limited presence of sulfate in the areas of impacted groundwater at concentrations lower than background, coupled with the presence of sulfide at concentrations higher than background, suggests that subsurface conditions at the site may be favorable for sulfate reduction in these areas.

Methane

The presence of methane in groundwater at concentrations above background is a good indicator that methanogenesis is occurring. During methanogenesis, carbon dioxide is used as an electron acceptor and methane is formed. The presence of methane in groundwater is also indicative of strong reducing conditions.

Dissolved methane was detected in three of the four wells analyzed at the BP Wells Site. The concentration of methane exceeded background concentrations in wells CEF-BP-1S, CEF-BP-5I, and CEF-BP-6S. The presence of methane above background concentrations may be indicative of anaerobic microbial degradation of hydrocarbons occurring at the site.

Dissolved methane was detected in each of the four wells analyzed at the Building G-82 Site. The concentration of methane exceeded background (estimated 1.63 µg/L) significantly in wells CEF-G82-1S (1,340 µg/L) and CEF-G82-2S (estimated 680 µg/L), suggesting anaerobic microbial degradation of hydrocarbons is occurring in these source areas.

2.0 Sampling and Analysis Plan for Natural Attenuation Monitoring

This section describes the sampling procedures that will be followed during execution of the work scope. Analytical methods, data quality objectives, protocol for equipment decontamination, and procedures used for the collection of samples for waste characterization are discussed in this section.

2.1 Sampling Objectives

The objective of long-term monitoring for natural attenuation at the Building G-82 and BP Wells Sites is to collect the physical and chemical data necessary to monitor changes in dissolved hydrocarbon concentrations and verify that conditions continue to be favorable for natural attenuation to occur. Remediation for groundwater will be complete when dissolved hydrocarbon concentrations naturally attenuate to concentration below the Florida GCTLs. In order to achieve these objectives, the following tasks will be performed:

- Measure water levels quarterly to obtain the data required to prepare potentiometric surface maps and to evaluate fluctuations in groundwater elevation.
- Collect the following water quality measurements from 13 wells (CEF-BP-1S, CEF-BP-2S, CEF-BP-3S, CEF-BP-4S, CEF-BP-5I, CEF-BP-6S, CEF-G82-1S, CEF-G82-2I, CEF-G82-2S, CEF-G82-3S, CEF-G82-4S, CEF-G82-5S, and CEF-G82-6S) during the well purging process to evaluate the physical parameters of the aquifer: pH, conductivity, turbidity, DO, ORP, and temperature.
- Collect groundwater samples from 13 wells (CEF-BP-1S, CEF-BP-2S, CEF-BP-3S, CEF-BP-4S, CEF-BP-5I, CEF-BP-6S, CEF-G82-1S, CEF-G82-2I, CEF-G82-2S, CEF-G82-3S, CEF-G82-4S, CEF-G82-5S, and CEF-G82-6S) for the analysis of BTEX and naphthalene by EPA Method 8260B, PAHs (16 PAHs including both 1-methylnaphthalene and 2-methylnaphthalene) by EPA Method 8270SIM, and TPH by the FL-PRO Method.
- Collect groundwater samples from eight wells (CEF-BP-1S, CEF-BP-2S, CEF-BP-5I, CEF-BP-6S, CEF-G82-1S, CEF-G82-2I, CEF-G82-2S, and CEF-G82-3S) for the analysis of sulfate/sulfide, alkalinity, nitrate/nitrite, and methane.

Details regarding completion of these tasks are described below.

2.2 Monitoring Well Network

The following eight wells will be analyzed for the MNA parameters: dissolved methane (Method RSK 175), nitrate/nitrite and sulfate (EPA Method 300.0), and sulfide (Method SM4500-S₂ F):

- BP Wells Site: CEF-BP-1S, CEF-BP-2S, CEF-BP-5I, and CEF-BP-6S.
- Building G-82 Site: CEF-G82-1S, CEF-G82-2I, CEF-G82-2S, and CEF-G82-3S.

The following 13 wells will be analyzed for BTEX and naphthalene by EPA Method 8260B, PAHs (including 1-methylnaphthalene and 2-methylnaphthalene) by EPA Method 8270SIM, and TRPH by the FL-PRO Method:

- BP Wells Site: CEF-BP-1S, CEF-BP-2S, CEF-BP-3S, CEF-BP-4S, CEF-BP-5I, and CEF-BP-6S.
- Building G-82 Site: CEF-G82-1S, CEF-G82-2I, CEF-G82-2S, CEF-G82-3S, CEF-G82-4S, CEF-G82-5S, and CEF-G82-6S.

Requirements for sample collection, preservation, and analysis are listed in Table 1.

2.3 Frequency of Monitoring

Based on discussions during the January 2008 NASCF BCT Meeting, groundwater will be monitored on a quarterly basis for the first year of long-term monitoring for the Building G-82 Site and on a semiannually basis for the BP Wells Site. During the second year, semiannual groundwater will be performed at both sites. During the third year, annual groundwater monitoring will performed at both sites. After the completion of the third year of monitoring, the natural attenuation progress will be evaluated to determine if additional monitoring is necessary.

2.4 Data Quality Levels for Measurement Data

The samples will be collected in accordance with the EPA Region IV Field Branches Quality System and Technical Procedures, November 2007, and the FDEP Standard Operating Procedures (SOPs).

The sampling team will be qualified under the Navy Installation Restoration Chemical Data Quality Manual (IRCDQM), 1999 sampling requirements. A Navy-, U.S. Army Corps of Engineers (USACE)-, or Air Force Center for Engineering and the Environment (AFCEE)- and FDEP-approved laboratory will be used for all sample analyses.

TABLE 1
 Requirements for Sample Collection, Preservation, and Analysis

Sample Task	Sample Point	Matrix	Sampling Frequency (Note 1)	Approx Sample No	Sampling Method	Sampling Equipment	TAT	DQO Level/ Data Package Reqmnt	Required Analysis	Analytical Method	Holding Time	Sample Preservation	Containers
Groundwater Sampling													
Groundwater Sampling	Monitoring Wells (6 wells – BP Wells Site; 7 wells – Bldg G-82 Site)	Water	1 st & 3 rd Quarter – 1 st yr; Semiannually 2 nd yr; Annually 3 rd yr	13 + 2 DUP + 1 MS/MSD = 17 (per event); 85 total	Grab	Hand Bailer	14 days	DQO Level IV, CCI Level C	BTEX and naphthalene	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
	Monitoring Wells (7 wells – Bldg G-82 Site)		2 nd & 4 th Quarter – 1 st yr;	7 + 1 DUP + 1 MS/MSD = 10; 20 total					PAH including 1- & 2-methylnaphthalene	8270SIM	7 days ext; 40-days analysis	Cool to 4°C	(2) 1-L amber glass
									TRPH	FL-PRO	7 days ext; 40-days analysis	HCl pH< 2; Cool to 4°C	(2) 1-L amber glass
	Monitoring Wells (4 wells – BP Wells Site; 4 wells – Bldg G-82 Site)	Water	1 st & 3 rd Quarter – 1 yr; Semiannually 2 nd yr; Annually 3 rd yr	8 + 1 DUP + 1 MS/MSD = 11 (per event) – 55 total	Grab	Hand Bailer	14 days		Sulfate	300.0 / 300.1	28 days	Cool to 4°C	(1) 500-mL plastic
	Monitoring Wells (4 wells – Bldg G-82 Site)		2 nd & 4 th Quarter – 1 st yr;	4 + 1 DUP + 1 MS/MSD = 7; 14 total					Sulfide	SM 4500-S2-F	7 days	Cool to 4°C, pH>9 w/NaOH; add Zinc Acetate	(1) 1000-mL plastic
									Nitrate	300.0	48 hours	Cool to 4°C	(1) 500-mL plastic
									Nitrite	300.0	48 hours	Cool to 4°C	(1) 500-mL plastic
									Methane	RSK-175	14 days	Cool to 4°C, pH <2 w/HCl, no headspace	(2) 40 mL vials

TABLE 1
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	Equipment Rinsate Blank	Water	1 per 10% of sampling	1 per event	Prepared in Field	Analyte-free water, SS funnel	14 days		BTEX and naphthalene	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
									PAH including 1- & 2-methylnaphthalene	8270SIM	7 days ext; 40-days analysis	Cool to 4°C	(2) 1-L amber glass
									TRPH	FL-PRO	7 days ext; 40-days analysis	HCl pH< 2; Cool to 4°C	(2) 1-L amber glass
									Sulfate	300.0 / 300.1	28 days	Cool to 4°C	(1) 500-mL plastic
									Sulfide	SM 4500-S2-F	7 days	Cool to 4°C, pH>9 w/NaOH; add Zinc Acetate	(1) 1000-mL plastic
									Nitrate	300.0 / 300.1	48 hours	Cool to 4°C	(1) 500-mL plastic
									Nitrite	300.0 / 300.1	48 hours	Cool to 4°C	(1) 500-mL plastic
									Methane	RSK-175	14 days	Cool to 4°C, pH <2 w/HCl, no headspace	(2) 40 mL vials
	Trip Blank	Water	1 per cooler containing volatile samples	7	Prepared by Lab	N/A	14 days		BTEX and naphthalene	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 mL vials
Waste Characterization Sampling													
Disposal of Liquid Waste from well development, purge water, etc.	55-gallon drums containing liquid waste	Water	One per event	7	Grab	Drum thief or dip jar	7 days	DQO Level III, CCI Level B	TCL Volatiles	8260B	14 days	HCl pH< 2; Cool to 4°C	(2) 40 ml vial
									TCL Semi-volatiles	8270C	7 days ext; 40-days analysis	Cool to 4°C	(2) 1-L amber glass

