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GROUNDWATER REMEDIAL DESIGN FOR OPERABLE UNIT 7 (OU 7) SITE 16 NAS CECIL FIELD FL

3/1/1999

TETRA TECH NUS INC

Groundwater Remedial Design
Operable Unit 7, Site 16

for

Naval Air Station
Cecil Field

Jacksonville, Florida

Southern Division
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888

Contract Task Order 0051

March 1999

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GROUNDWATER REMEDIAL DESIGN
OPERABLE UNIT 7, SITE 16
FOR

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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The engineering design and professional opinions rendered in this planning document for Site 16, Remedial Design for Groundwater, Naval Air Station Cecil Field, Jacksonville, Florida, were conducted or developed in accordance with commonly accepted procedures, consistent with applicable standards of practice. If conditions during implementation are determined to be different than those described in this document, then the undersigned professional engineer should be notified to evaluate the effects the additional information has on the design described in this report.

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ACRONYM LIST

ABB-ES	ABB Environmental, Inc.
AIMD	Aircraft Intermediate Maintenance Department
ARAR	Applicable, or Relevant and Appropriate Requirements
ARC	Ambient Reference Concentration
AS/SVE	Air Sparging/Soil Vapor Extraction
bgs	below ground surface
BRA	Baseline Risk Assessment
B & R	Brown & Root
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COCs	Chemicals of Concern
DCB	Dichlorobenzene
DCE	Dichloroethene
DO	Dissolved Oxygen
DOC	Dissolved Organic Carbon
FAC	Florida Administrative Code
ERA	Ecologic Risk Assessment
FDEP	Florida Department of Environmental Protection
FFA	Federal Facility Agreement
ft/ft	feet per foot
ft/yr	feet per year
ID	Inside Diameter
IR	Installation Restoration
IZS	Intermediate Zones
K	Hydraulic Conductivity
LZS	Lower Zones
mg/kg	milligrams per kilogram
NACIP	Naval Assessment and Control of Installation Pollutants
NAS	Naval Air Station
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NPL	National Priority List
OD	Outside Diameter
ORP	Oxidation/Reduction Potential

OU	Operable Unit
PCBs	Polychlorinated biphenyls
PSI	Pounds per Square Inch
QAPP	Quality Assurance Project Plan
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RBC	Risk Based Concentration
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SCFM	Standard Cubic Feet per Minute
SVOC	Semivolatile Organic Compounds
TtNUS	Tetra Tech NUS
TCE	Trichloroethene
µg/kg	microgram per kilogram
U.S. EPA	U.S. Environmental Protection Agency
USGS	U. S. Geological Survey
UZH	Upper Zone of the Hawthorn
UZS	Upper Zones
VOC	Volatile Organic Compounds

1.0 INTRODUCTION

This document presents the remedial design for groundwater treatment at Operable Unit (OU) 7, Site 16, at Naval Air Station (NAS) Cecil Field, Jacksonville, Florida. This remedial design is being performed under Contract Task Order 51 under comprehensive Long-Term Environmental Action Navy (CLEAN III) Contract No. N62467-94-D-0888. This document presents the groundwater remedial design.

This section presents the purpose and scope of the design and monitoring plan. Section 2.0 presents site background, including contaminant characterization and target cleanup levels. Section 3.0 presents design details for the air sparging system. Section 4.0 is the air sparging system execution and monitoring plan. Section 5.0 discusses groundwater monitoring for degradation of contaminants through air sparging and through natural processes. Section 6.0 presents costing information for system installation, operation and monitoring.

1.1 AMENDED RECORD OF DECISION

Based upon consideration of the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the National Contingency Plan (NCP) (U.S. EPA, 1990a), the U.S. EPA, the Florida Department of Environmental Protection (FDEP), and public comments, a remedy was initially selected as part of the ROD to address the contaminants in the groundwater at OU 7, Site 16 (ABB-ES, July 1996).

Subsequent to the publication of the ROD, certain site conditions changed. In particular, it was determined that, as a result of base closure, the NAS Cecil Field wastewater treatment plant was not likely to be available to receive the pre-treated source area groundwater. It was also determined that other treatment technologies, such as air sparging and vapor extraction would probably achieve cleanup goals in the source area quicker and more cost-effectively than a pump and treat system. Finally, as discussed in Section 2.3, results from additional investigations established that natural attenuation has excellent potential for the remediation of the OU 7, Site 16 groundwater. All of these factors have led to the preparation of a Revised Proposed Plan (TtNUS, 1998c) and subsequent amended ROD. The components of the selected remedy is as follows:

<u>In-situ Air Sparging of Source Area Groundwater and Treatment of Extracted Vapors:</u> As part of this component, compressed air will be forced into the surficial aquifer in the source area through a network of injection wells. This will strip VOCs from the groundwater and the resulting vapors will be removed from the subsurface by application of a vacuum through a network of extraction wells. The VOCs contained in

the extracted vapors will then be removed using off-gas treatment. A long-term groundwater monitoring plan will be implemented to evaluate the effectiveness of air sparging and to determine the appropriate time to begin site-wide natural attenuation. The BCT will make the decision based on the available data at that time as to when to discontinue operation of the AS/SVE system.

Natural Attenuation of Downgradient Groundwater: As part of this component, the naturally occurring processes that have been observed at OU 7, Site 16, such as biological degradation, dispersion, and adsorption, will be relied upon to reduce contaminant concentrations in the downgradient groundwater to cleanup levels.

Storm Sewer Inspection and Repair: A storm sewer inspection will be conducted to identify and record groundwater infiltration or anomalies in the storm sewer system within the area of the groundwater plume. Remediation options will be analyzed to select a technology to remove VOCs from the groundwater that infiltrates into the storm sewer system. A remedial design and repairs will be conducted to reduce groundwater infiltration which will reduce the concentration of VOCs at the outfall.

Details of the inspection of the storm sewer can be found in the Storm Sewer Investigation Report (TtNUS, 1998e) and the Pilot-Scale Treatability Study Report (B&R Environmental, 1998a). Details of the repair of the storm sewer can be found in the Draft Design Basis Document (TtNUS, 1998f) which has been accepted as final.

Long-term Groundwater Monitoring: As part of this component, groundwater would be regularly sampled and analyzed to monitor the decrease in contaminant concentration and determine when cleanup goals have been reached.

Implementation of Institutional Controls: As part of this component, deed restrictions and other administrative measures would be implemented to prevent the use of contaminated groundwater from the surficial aquifer as a source of potable water until cleanup goals had been met.

Five-Year Site Reviews: As part of this component, site reviews would be conducted every five years to determine the progress achieved by the selected remedy and evaluate the continued adequacy of this remedy.

1.2 PURPOSE

The purpose of this document is to provide sufficient information for the installation and operation of an air sparging system to address groundwater contamination at OU 7, Site 16. In addition, this document summarizes the groundwater monitoring plan presented in Section 4.0 of the Pilot-Scale Air Sparging/Soil Vapor Extraction (AS/SVE) Work Plan and Natural Attenuation Sampling and Analysis Plan OU 7, Site 16, August, 1998 (TtNUS, 1998a).