TABLE 1
 Requirements for Sample Collection, Preservation, and Analysis

Sample Task	Sample Point	Matrix	Sampling Frequency (Note 1)	Approx Sample No	Sampling Method	Sampling Equipment	TAT	DQO Level/ Data Package Reqmnt	Required Analysis	Analytical Method	Holding Time	Sample Preservation	Containers
									TCL Pesticides	8081A	7 days ext; 40-days analysis		(2) 1-L amber glass
									Herbicides	8151A	7 days ext; 40-days analysis		(2) 1-L amber glass
									PCBs	8082	7 days ext; 40-days analysis		(2) 1-L amber glass
									TAL Metals	6010B/7470 A	180 days; Hg = 28 days	HNO ₃ pH< 2; Cool to 4°C	(1) 500ml HDPE
									Ignitability	1010A/1030	ASAP	Cool to 4°C	(1) 500ml HDPE
									Corrosivity	9040B	ASAP		

Note 1: BTEX + Naphthalene, PAHs, TRPH, and MNA parameters will be collected from wells at both sites during the 1st and 3rd quarterly events in the first year; during both semiannual events in the second year; and annually during the 3rd year. Only the wells at the Building G-82 Site will be collected for these parameters during the 2nd and 4th quarterly events in the first year.

DQO – Data Quality Objective
 MS/MSD – Matrix Spike/Matrix Spike Duplicate
 PCBs – polychlorinated biphenyls
 TAL – Target Analyte List
 TCL – Target Compound List

2.5 Groundwater Sampling and Analyses

Samples will be collected from all BP Wells Site and Building G-82 Site wells and analyzed for BTEX and naphthalene, PAHs, and TRPH. In addition, samples will be collected from four wells at each site (eight total) for MNA analyses. Groundwater samples will be collected following the EPA's procedures for low-flow groundwater sampling. The procedure outlined below is based on the EPA's report entitled, "Ground Water Issue: Low-Flow (Minimal-Drawdown) Ground-Water Sampling Procedures," (EPA, 1996) and is as follows:

1. Slowly lower the decontaminated pump or pump intake to the middle of the screened interval to minimize excessive mixing of the stagnant water in the casing above the screen with water within screened zone and to minimize re-suspension of solids that may have accumulated at the bottom of the well.
2. Once the pump is positioned in the well, an airtight flow-through cell (equipped with a YSI-type water quality meter) will be connected to the water discharge line.
3. A water level meter will then be lowered into the well to monitor changes in water level during pumping. Once purging begins, water level measurements will be monitored, and pumping rates will be adjusted so that the rate is between 0.1 to 0.3 liter per minute (L/min) to maintain minimal drawdown.
4. While purging, field parameters (DO, pH, temperature, conductivity, salinity, turbidity, and ORP) will be measured every 3 to 5 minutes using a YSI-type meter and will be recorded until all parameters have stabilized for 3 consecutive readings. Once field parameter stabilization is achieved, the sample bottles will be filled.
5. Water samples will be collected by directing the groundwater discharge stream from the pump so that it runs down the inside of the sample bottle with a minimum amount of splashing. To minimize VOC loss, samples to be analyzed for BTEX and naphthalene will be collected first, followed by the analyses for PAHs, TRPH, sulfate/sulfide, alkalinity, nitrate/nitrite, total organic carbon, and ferrous iron. The sample bottles for each analysis are as follows:
 - BTEX and naphthalene by EPA Method 8260B: Three 40-milliliter (mL) volatile organic analytic (VOA) vials containing a hydrochloric acid (HCl) preservative. Fill bottles so there is no headspace within the bottles.
 - PAHs by EPA Method 8270SIM: Two 1-liter amber bottles. Fill to the top of the bottle.
 - TRPH by the FL-PRO Method: Two 1-liter amber bottles containing either hydrochloric acid (HCl) or sulfuric acid (H₂SO₄) preservative. Fill to the top of the bottle.
 - Sulfide by Method SM 4500S₂-F: One 1,000-mL bottle containing sodium hydroxide (NaOH) and zinc acetate preservative for sulfide. Fill to the top of each bottle.
 - Nitrate, nitrite, and sulfate by EPA Method 300.0: One 1000-mL plastic bottle. Fill to the top of the bottle.

- Methane by RSK-175: Two 40-mL VOA vials or amber glass bottle containing either HCl preservative. Fill with no headspace.
6. Cap each bottle and affix label to the bottle. Label information will include laboratory, project name and number, sample identification, station identification, preservative, analysis, sampler's initials, sample date, and time. Place samples in appropriate containers and pack with ice in coolers.

Requirements for sample collection, preservation, and analysis are listed in Table 1. Samples will be delivered to the laboratory as soon as possible to allow the samples to be analyzed within the specified holding times. Requirements for quality assurance/quality control (QA/QC) samples are listed in Table 1.

Residual purge water collected during sampling will be transferred to a 55-gallon drum and will be characterized in accordance with this Sampling and Analysis Plan and disposed of based on the results of sampling analyses.

2.6 Waste Characterization and Incidental Waste Stream Sampling and Analyses

Waste characterization samples will be collected to evaluate the handling and treatment and disposal requirements of accumulated decontamination water and purge water. Water characterization samples will be collected from containment drums prior to disposal. One composite sample (and one grab for VOC analysis) will be collected per event. Water samples will be collected as follows and analyzed for the parameters listed in Table 1:

1. Use a bailer or dip jar and collect a water sample from its containment.
2. Fill the sample containers for volatile analyses first (grab sample). The 40-mL vials will be filled so that there is no headspace in each vial.
3. Then fill the sample containers for the remaining analyses.
4. Label and package the samples for shipment to the laboratory.

2.7 Equipment Decontamination

Sampling methods and equipment have been selected to minimize decontamination requirements and the possibility of cross-contamination. The following procedure will be used for all sampling equipment used to collect routine samples undergoing trace organic or inorganic analyses.

Reusable sampling equipment will be decontaminated before the initial sample is collected and between sampling locations using the following procedure:

1. Clean with potable water and Alconox® or equivalent laboratory grade detergent using a brush, if necessary, to remove particulate matter and surface films.
2. Rinse thoroughly with potable water.
3. Rinse thoroughly with analyte-free water.
4. Rinse thoroughly with isopropanol (pesticide-grade). Do not rinse polyvinyl chloride or plastic items with isopropanol.

5. Rinse thoroughly with organic/analyte-free water.
6. Allow equipment to air dry completely.

2.8 Sample Documentation

Sampling documentation will include the following:

- Numbered Chain-of-Custody Forms
- Sample log book, which includes the following information:
 - Name of laboratories and contacts to which the samples were sent, turnaround time requested, and data results, when possible
 - Termination of a sample point or parameter and reasons
 - Unusual appearance or odor of a sample
 - Measurements, volume of flow, temperature, and weather conditions
 - Details of QC samples obtained
 - Field analytical equipment, and equipment utilized to make physical measurements
 - Calculations, results, and calibration data for field sampling, field analytical, and field physical measurement equipment
 - Sampling station identification
 - Date and time of sample collection
 - Sampler(s)' name(s) and company
 - How the sample was collected
 - Weather conditions that may affect the sample (e.g., rain, extreme heat or cold, wind, etc.)
- Sample Labels
- Custody Seals

2.9 Field Quality Control

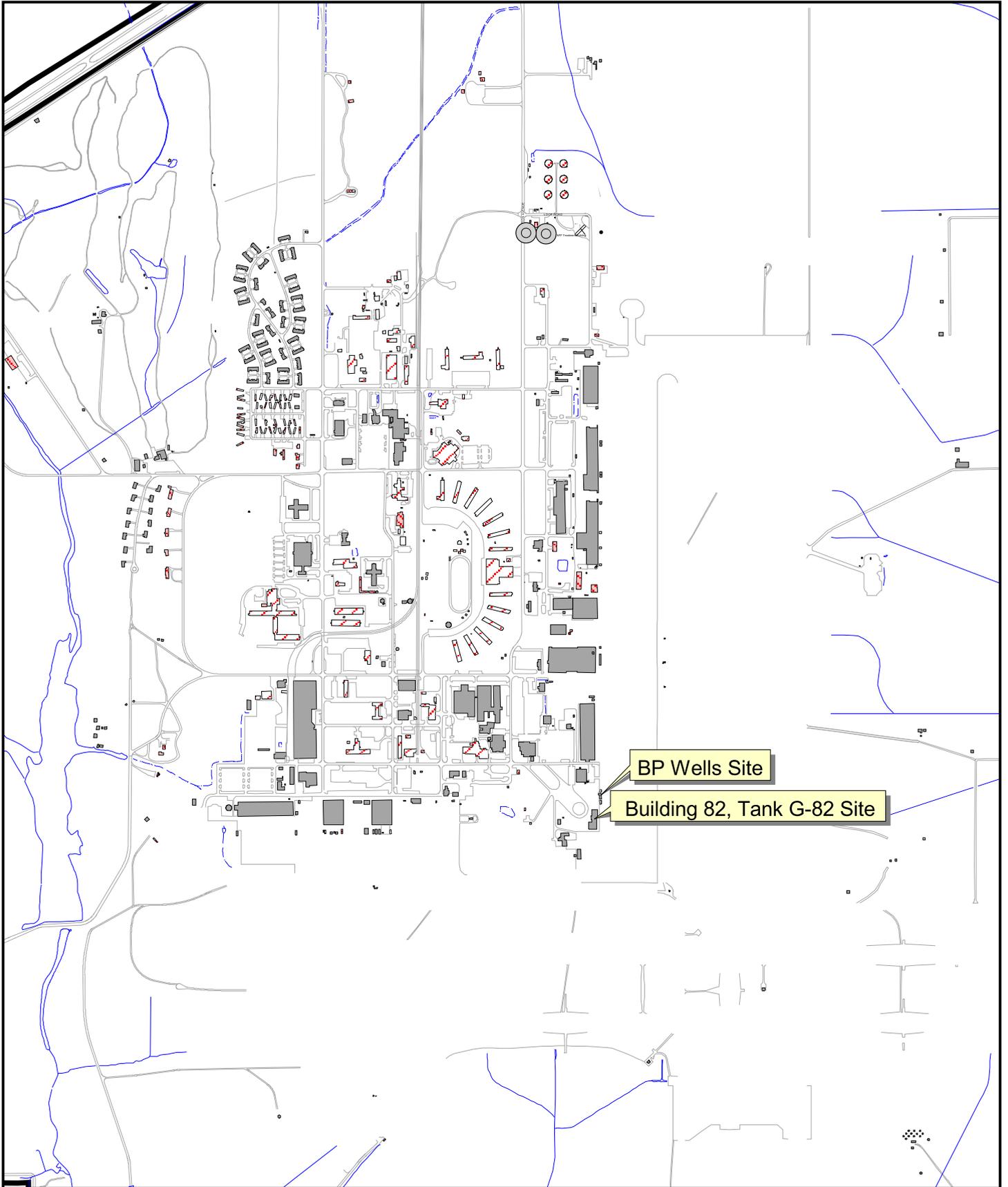
Field duplicate samples and equipment blank samples will be collected at a minimum frequency of 10 percent times the total number of samples (rounded to nearest whole number) collected for an analysis. One trip blank sample will be provided at a frequency of one per sample cooler containing volatile samples. MS/MSDs will be required at a frequency of one per sample event or a minimum of 5 percent of the total number (rounded to nearest whole number) of samples collected for an analysis. QC samples are not required for waste characterization. Quantity and frequency are detailed in Table 1.

2.10 Reporting

A report will be compiled at the completion of each of the monitoring events. Each performance monitoring report will include a description of the field sampling event, field data, updated potentiometric surface maps, validated analytical data from the monitoring event, a discussion of the MNA parameters, and charts showing trends of contaminants of concern concentrations over the period of the MNA long-term monitoring.

Figures

NOTE: Original figure created in color



BP Wells Site

Building 82, Tank G-82 Site



0 1000 2000 Feet

1 inch = 1376.99 feet

Figure 1
Site Location
Bldg. G-82 and BP Wells Sites
Former NAS Cecil Field, Jacksonville, FL

CH2MHILL



Figure 2
 Locations of Groundwater Monitoring Wells
 Building G-82 and BP Wells Sites
 Former NAS Cecil Field, Jacksonville, FL



Attachment 1

2007 CH2M HILL Technical Memorandum

Evaluation of Groundwater Analytical Results from BP Wells Site and Building 82 (Tank G82) Former Naval Air Station Cecil Field, Jacksonville, Florida

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CTO 0086 Project File

DATE: April 27, 2007

1.0 Introduction

This technical memorandum summarizes the findings from the sitewide groundwater monitoring conducted by CH2M HILL Constructors, Inc. (CH2M HILL) at the BP Wells Site and Building 82 Site (Tank G-82) at the former Naval Air Station (NAS) Cecil Field, Jacksonville, Florida. This site-wide groundwater monitoring effort was conducted to assess current groundwater quality conditions and to evaluate whether natural attenuation of site contaminants is occurring at these two sites. This work was conducted based on the methodology described in the *Work Plan Addendum No. 18, CTO 86, NAS Cecil Field, Jacksonville, Florida* (CH2M HILL, November 2006).

2.0 Groundwater Monitoring

Figure 1 shows the locations of the BP Wells site and the Building G-82 site. Figure 2 shows the locations of the monitoring wells at these two sites.

The following monitoring wells at the BP well site and the Building G-82 Site were sampled in November 2006 for contaminant characterization:

- **BP Wells Site:** CEF-BP-1S, CEF-BP -2S, CEF-BP -3S, CEF-BP -4S, CEF-BP -5I, and -6S
- **Building G82 Site:** CEF-G82-1S, CEF-G82 -2I, CEF-G82-2S, CEF-G82-3S, CEF-G82-4S, CEF-G82-5I, and CEF-G82-6S

The groundwater samples from both sites were analyzed for the following parameters: volatile organic compounds (VOCs) by U.S. Environmental Protection Agency (EPA) Method 8260B, polycyclic aromatic hydrocarbons (PAHs) by EPA Method 8310, and total recoverable petroleum hydrocarbons (TRPH) by the Florida Petroleum Residual Organic (FL PRO) method. The analytical results of these samples are summarized in Table 1.

The following groundwater monitoring wells were sampled for the monitored natural attenuation (MNA) parameters:

- **BP Wells Site:** CEF-BP-1S, CEF-BP -2S, CEF-BP -5I, and CEF-BP -6S
- **Building G82 Site:** CEF-G82-1S, CEF-G82-2I, CEF-G82-2S, and CEF-G82-3S

The groundwater samples were analyzed for the following MNA parameters: dissolved methane by EPA Method 8315, nitrate and nitrite by EPA Method 353.2, sulfate by EPA Method 375.4, sulfide by EPA Method 376.2, total organic carbon (TOC) by EPA Method 415.1 and total inorganic carbon (TIC) by EPA Method 415.1. The MNA groundwater analytical results are summarized in Table 2.

The groundwater in each monitoring well was tested in the field for pH, conductivity, turbidity, dissolved oxygen (DO), oxidation reducing potential (ORP) and temperature, as part of the sampling protocol. The results of the field tests are included in Table 2. The analytical laboratory and data validation reports for the groundwater sampling event are included in Attachment 1.

3.0 Summary of Findings from Groundwater Sampling

3.1 Contaminant Characterization Sampling Results

BP Wells Site

The following parameters were detected concentrations above the Florida Groundwater Cleanup Target Levels (GCTLs) during the November 2006 sampling event: isopropylbenzene (cumene), ethylbenzene, total xylenes, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene. All reported exceedances were in well CEF-BP-1S. None of these detections exceeded the Florida Natural Attenuation Default Concentration (NADC) criteria. The remaining wells at the BP Wells site did not show any exceedances of either the GCTLs or NADC criteria.

A summary of the 2003 historical analytical results from the BP Well Site is included in Attachment 2. The following parameters were detected historically at concentrations above the GCTLs in well CEF-BP-1S: ethylbenzene, total xylenes, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene. In general, these site groundwater constituents at the BP Wells Site have decreased in concentrations when compared to the previous sampling events conducted during 2003.

Building G-82 Site

The following parameters were detected at concentrations above the GCTLs during the November 2006 monitoring well sampling event: isopropylbenzene (cumene), naphthalene and 1-methylnaphthalene in wells CEF-G82-1S and CEF-G82-2S; 2-methylnaphthalene in well CEF-G82-2S; and benzo(a)pyrene and dibenz(a,h)anthracene in well CEF-G82-1S. The benzo(a)pyrene detection of 7.95 micrograms per liter ($\mu\text{g}/\text{L}$) and the dibenz(a,h)anthracene detection of 35.9 $\mu\text{g}/\text{L}$ in well CEF-G82-1S also exceeded NADC standards of 2 $\mu\text{g}/\text{L}$ and 0.05 $\mu\text{g}/\text{L}$, respectively.

A summary of the historical analytical results from the Building 82 Site is presented in Attachment 3. No parameters were detected historically at concentrations above the GCTLs in well CEF-G82-1S. The following parameters were historically detected at concentrations above the GCTLs in well CEF-BP-2S: benzene, ethylbenzene, total xylenes, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene. In general, the concentrations of VOCs (benzene, ethylbenzene, and total xylenes) in well CEF-G82-2S from the November 2006 sampling event decreased in concentrations when compared to the previous sampling events. However, the concentrations of PAHs 1-methylnaphthalene, 2-methylnaphthalene, benzo(a)pyrene and dibenz(a,h)anthracene increased slightly when compared with historical results.