1.3 SCOPE

The groundwater remedial design to be implemented at OU 7, Site 16 includes the following components:

- an air sparging system capable of volatilizing contaminants through the introduction of air into the groundwater plume;
- a vapor-extraction system capable of collecting the volatilized contaminants, and an off-gas treatment system;
- startup and physical testing of the system;
- monitoring of the system to evaluate performance;
- monitoring the groundwater plume to evaluate the effectiveness of the system and also to evaluate the effectiveness of natural processes on contaminant reduction; and
- required institutional controls, monitoring, site evaluation and reporting requirements.

2.0 SITE BACKGROUND AND NATURE AND EXTENT OF CONTAMINATION

The following sections contain a brief summary of the location, description, history, and nature and extent of contamination at OU 7, Site 16. This section also contains an evaluation of natural attenuation of contaminants. A detailed description of site physical and geological conditions and a summary of the human and ecological risks can be found in the Remedial Investigation (RI) conducted for OU 7, Site 16 (ABB-ES, 1995).

2.1 LOCATION, DESCRIPTION, AND HISTORY

NAS Cecil Field is located 14 miles southwest of Jacksonville, Florida. The majority of Cecil Field is located within Duval County; the southernmost part of the facility is located in Clay County (Figure 2-1). NAS Cecil Field was established in 1941 and provides facilities, services, and material support for the operation and maintenance of naval weapons, aircraft, and other units of the operation forces as designated by the Chief of Naval Operations. Some of the tasks required to accomplish this mission over past years included operation of fuel storage facilities, performance of aircraft maintenance, maintenance and operation of engine repair facilities and test cells for turbo-jet engines, and support of special weapons systems. NAS Cecil Field is scheduled for closure in 1999. Much of the facility will be transferred to the Jacksonville Port Authority. The facility will have multiple uses, but will be used primarily for aviation-related activities.

OU 7, Site 16 is located in the south-central portion of NAS Cecil Field north of Building 313 (see Figures 2-1 and 2-2). The site includes the former Aircraft Intermediate Maintenance Department (AIMD) seepage pit and associated bead separator, holding tank, and pipelines from Building 313, as well as adjacent areas to the east and southeast of Building 313 that have been affected by activities at the site.

Site 16 is vegetated with grass that is mowed regularly. The general area adjacent to the site is relatively flat and is covered with asphalt and concrete. The immediate area is criss-crossed with several utilities, including a water line, an overhead steam line, a fire water main, a sanitary sewer main, and active and abandoned storm sewers. There are no inlets to the storm sewer system in the immediate vicinity of OU 7, Site 16. During site visits, the ground surface exhibited no evidence (staining or absence of vegetation) of adverse effects from previous waste handling activities at the site (ABB-ES, 1995).

Surface water flow from OU 7, Site 16 is typically toward the adjacent paved roads and parking lots. To the east, an unlined grass drainage swale may receive some runoff and carry it toward a catch basin. The

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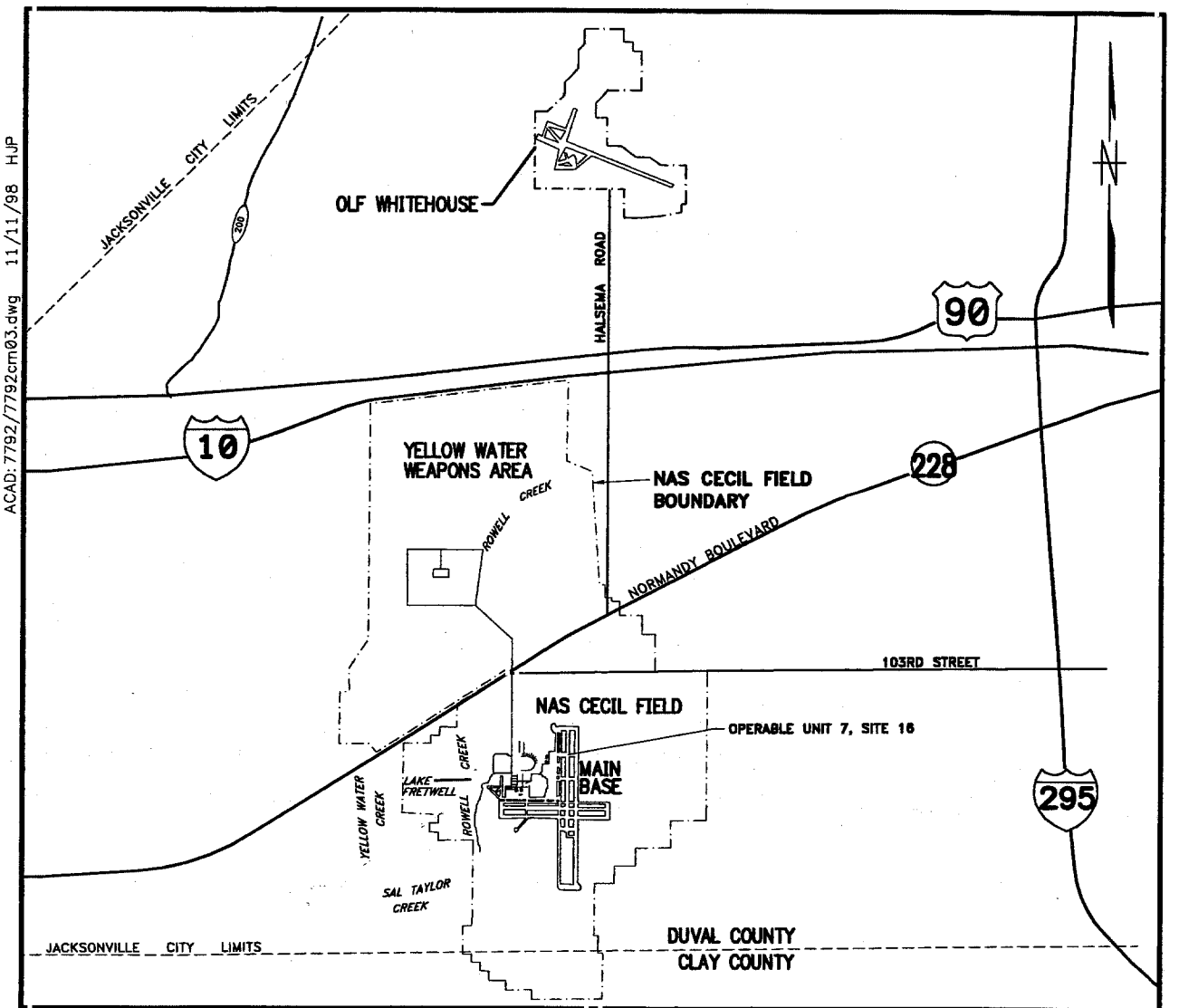