3.2 MNA Analytical Results

Geochemical data were evaluated to determine if natural attenuation is continuing to occur in groundwater at the two sites and if parameter concentrations are decreasing in response to naturally-occurring degradation processes. The evaluation involves comparing geochemical data from source area and downgradient monitoring wells to background values measured in upgradient wells. The parameters evaluated included DO, ORP, pH, nitrate and nitrite, sulfate and sulfide, and dissolved methane. A discussion of the results of each parameter is presented below.

3.2.1 BP Wells Site

Dissolved Oxygen

DO measurements were recorded in each monitoring well during the November 2006 groundwater sampling event. Typically, DO concentrations below 1.0 milligram per liter (mg/L) indicate conditions are anoxic and a reducing environment is present. DO concentrations at the BP Wells Site ranged from 0.6 mg/L (CEF-BP-1S) to 1.50 mg/L (CEF-BP-3S) as measured using the Chemetrics® field test kits. The DO concentration of 0.6 mg/L in well CEF-BP-1S was slightly below the DO measured in the upgradient (background) well CEF-BP-2S at 0.8 mg/L. With the exception of well CEF-BP-1S, which showed slightly elevated VOCs, the DO readings at the site are generally similar to background levels. These data suggest that subsurface conditions are suboptimal for aerobic hydrocarbon biodegradation. However, contaminant concentration reductions indicate that anaerobic biodegradation of contaminants could be occurring.

Oxidation/Reduction Potential (Redox potential)

Redox potential is a measure of the relative tendency of ions in solution to transfer electrons. As electron acceptors are utilized, the redox potential of the groundwater decreases. As DO is consumed, the redox potential will decline and become negative. Redox potentials across the BP Well Site ranged from -126 millivolts (mV) to 186.7 mV. The lowest redox level was measured in CEF BP-6S. Negative redox potentials were also measured in source area monitoring well CEF-BP-1S, which suggests that reducing conditions are favorable for biodegradation in the vicinity of CEF-BP-1S. This is the only well with parameter concentrations above GCTLs.

pH

The pH of groundwater has an effect on the presence and activity of microbial populations in groundwater. Microbes capable of degrading petroleum hydrocarbons generally prefer pH values varying from 6 to 8 standard units. The pH values range from 5.13 (CEF-BP-5I) to 6.49 (CEF-BP-1S) with a background value of 6.37 (CEF-BP-2S), generally within the preferred range of values for microbial activity.

Nitrate/Nitrite

After DO has been depleted, biodegradation of hydrocarbons may continue anaerobically using total nitrate and nitrite as electron acceptors (denitrification). Nitrate and nitrite concentrations will be lower in the wells containing hydrocarbons if biodegradation is occurring. Nitrate and nitrite were detected in three of the four monitoring wells in which the parameter was analyzed. The nitrate and nitrite concentrations, ranging from non-detect to 561 ug/L in the downgradient wells, were lower than the concentrations of the background well CEF-BP-2S (733 ug/L). The presence of nitrate/nitrite in the areas of impacted groundwater suggests that reducing conditions favorable for denitrification are not present.

Sulfate/Sulfide

After DO and total nitrogen have been depleted in the aquifer, sulfate may be used as an electron acceptor for anaerobic biodegradation. This process is termed sulfate reduction and results in the production of sulfide. Portions of the plume containing hydrocarbons and undergoing anaerobic biodegradation may have depleted the sulfate concentrations and elevated the sulfide concentrations. Sulfate reducing conditions are favorable at redox potentials of -200 mV and pH of 7. Sulfate was detected in each of the four wells that were monitored for the parameter. The concentrations of sulfate were higher in the downgradient wells than in the background well. The presence of sulfate in the areas of impacted groundwater at concentrations higher than background and low sulfide concentrations suggest that conditions favorable for sulfate reduction are not present.

Dissolved Methane

The presence of methane in groundwater at concentrations above background is a good indicator that methanogenesis is occurring. During methanogenesis, carbon dioxide is used as an electron acceptor and methane is formed. The presence of methane in groundwater is indicative of strong reducing conditions. Methane was detected in three of the four wells analyzed. The concentration of methane exceeded background concentrations in wells CEF-BP-1S, CEF-BP-5I, and CEF-BP-6S. The presence of methane above background concentrations may be indicative of anaerobic microbial degradation of hydrocarbons occurring at the site.

3.2.2 Building G-82 Site

Dissolved Oxygen

DO concentrations in groundwater at the Building G-82 site ranged from 0.36 mg/L (in well CEF-G82-2I) to 0.84 mg/L (in well CEF-G82-5S). The DO concentrations measured in wells CEF-G82-1S, CEF-G82-2I, CEF-G82-2S, CEF-G82-4S, and CEF-G82-6S were below those in

the background well CEF-G82-3S. These data suggest that subsurface conditions are suboptimal for aerobic hydrocarbon biodegradation. However, general reductions in VOC concentrations over time indicate that biological degradation of contaminants is occurring.

Oxidation/Reduction Potential

Redox potentials across the Building G-82 Site ranged from -127.2 mV to 233.8 mV. The lowest redox level was measured in well CEF-G82-2S at -127.2 mV. Significantly negative redox potentials were measured only in monitoring wells CEF-G82-1S and CEF-G82-2I, suggesting that reducing conditions are prevalent in the vicinity of these wells, which are the only wells with contaminant concentrations above GCTLs.

pH

The pH of groundwater has an effect on the presence and activity of microbial populations in groundwater. Microbes capable of degrading petroleum hydrocarbons generally prefer pH values varying from 6 to 8 standard units. The pH values range from 4.97 (CEF-G82-4S) to 6.02 (CEF-G82-2S) with a background value of 5.81 (CEF-G82-3S), indicating that optimal pH conditions for microbial activity are not present at all locations at this site.

Nitrate/Nitrite

Nitrate and nitrite were detected in each of the four monitoring wells in which the parameter was analyzed. The nitrate and nitrite concentrations ranging from 44 to 66 ug/L in the downgradient wells were similar to the concentration in background well CEF-G82-3S (72 ug/L). The presence of nitrate and nitrite in the areas of impacted groundwater suggests that reducing conditions favorable for denitrification are not present.

Sulfate/Sulfide

Sulfate was detected in two of the four wells that were monitored for the parameter. The concentrations of sulfate were lower in the downgradient wells than the background well. The presence of sulfate in the areas of impacted groundwater at concentrations higher than background suggests that subsurface conditions at the site may not be favorable for sulfate reduction.

Dissolved Methane

Dissolved methane was detected in each of the four wells analyzed. The concentration of methane exceeded background in wells CEF-G82-1S, CEF-G82-2I, and CEF-G82-2S. Because methane is not present in gasoline or diesel fuel, the presence of methane above background concentrations may be indicative of anaerobic microbial degradation of hydrocarbons.

4.0 Conclusions

At the BP Wells Site, the following parameters were detected at concentrations above the GCTLs during the November 2006 sampling event: isopropylbenzene (cumene), ethylbenzene, total xylenes, 1,3,5-trimethylbenzene, and 1,2,4-trimethylebenzene in well CEF-BP-1S. Contaminant concentrations exceeded the GCTLs at only one monitoring well (CEF-BP-1S). Based on the laboratory analytical results, site contaminant concentrations in remaining wells at the BP Well site did not exceed GCTLs, and none of the detected

concentrations at this site exceed the NADC criteria. In general, the November 2006 site groundwater contaminant concentrations at the BP Wells site have decreased when compared to the historical sampling events. The MNA sampling data indicate that anaerobic degradation processes may be prevalent at the site.

Based on the analytical results, the residual groundwater contamination at this site appears to remain localized around the source area well CEF-BP-1S and does not appear to have migrated downgradient since the last sampling event in October 2003. Additionally, the impervious paved surface at the site acts as a barrier against the infiltration of precipitation, thus reducing the contaminant migration potential.

At the Building G-82 Site, the following parameters were detected at concentrations above the GCTLs during the well November 2006 sampling event: isopropylbenzene (cumene), naphthalene, 1-methylnaphthalene, 2-methylnaphthalene, benzo(a)pyrene and dibenz(a,h)-anthracene. Only the dibenz(a,h)anthracene detection in well CEF-G82-1S exceeded the NADC criteria.

In summary, the concentrations of VOCs (benzene, ethylbenzene, and xylenes) in the source area well CEF-G82-2S have decreased in concentrations when compared to the previous sampling events, and the concentrations of PAHs have remained similar in CEF-G82-2S and increased slightly in well CEF-G82-1S, when compared to the historical results.

The single NADC exceedance in the source well CEF-G82-1S of dibenz(a,h)anthracene and the appearance of benzo(a)pyrene (two compounds which were not previously detected at the site above laboratory detection limits) appear to be anomalous. The PAH concentrations in CEF-G82-1S should be monitored further to establish concentration trends over time.

Tables

TABLE 1
Groundwater Analytical Results
Bldg. G82 and BP Site Groundwater

Parameter	Station ID		BP WELL SITE						Building 82 Tank G82 Site								
	Sample ID		CEF-BP-1S	CEF-BP-2S	CEF-BP-3S	CEF-BP-4S		CEF-BP-5I	CEF-BP-6S	CEF-G82-1S	CEF-G82-2I		CEF-G82-2S	CEF-G82-3S	CEF-G82-4S	CEF-G82-5S	CEF-G82-6S
	Sample Date		86BP1SW061108	86BP2SW061107	86BP3SW061102	86BP4SW061102	86BPDPW061102	86BP5IW061107	86BP6SW061108	86G821SW061108	86G822IW061106	86G82DPW061106	86G822SW061106	86G823SW061106	86G824SW061102	86G825SW061102	86G826SW061102
	GCTL ¹	NADC	11/8/2006	11/7/2006	11/2/2006	11/2/2006	11/2/2006	11/7/2006	11/8/2006	11/8/2006	11/6/2006	11/6/2006	11/6/2006	11/6/2006	11/2/2006	11/2/2006	11/2/2006
SW8260B		Jnits in ug/L		FIELD DUP						FIELD DUP							
1,1,2-trichloro-1,2,2-trifluoroethane	210000	2100000	1.15 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2,4-Trichlorobenzene	70	700	3.34 JB	5 U	5 U	5 U	5 U	5 U	3.39 JB	3.44 JB	1.08 J	5 U	5 U	5 U	3.55 J	3.57 J	5 U
1,2,4-Trimethylbenzene	10	100	60.8 JB	5 U	0.201 J	5 U	5 U	5 U									
1,3,5-Trimethylbenzene (Mesitylene)	10	100	19 JB	5 U	0.224 J	5 U	5 U	5 U									
1,2-Dichlorobenzene	600	6000	5 UJ	5 U	0.277 J	5 U	5 U	5 U	5 UJ	5 UJ	5 U	0.35 J	5 U	5 UJ	5 U	5 U	5 U
1,3-Dichlorobenzene	210	2100	5 U	5 U	0.25 JB	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Acetone	6300	63000	5.42 JB	89	25 UJ	25 UJ	25 UJ	25 U	25 JB	32.8 JB	3.25 J	6.72 B	18 J	15.9 B	7.38 JB	17.1 JB	25 U
Benzene	1	10	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	0.447 J	5 U	5 U	5 U	5 U	5 U
Bromomethane	9.8	98	5 U	5 UJ	5 U	5 U	5 U	5 UJ	0.924 JB	5 U	5 UJ	0.74 B	5 UJ	0.926 B	5 U	5 U	5 U
cyclohexane	NE	NE	5.74	5 U	5 U	5 U	5 U	5 U	5 U	3.97 J	5 U	5 U	2.62 J	5 U	5 U	5 U	5 U
Ethylbenzene	30	300	53.1	5 U	5 U	5 U	5 U	5 U	0.458 J	6.21	5 U	5 U	11.1	5 U	0.433 J	5 U	5 U
Isopropylbenzene (Cumene)	0.8	8	5.61	5 U	0.179 J	5 U	5 U	5 U	5 U	3.66 J	5 U	5 U	4.02 J	5 U	5 U	5 U	5 U
methylcyclohexane	NE	NE	9.53	5 U	0.173 J	5 U	5 U	5 U	3.95 J	4.04 J	5 U	5 U	3.23 J	5 U	5 U	5 U	5 U
Methylene chloride	5	50	10 U	10 U	1.74 JB	1.58 JB	1.46 JB	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Tetrachloroethene (PCE)	3	30	5 UJ	5 U	0.406 J	0.233 J	5 U	5 U	5 UJ	5 UJ	5 U	5 UJ	5 U	5 UJ	5 U	5 U	5 U
Toluene	40	400	3.16 J	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
Xylenes, total	20	200	101 J	10 U	0.61 J	10 U	10 U	10 U	10 UJ	12.1 J	10 U	10 UJ	5.89 J	10 UJ	10 U	10 U	10 U
SW8310																	
1-methylnaphthalene	28	280	8.66 J	1 U	1 U	1 U	1 U	1 U	1 U	48.8	1 U	1 U	138 J	1 U	6.11 J	1 U	1 U
2-Methylnaphthalene	28	280	1 U	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	65.9 J	1 U	1 U	1 U	1 U
Acenaphthylene	210	2100	1 U	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U	1 U	5.54 J	1 U	1 U	1 U	1 U
Benzo(a)pyrene	0.2	2	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	7.95 J	0.1 U	0.1 U	1 U	0.1 U	0.1 U	0.1 U	0.1 U
Dibenz(a,h)anthracene	0.005	0.05	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	35.9 J	0.1 U	0.1 U	1 U	0.1 U	0.1 U	0.1 U	0.1 U
Fluorene	280	2800	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	2.51 J	0.5 U	0.5 U	3.98 J	0.5 U	0.5 U	0.5 U	0.5 U
Naphthalene	14	140	6.47	0.5 U	40.7 J	0.5 U	0.5 U	56.5 J	0.5 U	0.5 U	0.5 U	0.5 U					
FLPRO																	
Petroleum hydrocarbons	5000	50000	459 B	126 B	86.4 B	112 B	114 B	69 JB	133 B	613 B	59 JB	59 JB	878 JB	54 JB	202 B	274 B	86 B

Notes:
All concentrations reported in micrograms per liter (ug/L).
GCTL - Groundwater Cleanup Target Level
NADC - Natural Attenuation Default Concentration
1 = Ch 62-777 FAC GCTLs reported in ug/L
U - The analyte was analyzed for, but not detected.
J - Result is estimated
UJ- Value non-detect, estimated.
JB- Estimated value; the analyte was detected in the associated method and/or calibration blank.
NE - Not Established at time of rule adoption
Bold indicates concentration exceeds GCTL.
Shaded indicates concentration exceeds NADC.

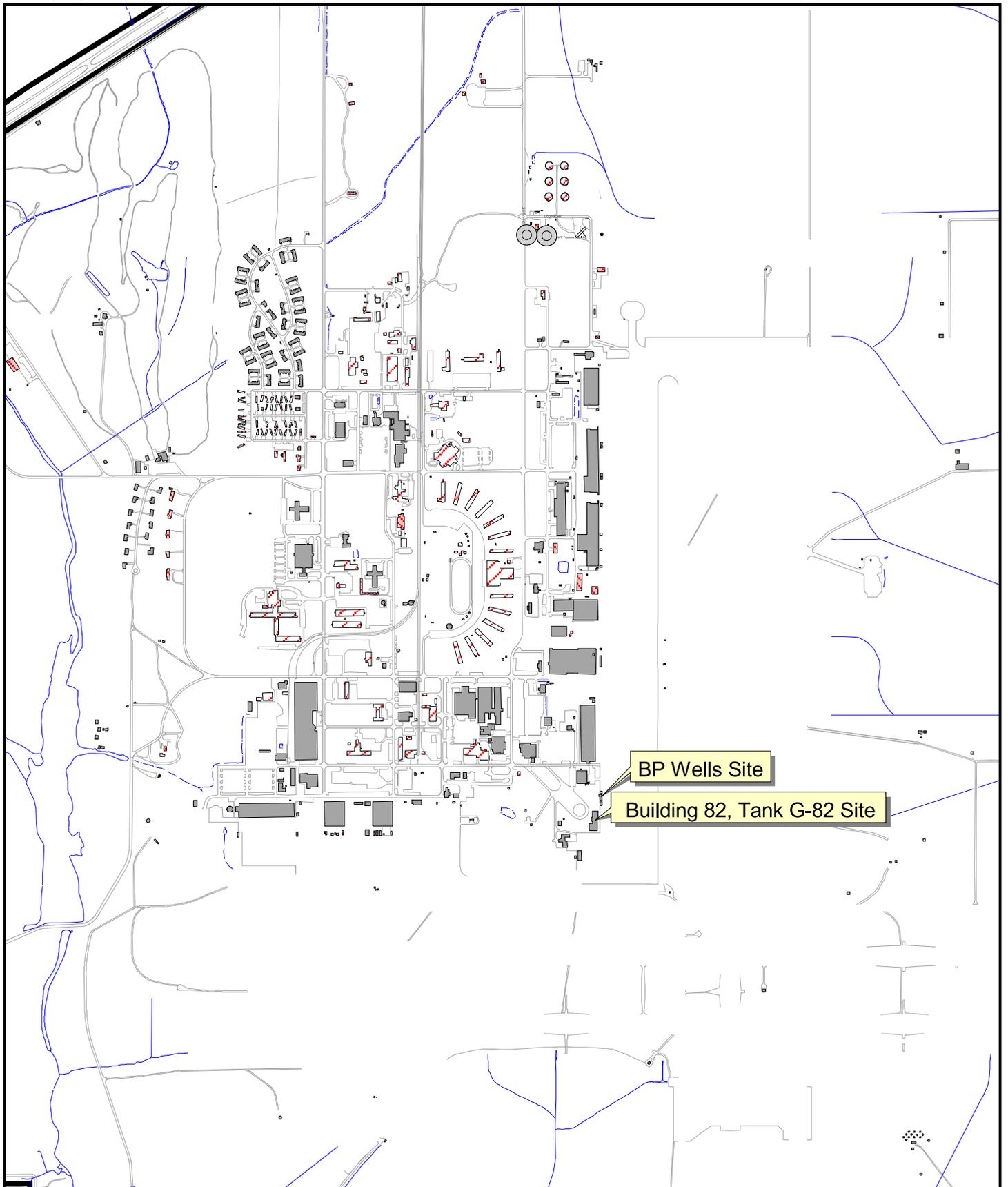
TABLE 2
MNA Parameter Results
Bldg. G82 and BP Site Groundwater