NOTES:
NAS = Naval Air Station
OLF = Outlying Landing Field

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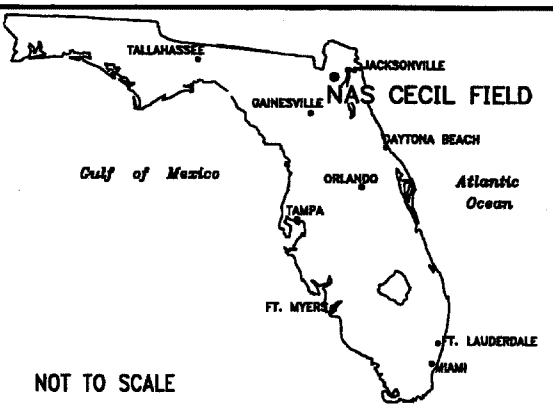

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GENERAL LOCATION MAP
REMEDIAL INVESTIGATION
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

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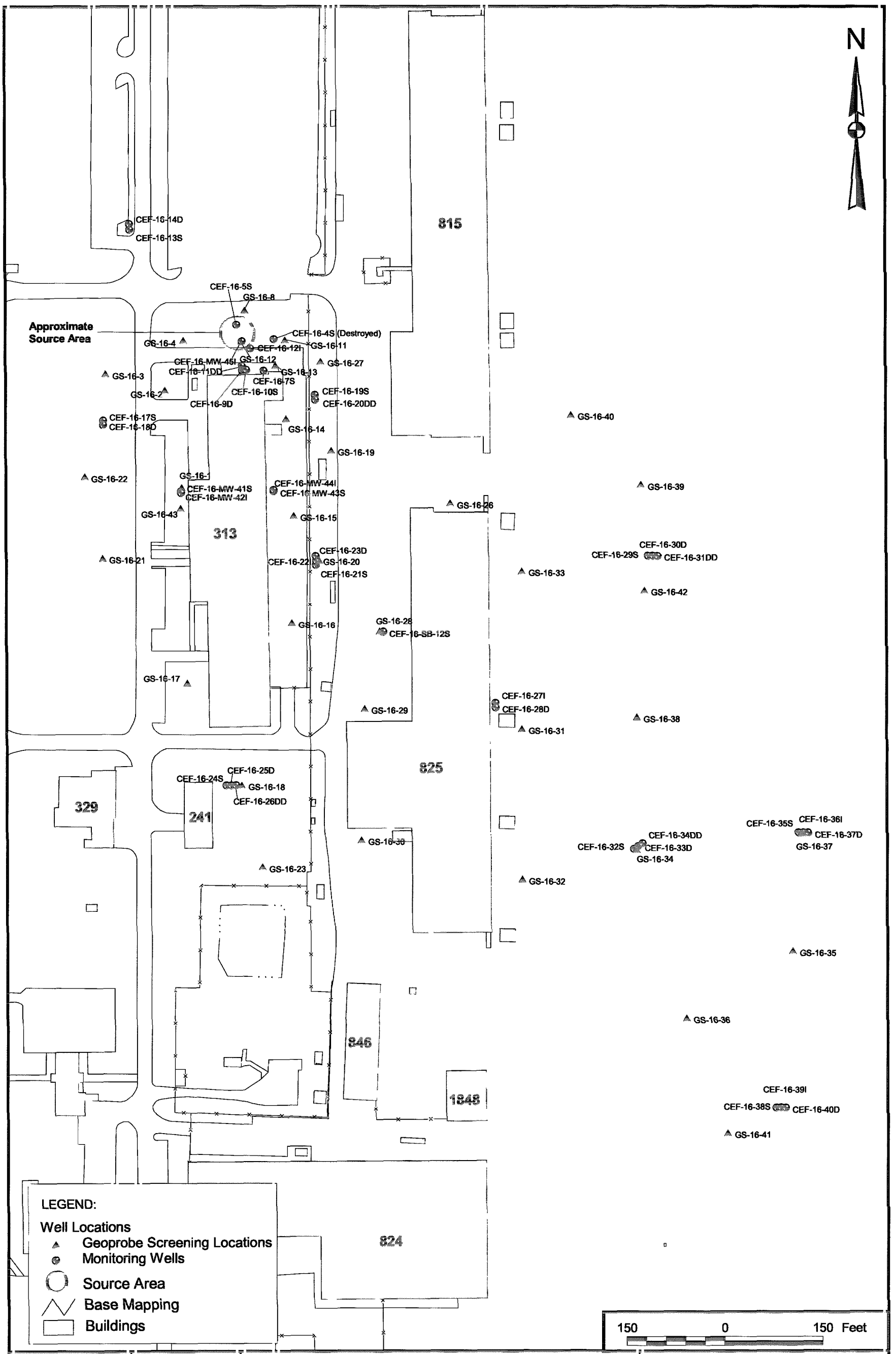
P:\GIS\CECIL\SITE16.APR 3/4/99 CPG LAYOUT WELL LOCATION



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SITE LAYOUT AND MONITORING WELL LOCATIONS
OPERABLE UNIT 7, SITE 16
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

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runoff from the paved roads and parking lots in the vicinity of Site 16 flows to the storm sewer system (HLA, 1988).

The storm sewer system collects surface water runoff in catch basins and transports it through underground piping that discharges into drainage ditches leading to the wetlands on the east side of the north-south runways and eventually to Sal Taylor Creek, farther to the east. Most of the storm sewer trunk (main) lines intersect the water table as do some of the smaller tributary lines.

From 1959 to 1980, Site 16 was used to dispose of greases, rusts, scale and paint wastes from the cleaning of machines and engine parts as well as waste glass beads and blasting grit from the airframes blasting shop. Most wastes were discharged to a 4,100-gallon underground concrete holding tank located north of Building 313 and from there to an adjacent pit which allowed seepage of the waste directly into the subsurface soil and groundwater. In the late 1960s, the seepage pit was modified to allow discharge to the storm sewer system.

Use of the seepage pit was discontinued in 1980 and connecting pipes were removed or plugged. A bead separator was installed and its discharge was connected to the sanitary sewer system. During that period, the holding tank was used as a Resource Conservation and Recovery Act (RCRA) permitted facility for the 90-day storage of hazardous wastes. In 1989, the system was abandoned. All piping connections between Building 313 and the bead separator and holding tank were removed and plugged and the contents of the holding tank were removed for offsite treatment and disposal. The tank itself remained in place.

In March 1993, a modification to the RCRA permit of the holding tank stipulated that the tank be closed. In May 1994, the holding tank, seepage pit, and glass bead separator were excavated and removed from the site as part of an IRA. Associated piping was removed or plugged with grout and 1,500 cubic yards of surrounding contaminated soil was excavated and disposed of offsite. Figure 2-3 provides a historical site layout as it existed prior to the removal action.