Station ID Sample ID Sample Date	CEF-BP-1S	CEF-BP-2S	CEF-BP-3S	CEF-BP-4S		CEF-BP-5I	CEF-BP-6S	CEF-G82-1S	CEF-G82-2I		CEF-G82-2S	CEF-G82-3S	CEF-G82-4S	CEF-G82-5S	CEF-G82-6S
	86BP1SW061108	86BP2SW061107	86BP3SW061102	86BP4SW061102	86BPDPW061102	86BP5IW061107	86BP6SW061108	86G821SW061108	86G822IW061106	86G82DPW061106	86G822SW061106	86G823SW061106	86G824SW061102	86G825SW061102	86G826SW061102
	11/8/2006	11/7/2006	11/2/2006	11/2/2006	11/2/2006	11/7/2006	11/8/2006	11/8/2006	11/6/2006	11/6/2006	11/6/2006	11/6/2006	11/2/2006	11/2/2006	11/2/2006
Parameter	Units in ug/L														
Nitrogen, nitrate (as n)	10 U	709 B	NA	NA	NA	561 B	10 U	10 U	10 U	10 U	36	65	NA	NA	NA
Nitrogen, nitrite	10 U	24	NA	NA	NA	10 U	3 J	44	66	59	18	7 J	NA	NA	NA
Sulfate (as SO4)	6300	4200 J	NA	NA	NA	10400	8600	5000 U	5000 J	5400	6800	31600	NA	NA	NA
E376.1															
Sulfide	4000 U	1600 J	NA	NA	NA	3200 J	4000 U	8000	3200 JB	3200 JB	5200 JB	2800 JB	NA	NA	NA
E415.1															
Total Inorganic Carbon	9400	6000	NA	NA	NA	24600	6800	6500	9600 JB	8400 JB	24900 JB	20000 JB	NA	NA	NA
Total organic carbon	9000	2300	NA	NA	NA	1000 U	8100	16700	910 J	1100	9900	7700	NA	NA	NA
RSK-175															
Methane	7.8	2 U	NA	NA	NA	1.26 J	1230	1340	2.27 JB	2.09 JB	680 JB	1.63 JB	NA	NA	NA
Field Parameters															
pH	6.49	6.37	6.24	6.43	6.43	5.13	5.96	5.96	5.08	5.08	6.02	5.81	4.97	5.25	5
Cond. (mmhos/cm)	399	199	176	248	248	87	210	210	54	54	262	265	93	129	97
Dissolved Oxygen (mg/L) Field	0.3	0.53	1.97	0.69	0.69	1.07	0.37	0.37	0.36	0.36	0.51	0.78	0.64	0.84	0.65
Dissolved Oxygen (mg/L) Chemets	0.6	0.8	1.5	1	1	1	0.8	0.6	0.3	0.3	0.6	0.8	0.6	1	1
Dissolved Oxygen (mg/L) Hach	NA	NA	NA	NA	NA	NA	0.8	1							
ORP (mV)	-117.9	129.9	186.7	76.5	76.5	261	-126	-126	-7	-7	-127.2	200.4	99.4	69.7	233.8
Temp. (°C)	24.4	25.5	28.5	28.2	28.2	23.79	23.28	23.2	23.6	23.6	24.5	24.4	28.5	26.9	24.5
Turbidity (NTUs)	0.33	7.6	7.57	29.7	29.7	0.73	3.67	61.7	99.3	99.3	21.1	3.92	4.3	5.83	24

J - Result is estimated.
UJ- Value non-detect, estimated.
JB- Estimated value; the analyte was detected in the associated method and/or calibration blank.
mS/cm = millisiemens per centimeter
NTU = nephelometric turbidity units
mg/L = milligrams per liter
°C = degrees Celsius
ORP = oxygen reducing potential
mV = millivolts
NA - Not analyzed

Figures

NOTE: Original figure created in color



BP Wells Site

Building 82, Tank G-82 Site

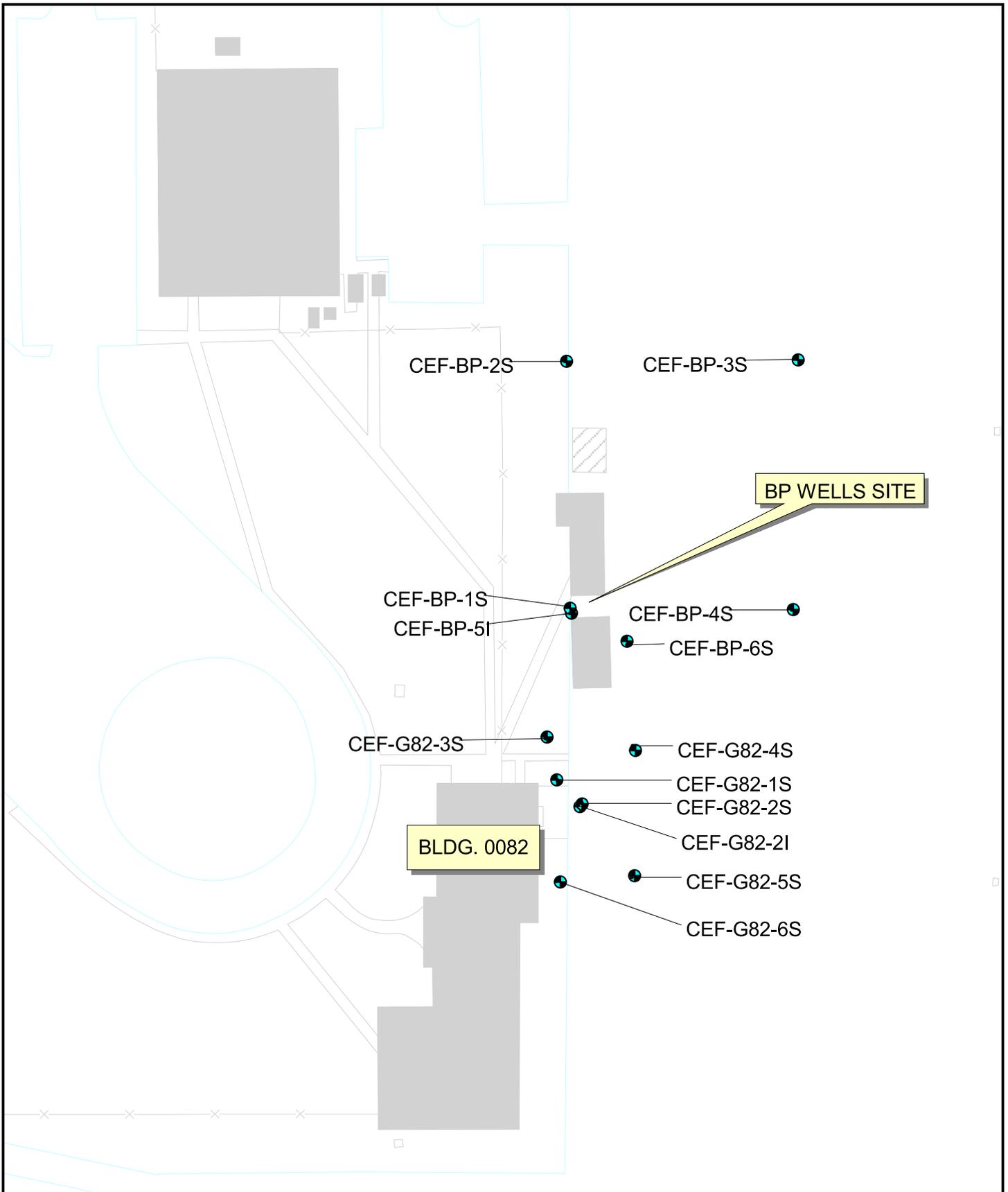


0 1000 2000 Feet

1 inch = 1376.99 feet

Figure 1
Site Location
Bldg. G-82 and BP Wells Sites
Former NAS Cecil Field, Jacksonville, FL

CH2MHILL



● Monitoring Wells



1 inch = 78 feet

Figure 2
 Locations of Groundwater Monitoring Wells
 BP Wells and Bldg. G-82 Sites
 Former NAS Cecil Field, Jacksonville, FL

CH2MHILL

Attachment 1
Laboratory Analytical Reports
(provided on CD)

Attachment 2
BP Well Site Historical Analytical Results

Historical Detects in BP Wells - NAS Cecil Field

LOCID	SAMPLEID	QCTYPE	CAS	PARAMETER	RESULT	UNIT	QUALIFIER	FRACTION	MAT	SAMPLEDATE	SAMPLECODE
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	71-43-2	BENZENE	0.56	UG/L	J	OV	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	TTNUS001	TOTAL PETROLEUM HYDROCA	0.561	MG/L		PET	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	208-96-8	ACENAPHTHYLENE	2	UG/L		OS	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	7439-95-4	MAGNESIUM	9420	UG/L		M	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	7440-23-5	SODIUM	2430	UG/L		M	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	7439-97-6	MERCURY	0.11	UG/L		M	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	7440-66-6	ZINC	45.5	UG/L		M	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	91-20-3	NAPHTHALENE	3.9	UG/L		OS	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	108-88-3	TOLUENE	38.5	UG/L		OV	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	1330-20-7	TOTAL XYLENES	114	UG/L		OV	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	7440-09-7	POTASSIUM	2260	UG/L		M	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	100-41-4	ETHYLBENZENE	20.9	UG/L		OV	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	7439-89-6	IRON	209	UG/L		M	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	7440-39-3	BARIUM	5.6	UG/L		M	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	7440-70-2	CALCIUM	26800	UG/L		M	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	95-63-6	1,2,4-TRIMETHYLBENZENE	45.9	UG/L		OV	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	108-67-8	1,3,5-TRIMETHYLBENZENE	16.1	UG/L		OV	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-01	NM	91-57-6	2-METHYLNAPHTHALENE	2.7	UG/L		OS	GW	02/03/2000	NORMAL
CEF-BP-1S	CEF-BP1-GW-01S-02-D	FD	TTNUS054	M+P-XYLENES	67.1	UG/L		OV	GW	03/27/2000	DUP
CEF-BP-1S	CEF-BP1-GW-01S-02-D	FD	108-67-8	1,3,5-TRIMETHYLBENZENE	13.5	UG/L		OV	GW	03/27/2000	DUP
CEF-BP-1S	CEF-BP1-GW-01S-02-D	FD	95-63-6	1,2,4-TRIMETHYLBENZENE	39.7	UG/L		OV	GW	03/27/2000	DUP
CEF-BP-1S	CEF-BP1-GW-01S-02-D	FD	100-41-4	ETHYLBENZENE	15	UG/L		OV	GW	03/27/2000	DUP
CEF-BP-1S	CEF-BP1-GW-01S-02-D	FD	95-47-6	O-XYLENE	19.1	UG/L		OV	GW	03/27/2000	DUP
CEF-BP-1S	CEF-BP1-GW-01S-02-D	FD	108-88-3	TOLUENE	30.1	UG/L		OV	GW	03/27/2000	DUP
CEF-BP-1S	CEF-BP-GW-01S-01-D	FD	95-63-6	1,2,4-TRIMETHYLBENZENE	144	UG/L		OV	GW	04/11/2001	DUP
CEF-BP-1S	CEF-BP-GW-01S-01-D	FD	108-67-8	1,3,5-TRIMETHYLBENZENE	49.9	UG/L		OV	GW	04/11/2001	DUP
CEF-BP-1S	CEF-BP-GW-01S-01-D	FD	1330-20-7	TOTAL XYLENES	432	UG/L		OV	GW	04/11/2001	DUP
CEF-BP-1S	CEF-BP-GW-01S-01A	NM	95-63-6	1,2,4-TRIMETHYLBENZENE	156	UG/L		OV	GW	05/22/2001	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-01A	NM	108-67-8	1,3,5-TRIMETHYLBENZENE	53.8	UG/L		OV	GW	05/22/2001	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-01A	NM	1330-20-7	TOTAL XYLENES	634	UG/L		OV	GW	05/22/2001	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-02A	NM	95-63-6	1,2,4-TRIMETHYLBENZENE	360	UG/L		OV	GW	11/06/2001	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-02A	NM	108-67-8	1,3,5-TRIMETHYLBENZENE	124	UG/L		OV	GW	11/06/2001	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-02A	NM	1330-20-7	TOTAL XYLENES	894	UG/L		OV	GW	11/06/2001	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-03	NM	95-63-6	1,2,4-TRIMETHYLBENZENE	262	UG/L		OV	GW	10/03/2002	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-03	NM	100-41-4	ETHYLBENZENE	117	UG/L		OV	GW	10/03/2002	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-03	NM	1330-20-7	TOTAL XYLENES	658	UG/L		OV	GW	10/03/2002	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-04	NM	95-63-6	1,2,4-TRIMETHYLBENZENE	224	UG/L		OV	GW	01/06/2003	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-04	NM	108-67-8	1,3,5-TRIMETHYLBENZENE	71.5	UG/L		OV	GW	01/06/2003	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-04	NM	100-41-4	ETHYLBENZENE	161	UG/L		OV	GW	01/06/2003	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-04	NM	1330-20-7	TOTAL XYLENES	811	UG/L		OV	GW	01/06/2003	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-04A	NM	14797-55-8	NITRATE	0.41	MG/L		MISC	GW	01/30/2003	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-04A	NM	TTNUS003	TOTAL ORGANIC CARBON	12	MG/L		MISC	GW	01/30/2003	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-04A	NM	74-82-8	METHANE	14	UG/L		OV	GW	01/30/2003	NORMAL
CEF-BP-1S	CEF-BP-GW-01S-05-D	FD	74-82-8	METHANE	6.55	UG/L		OV	GW	04/17/2003	DUP
CEF-BP-1S	CEF-BP-GW-01S-05-D	FD	14797-55-8	NITRATE	0.12	MG/L		MISC	GW	04/17/2003	DUP