Following the IRA, a Remedial Investigation (RI) (ABB-ES, July 1995) was conducted to evaluate residual site contamination and associated risks. Samples of surface and subsurface soil, and groundwater were collected and analyzed. Results of these analyses were used to determine human health and ecological risks. The Baseline Risk Assessment (BRA) determined that there were no unacceptable ecological risks at Site 16 but that groundwater contained chlorinated VOCs which would result in significant human health risk if the groundwater was to be used as a source of drinking water. Based on the results of the RI and

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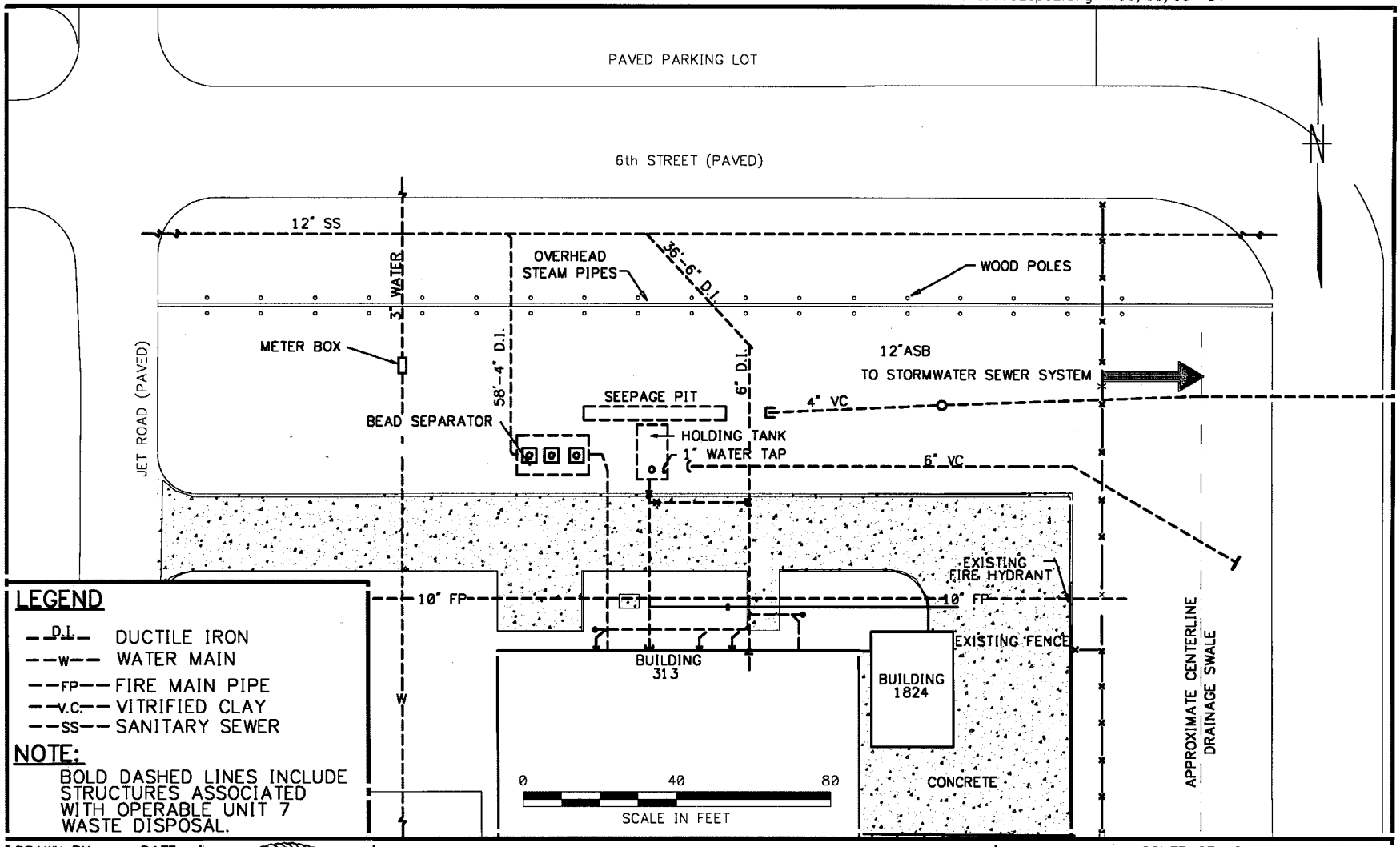

LEGEND

- —D.I.— DUCTILE IRON
- —W— WATER MAIN
- —FP— FIRE MAIN PIPE
- —V.C.— VITRIFIED CLAY
- —SS— SANITARY SEWER

NOTE:

BOLD DASHED LINES INCLUDE STRUCTURES ASSOCIATED WITH OPERABLE UNIT 7 WASTE DISPOSAL.

DRAWN BY HJP 10/26/98	HISTORICAL SITE LAYOUT OPERABLE UNIT 7, SITE 16 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NO. 7792
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COST/SCHED-AREA		APPROVED BY DATE
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the BRA, a Feasibility Study (FS) (ABB-ES, August 1995) was performed to define Remedial Action Objectives (RAOs) and evaluate a range of clean-up alternatives to meet these objectives.

A Proposed Plan was prepared to identify the preferred clean-up alternative for Site 16 (ABB-ES, March 1996). A public meeting was held at NAS Cecil Field on March 21, 1996 to present this Proposed Plan and to respond to public comments. Based on the resolution of the comments received at the public meeting and during the comment period, a Record of Decision (ROD) was prepared to select the clean-up alternative for OU 7, Site 16 (ABB-ES, July 1996).

Subsequently, re-evaluation of site conditions and available remedial alternatives was conducted and a revised Proposed Plan (TtNUS, 1998c) was prepared. The draft amended ROD (TtNUS, 1999) was submitted and is pending comment.

2.2 NATURE AND EXTENT OF CONTAMINATION/REMEDIAL ACTION OBJECTIVE

At OU 7, Site 16, the primary source of contamination was the liquid waste generated during the cleaning of machine and engine parts conducted at Building 313. The 1994 IRA adequately addressed soil contamination but, as previously mentioned, results from the RI (ABB-ES, July 1995) established that several chlorinated VOCs, including 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE), and 1,1-dichloroethene (1,1-DCE) are still present in the groundwater at concentrations in excess of regulatory criteria. Figure 2-2 shows the locations of monitoring wells installed. Table 2-1 summarizes the analytical results for organic compounds detected in groundwater during the RI along with the clean-up levels and Figure 2-4 shows the areal extent of organic contamination in groundwater. The plumes shown in Figure 2-4 are from 1994 RI data (ABB-ES, July 1995). More recent groundwater data from the pilot-scale treatability study (TtNUS, August 1998) showed that at the source location north of Building 313, TCE concentrations up to a maximum of 407,900 µg/L are present. The concentration of TCE below the former seepage pit area exceeds one percent of the solubility for TCE which indicates there is a potential for the presence of DNAPL in the groundwater (EPA, 1992). However, the RI indicated that the NAPL is not believed to be present in any significant volume.

The BRA completed for Site 16 as part of the RI (ABB-ES, July 1995) identified no unacceptable human health risks from exposure to soil, surface water, or sediment, and no unacceptable ecological risks from exposure to any media. The BRA identified an unacceptable human health risk from exposure to the groundwater from the surficial aquifer in the unlikely event that this aquifer would be developed in the

TABLE 2-1

SUMMARY OF ORGANIC COMPOUNDS DETECTED IN GROUNDWATER
REMEDIAL INVESTIGATION
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD, JACKSONVILLE, FLORIDA

Analyte	Frequency of Detection	Range of Detected Concentration	Federal Primary MCL[3]	Florida Primary Standard[4]	Florida Guidance Concentration[5]	Florida Brown Field Concentration[7]
SURFICAL AQUIFER						
VOCs (µg/l)						
1,1,1-Trichloroethane	1/26	3,000[2]	200	200	200	NA
1,1-Dichloroethane	1/26	1J	NA	NA	700	700
1,1-Dichloroethene	1/26	400[2]	7	7	7	NA
1,2-Dichloroethene(total)	2/26	270J to 12,500[2]J	70[6]	70[6]	70[6]	63
4-Methyl-2-pentanone	1/21	1	NA	NA	350	560
Trichloroethene	7/26	12J to 630[2]J	5	3	3	NA
SVOCs (µg/l)						
2-Methylnaphthalene	1/26	2.75[2]J	NA	NA	NA	20
Diethylphthalate	2/26	1J	NA	NA	5,600	5,600
Naphthalene	1/26	3.5[2]J	NA	NA	6.8	20
Phenanthrene	1/26	3J	NA	NA	10	210
Phenol	3/26	0.8J to 1.45[2]J	NA	NA	10	10
Bis (2-ethylhexy) phthalate	21/26	0.5J to 20.5[2]	6	6	6	NA
Pesticides and PCBs (µg/l)						
Endrin	1/26	0.02J	2	2	2	NA
INTERMEDIATE AQUIFER						
SVOCs (µg/l)						
Di-n-butylphthalate	1/4	1J	NA	NA	700	700
Bis (2-ethylhexyl) phthalate	4/4	1J to 10	6	6	6	NA

Notes:
1 Frequency of detection is the number of samples in which the analyte was detected divided by the total number of samples analyzed.
2 Value is the average of a sample and its duplicate.
3 Federal Primary MCLs are taken from USEPA Drinking Water Regulations and Health Advisories (May 1994).
4 Florida Primary Standards are taken from Chapter 1 (Primary Standards) of the FDEP Groundwater Guidance Concentrations (June 1994).
5 Florida Guidance Concentrations are taken from Chapter 6 (Guidance Concentrations Index) of the FEDP Groundwater Guidance Concentrations (June 1994).
6 Primary MCL is for cis-1, 2-Dichloroethylene.
7 Chapter 62-785 F.A.C., Florida Brownfields Criteria Rule.
µg/l = microgram per liter.
PCBs = polychlorinated biphenyls.
NA = not applicable

future as a potable water supply. Therefore, a risk-based remedial action objective (RAO) was developed to protect humans from possible future risks resulting from potable water exposure to contaminants currently present in the surficial aquifer groundwater. This RAO is as follows: Protect humans from health risks resulting from potential exposure to groundwater from the surficial aquifer by preventing the use of this aquifer as a source of drinking water in areas where contaminant concentrations exceed site-specific risk-based criteria or regulatory standards and guidance criteria.

2.3 GROUNDWATER NATURAL ATTENUATION DATA

Groundwater from 12 monitoring wells was sampled and analyzed in 1994, 1997, and February 1998 to evaluate natural attenuation. Two wells were located upgradient of Site 16, (CEF-16-13S and CEF-16-17S), four wells were located in the source area of the site (CEF-16-9D, CEF-16-10S, CEF-16-11DD, and CEF-16-19S), and the remainder of the wells were located downgradient of the site either within the contaminant plume (CEF-16-22I, CEF-16-27I, and CEF-32S) or outside of it (CEF-16-24S, CEF-16-29S, and CEF-16-32S). In 1994, groundwater was only analyzed for chlorinated VOCs.

In 1997, groundwater was analyzed for chlorinated VOCs and natural attenuation parameters. Natural alternation parameters were measured in the field (oxidation/reduction potential, dissolved oxygen, carbon dioxide, ferrous iron, chlorides, and alkalinity) and by fixed-based laboratory (nitrates, nitrites, sulfates, dissolved sulfides, methane, ethane, ethylene, and total organic carbon). In February 1998, groundwater was analyzed for the same parameters as in 1997, plus additional natural attenuation parameters measured in the field.

Table 2-2 presents the trend data for chlorinated alkanes/alkenes for the duration of 1991-1998, including the August/September 1998 sampling round. Table 2-3 presents the trend data for natural attenuation parameters collected from the wells during the same period. The remainder of this section presents an evaluation of the results.

2.3.1 Natural Attenuation Parameters – August/September 1998 Analysis

In August/September 1998, a selected set of existing and newly installed wells were sampled and analyzed for chlorinated alkanes/alkenes as well as natural attenuation parameters. The analytical results from this recent sampling event are summarized on Figures 2-5, 2-6, and 2-7. Figure 2-5 presents a summary of the detected chlorinated alkanes/alkenes. Figure 2-6 presents the natural attenuation data obtained from the fixed-based laboratory analysis. Figure 2-7 presents a summary of the natural attenuation data obtained from the field tests. The laboratory data sheets and summary of the data validation effort are provided in Appendix A.

TABLE 2-2
CHLORINATED ALKANES/ALKENES DATA (1991-1998) IN SURFICIAL GROUNDWATER
OPERABLE UNIT 7, SITE 16
NAS CECEL FIELD, JACKSONVILLE, FLORIDA
PAGE 1 OF 3

	DETECTION	CEF-16-11DD				CEF-16-9D					CEF-16-10S				
PARAMETER	LIMIT	1994	1997	Feb-98	Sep-98	1991	1994	1997	Feb-98	Sep-98	1991	1994	1997	Feb-98	Sep-98
LABORATORY ANALYSIS															
TCE (ug/l)	3	ND	ND	ND	5	330	20J	8.6	ND	ND	2650	630	ND	22	45.9
1,1 DCE (ug/l)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	400	ND	26	231
cis 1,2 DCE (ug/l)	5	ND	ND	ND	ND	8J	ND	2	ND	ND	1100	12500J	1700	25	60
trans 1,2 DCE (ug/l)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
TCA (ug/l)	5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3000J	ND	1200	1300
Vinyl Chloride (ug/l)	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	230	3	32
Ethane (ug/l)	5.8	NA	ND	ND	ND	NA	NA	ND	ND	ND	NA	NA	148	ND	47.7
Ethene (ug/l)	6.2	NA	ND	ND	ND	NA	NA	ND	ND	ND	NA	NA	458	ND	142

TABLE 2-2
CHLORINATED ALKANES/ALKENES DATA (1991-1998) IN SURFICIAL GROUNDWATER
OPERABLE UNIT 7, SITE 16
NAS CECEL FIELD, JACKSONVILLE, FLORIDA
PAGE 2 OF 3