Historical Detects in BP Wells - NAS Cecil Field

LOCID	SAMPLEID	QCTYPE	CAS	PARAMETER	RESULT	UNIT	QUALIFIER	FRACTION	MAT	SAMPLEDATE	SAMPLECODE
CEF-BP-1S	CEF-BP-GW-01S-05-D	FD	TTNUS003	TOTAL ORGANIC CARBON	11.7	MG/L		MISC	GW	04/17/2003	DUP
CEF-BP-1S	CEF-BP-GW-01S-05-D	FD	95-63-6	1,2,4-TRIMETHYLBENZENE	273	UG/L		OV	GW	04/17/2003	DUP
CEF-BP-1S	CEF-BP-GW-01S-05-D	FD	108-67-8	1,3,5-TRIMETHYLBENZENE	144	UG/L		OV	GW	04/17/2003	DUP
CEF-BP-1S	CEF-BP-GW-01S-05-D	FD	100-41-4	ETHYLBENZENE	184	UG/L		OV	GW	04/17/2003	DUP
CEF-BP-1S	CEF-BP-GW-01S-05-D	FD	1330-20-7	TOTAL XYLENES	542	UG/L		OV	GW	04/17/2003	DUP
CEF-BP-1S	CEF-BP-GW-01-06	NM	74-82-8	METHANE	24.5	UG/L		OV	GW	07/17/2003	NORMAL
CEF-BP-1S	CEF-BP-GW-01-06	NM	108-67-8	1,3,5-TRIMETHYLBENZENE	38.4	UG/L		OV	GW	07/17/2003	NORMAL
CEF-BP-1S	CEF-BP-GW-01-06	NM	95-63-6	1,2,4-TRIMETHYLBENZENE	118	UG/L		OV	GW	07/17/2003	NORMAL
CEF-BP-1S	CEF-BP-GW-01-06	NM	100-41-4	ETHYLBENZENE	48	UG/L		OV	GW	07/17/2003	NORMAL
CEF-BP-1S	CEF-BP-GW-01-06	NM	1330-20-7	TOTAL XYLENES	236	UG/L		OV	GW	07/17/2003	NORMAL
CEF-BP-1S	CEF-BP-GW-01-06	NM	TTNUS003	TOTAL ORGANIC CARBON	13	MG/L		MISC	GW	07/17/2003	NORMAL
CEF-BP-1S	CEF-BP-GW-1S-07-D	FD	1330-20-7	TOTAL XYLENES	1040	UG/L		OV	GW	10/16/2003	DUP
CEF-BP-1S	CEF-BP-GW-1S-07-D	FD	TTNUS003	TOTAL ORGANIC CARBON	12.4	MG/L		MISC	GW	10/16/2003	DUP
CEF-BP-1S	CEF-BP-GW-1S-07-D	FD	74-82-8	METHANE	28.3	UG/L		OV	GW	10/16/2003	DUP
CEF-BP-1S	CEF-BP-GW-1S-07-D	FD	108-67-8	1,3,5-TRIMETHYLBENZENE	130	UG/L		OV	GW	10/16/2003	DUP
CEF-BP-1S	CEF-BP-GW-1S-07-D	FD	95-63-6	1,2,4-TRIMETHYLBENZENE	460	UG/L		OV	GW	10/16/2003	DUP
CEF-BP-1S	CEF-BP-GW-1S-07-D	FD	100-41-4	ETHYLBENZENE	207	UG/L		OV	GW	10/16/2003	DUP
CEF-BP-2S	CEF-BP1-GW-02S-01-D	FD	7429-90-5	ALUMINUM	1790	UG/L		M	GW	02/03/2000	DUP
CEF-BP-2S	CEF-BP1-GW-02S-01-D	FD	7440-70-2	CALCIUM	41200	UG/L		M	GW	02/03/2000	DUP
CEF-BP-2S	CEF-BP1-GW-02S-01-D	FD	7439-95-4	MAGNESIUM	1010	UG/L		M	GW	02/03/2000	DUP
CEF-BP-2S	CEF-BP1-GW-02S-01-D	FD	7440-39-3	BARIIUM	11.5	UG/L		M	GW	02/03/2000	DUP
CEF-BP-2S	CEF-BP1-GW-02S-01-D	FD	7440-50-8	COPPER	1.2	UG/L		M	GW	02/03/2000	DUP
CEF-BP-2S	CEF-BP1-GW-02S-01-D	FD	7439-89-6	IRON	758	UG/L		M	GW	02/03/2000	DUP
CEF-BP-2S	CEF-BP1-GW-02S-01-D	FD	7439-97-6	MERCURY	0.19	UG/L		M	GW	02/03/2000	DUP
CEF-BP-2S	CEF-BP1-GW-02S-01-D	FD	7440-66-6	ZINC	8.6	UG/L		M	GW	02/03/2000	DUP
CEF-BP-2S	CEF-BP1-GW-02S-01-D	FD	7440-23-5	SODIUM	12100	UG/L		M	GW	02/03/2000	DUP
CEF-BP-2S	CEF-BP1-GW-02S-01-D	FD	7440-62-2	VANADIUM	9.2	UG/L		M	GW	02/03/2000	DUP
CEF-BP-2S	CEF-BP1-GW-02S-01-D	FD	7440-09-7	POTASSIUM	3270	UG/L		M	GW	02/03/2000	DUP
CEF-BP-2S	CEF-BP-GW-02S-04A	NM	74-82-8	METHANE	1.4	UG/L		OV	GW	01/30/2003	NORMAL
CEF-BP-2S	CEF-BP-GW-02S-04A	NM	14797-55-8	NITRATE	0.88	MG/L		MISC	GW	01/30/2003	NORMAL
CEF-BP-2S	CEF-BP-GW-02S-04A	NM	TTNUS003	TOTAL ORGANIC CARBON	4	MG/L		MISC	GW	01/30/2003	NORMAL
CEF-BP-2S	CEF-BP-GW-02S-05	NM	14797-55-8	NITRATE	0.34	MG/L		MISC	GW	04/17/2003	NORMAL
CEF-BP-2S	CEF-BP-GW-02S-05	NM	TTNUS003	TOTAL ORGANIC CARBON	4.7	MG/L		MISC	GW	04/17/2003	NORMAL
CEF-BP-2S	CEF-BP-GW-02S-05	NM	74-82-8	METHANE	5.76	UG/L		OV	GW	04/17/2003	NORMAL
CEF-BP-2S	CEF-BP-GW-02S-06	NM	TTNUS003	TOTAL ORGANIC CARBON	4.8	MG/L		MISC	GW	07/17/2003	NORMAL
CEF-BP-2S	CEF-BP-GW-2S-07	NM	TTNUS003	TOTAL ORGANIC CARBON	4.6	MG/L		MISC	GW	10/16/2003	NORMAL
CEF-BP-2S	CEF-BP-GW-2S-07	NM	14797-55-8	NITRATE	0.33	MG/L		MISC	GW	10/16/2003	NORMAL
CEF-BP-2S	CEF-BP-GW-2S-07	NM	74-82-8	METHANE	12.9	UG/L		OV	GW	10/16/2003	NORMAL
CEF-BP-6S	CEF-BP1-GW-06S-01	NM	67-64-1	ACETONE	26.3	UG/L		OV	GW	03/27/2000	NORMAL
CEF-BP-6S	CEF-BP1-GW-06S-01	NM	67-66-3	CHLOROFORM	1.1	UG/L		OV	GW	03/27/2000	NORMAL
CEF-BP-6S	CEF-BP-GW-06S-04A	NM	14797-55-8	NITRATE	0.13	MG/L		MISC	GW	01/30/2003	NORMAL
CEF-BP-6S	CEF-BP-GW-06S-04A	NM	TTNUS003	TOTAL ORGANIC CARBON	9	MG/L		MISC	GW	01/30/2003	NORMAL
CEF-BP-6S	CEF-BP-GW-06S-04A	NM	74-82-8	METHANE	136	UG/L		OV	GW	01/30/2003	NORMAL
CEF-BP-6S	CEF-BP-GW-06S-05	NM	14797-55-8	NITRATE	0.71	MG/L		MISC	GW	04/17/2003	NORMAL
CEF-BP-6S	CEF-BP-GW-06S-05	NM	TTNUS003	TOTAL ORGANIC CARBON	6.1	MG/L		MISC	GW	04/17/2003	NORMAL

Historical Detects in BP Wells - NAS Cecil Field

LOCID	SAMPLEID	QCTYPE	CAS	PARAMETER	RESULT	UNIT	QUALIFIER	FRACTION	MAT	SAMPLEDATE	SAMPLECODE
CEF-BP-6S	CEF-BP-GW-06S-05	NM	100-41-4	ETHYLBENZENE	1.2	UG/L		OV	GW	04/17/2003	NORMAL
CEF-BP-6S	CEF-BP-GW-06S-05	NM	74-82-8	METHANE	149	UG/L		OV	GW	04/17/2003	NORMAL
CEF-BP-6S	CEF-BP-GW-06S-06-D	FD	100-41-4	ETHYLBENZENE	0.51	UG/L	J	OV	GW	07/17/2003	DUP
CEF-BP-6S	CEF-BP-GW-06S-06-D	FD	TTNUS003	TOTAL ORGANIC CARBON	6.6	MG/L		MISC	GW	07/17/2003	DUP
CEF-BP-6S	CEF-BP-GW-06S-06-D	FD	14797-55-8	NITRATE	0.33	MG/L		MISC	GW	07/17/2003	DUP
CEF-BP-6S	CEF-BP-GW-06S-06-D	FD	74-82-8	METHANE	87.2	UG/L		OV	GW	07/17/2003	DUP
CEF-BP-6S	CEF-BP-GW-6S-07	NM	TTNUS003	TOTAL ORGANIC CARBON	8.5	MG/L		MISC	GW	10/16/2003	NORMAL
CEF-BP-6S	CEF-BP-GW-6S-07	NM	14797-55-8	NITRATE	0.34	MG/L		MISC	GW	10/16/2003	NORMAL
CEF-BP-6S	CEF-BP-GW-6S-07	NM	74-82-8	METHANE	738	UG/L		OV	GW	10/16/2003	NORMAL

Attachment 3
Building G82 Site Historical Analytical Results

TABLE 3-1

**SUMMARY OF POSITIVE DETECTIONS IN GROUNDWATER
SITE ASSESSMENT REPORT BUILDING 82, TANK G82
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA
PAGE 1 OF 2**

Location	FDEP GCTL, FAC 62-777	CEF-G82-1S CEF-G82-GW-1S-01 07-Oct-99 15	CEF-G82-2S CEF-G82-GW-2S-01 07-Oct-99 14	CEF-G82-3S CEF-G82-GW-3S-01 07-Oct-99 14	CEF-G82-2I CEF-G82-GW-2I-02 22-Feb-00 35
Volatile Organic Compounds (ug/L)					
BENZENE	1	1 U	19 J	1 U	1 U
CHLOROFORM	5.7	1 U	2 U	1 U	1.2
ETHYLBENZENE	30	3.3	50 J	1 U	1 U
TOLUENE	40	1 U	6.8	1 U	1 U
XYLENES,TOTAL	20	3.8	196	3 U	3 U
Semivolatile Organic Compounds (ug/L)					
1-METHYLNAPHTHALENE	20	8.7 J	53.4 J	1.1 UJ	2.4 U
2-METHYLNAPHTHALENE	20	11.6 J	53.9 J	1.1 UJ	2.4 U
ACENAPHTHENE	20	1 UJ	1.8 J	1.1 UJ	2.4 U
ACENAPHTHYLENE	210	1 UJ	1.8 J	1.1 UJ	2.4 U
FLUORANTHENE	280	1 UJ	2.3 J	1.1 UJ	2.4 U
FLUORENE	280	1.9 J	6.3 J	1.1 UJ	2.4 U
NAPHTHALENE	20	6.8 J	24.5 J	1.1 UJ	2.4 U
PHENANTHRENE	210	4 J	18.7 J	1.1 UJ	2.4 U
Total Petroleum Hydrocarbons (mg/L)					
TRPH (C8-C40)	5	1.19	3.57	0.5 U	NM

Notes:

- GCTL- Groundwater Cleanup Target Level
- Shaded values are greater than criteria.
- µg/L - microgram per liter
- mg/L - milligram per liter
- NM - Not measured
- U - Not detected at detection limit shown
- J - Estimated value