PARAMETER	DETECTION LIMIT	CEF-16-13S			CEF-16-17S			CEF-16-19S			CEF-16-22I				CEF-16-24S		
		1994	1997	Feb-98	1994	1997	Feb-98	1994	1997	Feb-98	1994	1997	Feb-98	Sep-98	1994	1997	Feb-98
LABORATORY ANALYSIS																	
TCE (ug/l)	3	ND	NA	NA	ND	NA	NA	ND	ND	ND	15	3.2	3	6.4	ND	NA	NA
1,1 DCE (ug/l)	5	ND	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
cis 1,2 DCE (ug/l)	5	ND	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
trans 1,2 DCE (ug/l)	5	ND	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
TCA (ug/l)	5	ND	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Vinyl Chloride (ug/l)	1	ND	NA	NA	ND	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	NA	NA
Ethane (ug/l)	5.8	NA	ND	ND	NA	ND	ND	NA	ND	ND	NA	ND	ND	ND	NA	ND	ND
Ethene (ug/l)	6.2	NA	ND	ND	NA	ND	ND	NA	ND	ND	NA	ND	ND	ND	NA	ND	ND

TABLE 2-2
CHLORINATED ALKANES/ALKENES DATA (1991-1998) IN SURFICIAL GROUNDWATER
OPERABLE UNIT 7, SITE 16
NAS CECEL FIELD, JACKSONVILLE, FLORIDA
PAGE 3 OF 3

	DETECTION	CEF-16-27I				CEF-16-29S			CEF-16-32S				CEF-16-38S			
PARAMETER	LIMIT	1994	1997	Feb-98	Sep-98	1994	1997	Feb-98	1994	1997	Feb-98	Sep-98	1994	1997	Feb-98	Sep-98
LABORATORY ANALYSIS																
TCE (ug/l)	3	**12 J**	**25**	**32**	**33.3**	ND	NA	NA	**470 J**	**220**	**150**	**126 J**	ND	ND	NA	ND
1,1 DCE (ug/l)	5	ND	ND	ND	ND	ND	NA	NA	ND	ND	ND	0.3	ND	ND	NA	ND
cis 1,2 DCE (ug/l)	5	ND	ND	ND	0.6	ND	NA	NA	ND	ND	ND	0.9	ND	ND	NA	ND
trans 1,2 DCE (ug/l)	5	ND	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	NA	ND
TCA (ug/l)	5	ND	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	NA	ND
Vinyl Chloride (ug/l)	1	ND	ND	ND	ND	ND	NA	NA	ND	ND	ND	ND	ND	ND	NA	ND
Ethane (ug/l)	5.8	NA	ND	ND	ND	NA	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
Ethene (ug/l)	6.2	NA	ND	ND	ND	NA	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND

Notes:
NA - not analyzed
ND - not detected
Bold and shade exceed target cleanup levels
Wells CEF-16-13S, CEF-16-17S, CEF-16-19S, CEF-16-29S were not samples in September 1998

TABLE 2-3
NATURAL ATTENUATION PARAMETERS - (1991-1998 SAMPLING ACTIVITIES)
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD, JACKSONVILLE, FLORIDA
PAGE 1 OF 3

	CEF-16-11DD				CEF-16-9D					CEF-16-10S				
PARAMETER	1994	1997	Feb-98	Sep-98	1991	1994	1997	Feb-98	Sep-98	1991	1994	1997	Feb-98	Sep-98
LABORATORY ANALYSIS														
Nitrate (mg/l)	NA	ND	ND	ND	NA	NA	ND	ND	ND	NA	NA	ND	4.4	ND
Nitrite (mg/l)	NA	ND	ND	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND	ND
Iron (ug/l)	NA	NA	NA	365	NA	NA	NA	NA	875	NA	NA	NA	NA	815
Manganese (ug/l)	NA	NA	NA	40.6	NA	NA	NA	NA	19.8	NA	NA	NA	NA	339
Sulfate (mg/l)	NA	7	4	105	NA	NA	8	2	0.26	NA	NA	13	3	9.69
Dissolved Sulfide (mg/l)	NA	ND	ND	ND	NA	NA	ND	ND	ND	NA	NA	ND	ND	ND
Methane (mg/l)	NA	0.31	0.395	0.141	NA	NA	.04J	0.055	0.047	NA	NA	4.538	0.029	2.59
Ethane (mg/l)	NA	ND	ND	ND	NA	NA	ND	ND	ND	NA	NA	0.148	ND	0.0477
Ethene (mg/l)	NA	ND	ND	ND	NA	NA	ND	ND	ND	NA	NA	0.458	ND	0.142
Alkalinity (mg/l)	NA	NA	NA	260	NA	NA	NA	NA	36.5	NA	NA	NA	NA	302
Carbonate Alkalinity (mg/l)	NA	NA	NA	ND	NA	NA	NA	NA	ND	NA	NA	NA	NA	ND
Bicarbonate Alkalinity (mg/l)	NA	NA	NA	260	NA	NA	NA	NA	36.5	NA	NA	NA	NA	302
Chloride (mg/l)	NA	NA	NA	9.46 J	NA	NA	NA	NA	9.08 J	NA	NA	NA	NA	2.84 J
Total Organic Carbon (mg/l)	NA	NA	NA	1.95 J	NA	NA	NA	NA	2.78 J	NA	NA	NA	NA	57.4 J
Dissolved Organic Carbon (mg/l)	NA	3	8	NA	NA	NA	2	3	NA	NA	NA	36	11	NA
Orthophosphate (mg/l)	NA	NA	NA	ND	NA	NA	NA	NA	0.14	NA	NA	NA	NA	ND
Chemical Oxygen Demand (mg/l)	NA	NA	NA	ND	NA	NA	NA	NA	ND	NA	NA	NA	NA	57.1
Biochemical Oxygen Demand (mg	NA	NA	NA	ND	NA	NA	NA	NA	ND	NA	NA	NA	NA	3.29
FIELD ANALYSIS														
Redox Potential (millivolts)	NA	1.2	NC	66	NA	NA	-36	175	66	NA	NA	-191	-125.3	-100
pH	NA	6.91	7.11	6.70	NA	NA	6.16	5.84	5.46	NA	NA	6.48	6.39	6.06
Temperature (Fahrenheit)	NA	77.4	74.3	24.1	NA	NA	88.4	73.4	24.5	NA	NA	86	66.2	25.9
Conductivity (umhos/cm)	NA	543	478	483	NA	NA	150	110	110	NA	NA	737	455	609
Turbidity (NTU)	NA	0.39	1.3	0	NA	NA	3.62	1.81	0	NA	NA	3.58	6.87	0
HACH KIT ANALYSIS														
Dissolved Oxygen (mg/l)	NA	0	1.07	0.7	NA	NA	0	1.83	0.58	NA	NA	0	3.21	0.4
Ferrous Iron (Fe 2+) (mg/l)	NA	0.6	NC	0.6	NA	NA	1	NC	1	NA	NA	0.8	NC	>10
Hydrogen Sulfide (mg/l)	NA	NA	NA	0	NA	NA	NA	NA	0	NA	NA	NA	NA	0.3
Carbon Dioxide (mg/l)	NA	60	45	84.2	NA	NA	60	10	82	NA	NA	250	120	273.6
Chloride (mg/l)	NA	15	15	NA	NA	NA	20	15	NA	NA	NA	20	15	NA
Alkalinity (mg/l)	NA	300	260	200	NA	NA	80	45	30	NA	NA	340	215	258
COLORIMETER														
Nitrate (mg/l)	NA	NA	0.011	NA	NA	NA	NA	0.03	NA	NA	NA	NA	0.03	NA
Nitrite (mg/l)	NA	NA	0.05	NA	NA	NA	NA	0.006	NA	NA	NA	NA	0.005	NA
Ferrous (mg/l)	NA	NA	0.041	NA	NA	NA	NA	0.83	NA	NA	NA	NA	0.08	NA
Sulfate (mg/l)	NA	NA	4	NA	NA	NA	NA	0	NA	NA	NA	NA	0	NA

TABLE 2-3
NATURAL ATTENUATION PARAMETERS - (1991-1998 SAMPLING ACTIVITIES)
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD, JACKSONVILLE, FLORIDA
PAGE 2 OF 3

	CEF-16-13S			CEF-16-17S			CEF-16-19S			CEF-16-22I				CEF-16-24S		
PARAMETER	1994	1997	Feb-98	1994	1997	Feb-98	1994	1997	Feb-98	1994	1997	Feb-98	Sep-98	1994	1997	Feb-98
LABORATORY ANALYSIS																
Nitrate (mg/l)	NA	ND	2	NA	ND	ND	NA	ND	0.02	NA	ND	ND	ND	NA	ND	ND
Nitrite (mg/l)	NA	ND	ND	NA	ND	ND	NA	ND	ND	NA	ND	ND	ND	NA	ND	ND
Iron (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	597	NA	NA	NA
Manganese (ug/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.8	NA	NA	NA
Sulfate (mg/l)	NA	ND	3	NA	ND	4	NA	ND	2	NA	15	2	51.5	NA	12	ND
Dissolved Sulfide (mg/l)	NA	ND	ND	NA	ND	ND	NA	ND	ND	NA	ND	ND	19	NA	ND	ND
Methane (mg/l)	NA	ND	ND	NA	1.517	0.687	NA	0.012	0.01	NA	0.044	0.038	0.0147	NA	1.219	0.876
Ethane (mg/l)	NA	ND	ND	NA	ND	ND	NA	ND	ND	NA	ND	ND	ND	NA	ND	ND
Ethene (mg/l)	NA	ND	ND	NA	ND	ND	NA	ND	ND	NA	ND	ND	ND	NA	ND	ND
Alkalinity (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Carbonate Alkalinity (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Bicarbonate Alkalinity (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Chloride (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3.62 J	NA	NA	NA
Total Organic Carbon (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.33	NA	NA	NA
Dissolved Organic Carbon (mg/l)	NA	ND	4	NA	ND	16	NA	ND	5	NA	6	9	NA	NA	10	11
Orthophosphate (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
Chemical Oxygen Demand (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10.3	NA	NA	NA
Biochemical Oxygen Demand (mg	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA
FIELD ANALYSIS																
Redox Potential (millivolts)	NA	76.4	187.7	NA	-109.4	-80.2	NA	36	231.2	NA	-84	0.7	-11	NA	-112	-53.1
pH	NA	5.28	5.59	NA	4.92	4.39	NA	5.26	4.96	NA	4.78	4.74	4.50	NA	5.61	4.95
Temperature (Fahrenheit)	NA	84.8	70.7	NA	84.4	75.2	NA	84.4	74.3	NA	81	74.3	24.5	NA	79.9	71.6
Conductivity (umhos/cm)	NA	106	92	NA	94	70	NA	74	59	NA	54.5	41	41	NA	76	48
Turbidity (NTU)	NA	3.55	5.83	NA	1.61	1.59	NA	0.76	2.96	NA	0.75	1.85	0	NA	1.2	0.46
HACH KIT ANALYSIS																
Dissolved Oxygen (mg/l)	NA	0	2.79	NA	0	0	NA	0	2.65	NA	0	0	1.26	NA	0	0
Ferrous Iron (Fe 2+) (mg/l)	NA	0.6	NC	NA	1.2	NC	NA	1.6	NC	NA	1	NC	1	NA	0.6	NC
Hydrogen Sulfide (mg/l)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2	NA	NA	NA
Carbon Dioxide (mg/l)	NA	90	40	NA	165	140	NA	110	65	NA	100	70	78.4	NA	90	100
Chloride (mg/l)	NA	10	10	NA	15	10	NA	15	10	NA	15	10	NA	NA	15	10
Alkalinity (mg/l)	NA	0	NA	NA	0	10	NA	15	15	NA	10	10	3.2	NA	15	10
COLORIMETER																
Nitrate (mg/l)	NA	NA	0.55	NA	NA	0.04	NA	NA	0.07	NA	NA	0.02	NA	NA	NA	0.04
Nitrite (mg/l)	NA	NA	0.007	NA	NA	0.004	NA	NA	0.017	NA	NA	0.008	NA	NA	NA	0.017
Ferrous (mg/l)	NA	NA	0.22	NA	NA	0.91	NA	NA	0.85	NA	NA	0.55	NA	NA	NA	0.58
Sulfate (mg/l)	NA	NA	0	NA	NA	4	NA	NA	10	NA	NA	0	NA	NA	NA	0

TABLE 2-3
NATURAL ATTENUATION PARAMETERS - (1991-1998 SAMPLING ACTIVITIES)
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD, JACKSONVILLE, FLORIDA
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	CEF-16-27I				CEF-16-29S			CEF-16-32S				CEF-16-38S			
PARAMETER	1994	1997	Feb-98	Sep-98	1994	1997	Feb-98	1994	1997	Feb-98	Sep-98	1994	1997	Feb-98	Sep-98
LABORATORY ANALYSIS															
Nitrate (mg/l)	NA	ND	0.02	ND	NA	ND	ND	NA	ND	ND	ND	NA	ND	0.26	0.339
Nitrite (mg/l)	NA	ND	ND	ND	NA	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
Iron (ug/l)	NA	NA	NA	1740	NA	NA	NA	NA	NA	NA	149	NA	NA	NA	215
Manganese (ug/l)	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA	ND
Sulfate (mg/l)	NA	7	5	2.5	NA	5	2	NA	9	4	3.22	NA	17	12	9.92
Dissolved Sulfide (mg/l)	NA	ND	ND	ND	NA	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
Methane (mg/l)	NA	.018J	0.014	0.014 J	NA	.011J	0.01	NA	0.037	0.027	ND	NA	.036J	0.037	0.0225
Ethane (mg/l)	NA	ND	ND	ND	NA	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
Ethene (mg/l)	NA	ND	ND	ND	NA	ND	ND	NA	ND	ND	ND	NA	ND	ND	ND
Alkalinity (mg/l)	NA	NA	NA	5.25	NA	NA	NA	NA	NA	NA	12.6	NA	NA	NA	14.7
Carbonate Alkalinity (mg/l)	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA	ND
Bicarbonate Alkalinity (mg/l)	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA	ND
Chloride (mg/l)	NA	NA	NA	2.76	NA	NA	NA	NA	NA	NA	5.34	NA	NA	NA	7.7
Total Organic Carbon (mg/l)	NA	NA	NA	2.88	NA	NA	NA	NA	NA	NA	3.04	NA	NA	NA	24.2
Dissolved Organic Carbon (mg/l)	NA	3	6	NA	NA	2	4	NA	5	7	NA	NA	5	7	NA
Orthophosphate (mg/l)	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	ND	NA	NA	NA	ND
Chemical Oxygen Demand (mg/l)	NA	NA	NA	20.2	NA	NA	NA	NA	NA	NA	20.2	NA	NA	NA	35.4
Biochemical Oxygen Demand (mg	NA	NA	NA	ND	NA	NA	NA	NA	NA	NA	8.28	NA	NA	NA	ND
FIELD ANALYSIS															
Redox Potential (millivolts)	NA	-26	66.1	140	NA	40	88.5	NA	-187	-8.6	43	NA	120	200.5	22
pH	NA	5.51	4.89	4.81	NA	5.53	5.16	NA	5.82	5.03	5.04	NA	5.28	5.07	5.00
Temperature (Fahrenheit)	NA	78.2	75.2	28	NA	79.3	72.5	NA	80.8	74.3	28.5	NA	83.9	74.3	29.6
Conductivity (umhos/cm)	NA	45	30	33	NA	50	31	NA	72	50	52	NA	126	75	83
Turbidity (NTU)	NA	1.62	0.65	0	NA	4.5	3.22	NA	1.44	2.5	0	NA	3.08	15.11	0
HACH KIT ANALYSIS															
Dissolved Oxygen (mg/l)	NA	0	1.15	0.8	NA	0	0	NA	0	1.25	0.66	NA	0.1	2.2	0.56
Ferrous Iron (Fe 2+) (mg/l)	NA	1.6	NC	1	NA	1.4	NC	NA	0.8	NC	1	NA	0	NC	1
Hydrogen Sulfide (mg/l)	NA	NA	NA	0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	0
Carbon Dioxide (mg/l)	NA	70	35	80	NA	50	30	NA	120	50	82	NA	150	55	92
Chloride (mg/l)	NA	15	10	NA	NA	15	15	NA	15	10	NA	NA	15	10	NA
Alkalinity (mg/l)	NA	10	5	32	NA	10	5	NA	10	10	36	NA	20	20	40
COLORIMETER															
Nitrate (mg/l)	NA	NA	0.02	NA	NA	NA	0.02	NA	NA	0.04	NA	NA	NA	0.07	NA
Nitrite (mg/l)	NA	NA	0.005	NA	NA	NA	0.004	NA	NA	0.021	NA	NA	NA	0.005	NA
Ferrous (mg/l)	NA	NA	1.77	NA	NA	NA	1.69	NA	NA	0.2	NA	NA	NA	0.11	NA
Sulfate (mg/l)	NA	NA	0	NA	NA	NA	0	NA	NA	0	NA	NA	NA	9	NA

Notes:
NA - not analyzed
ND - not detected
Wells CEF-16-13S, CEF-16-17S, CEF-16-19S, CEF-16-29S were not sampled in September 1998.

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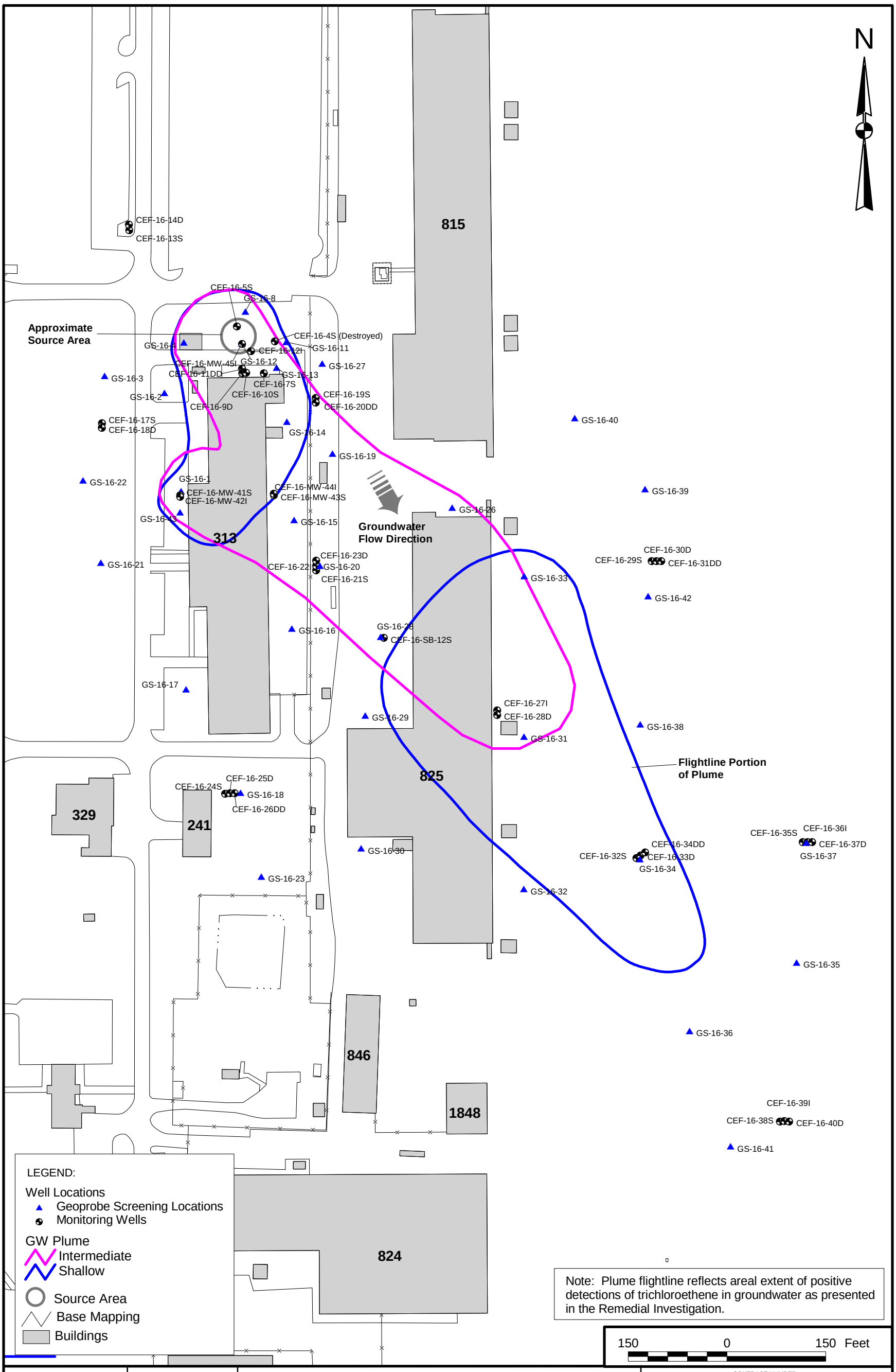

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CHECKED BY RD	DATE 1/7/98		APPROVED BY — DATE —
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED			DRAWING NO. FIGURE 2-4 REV 0

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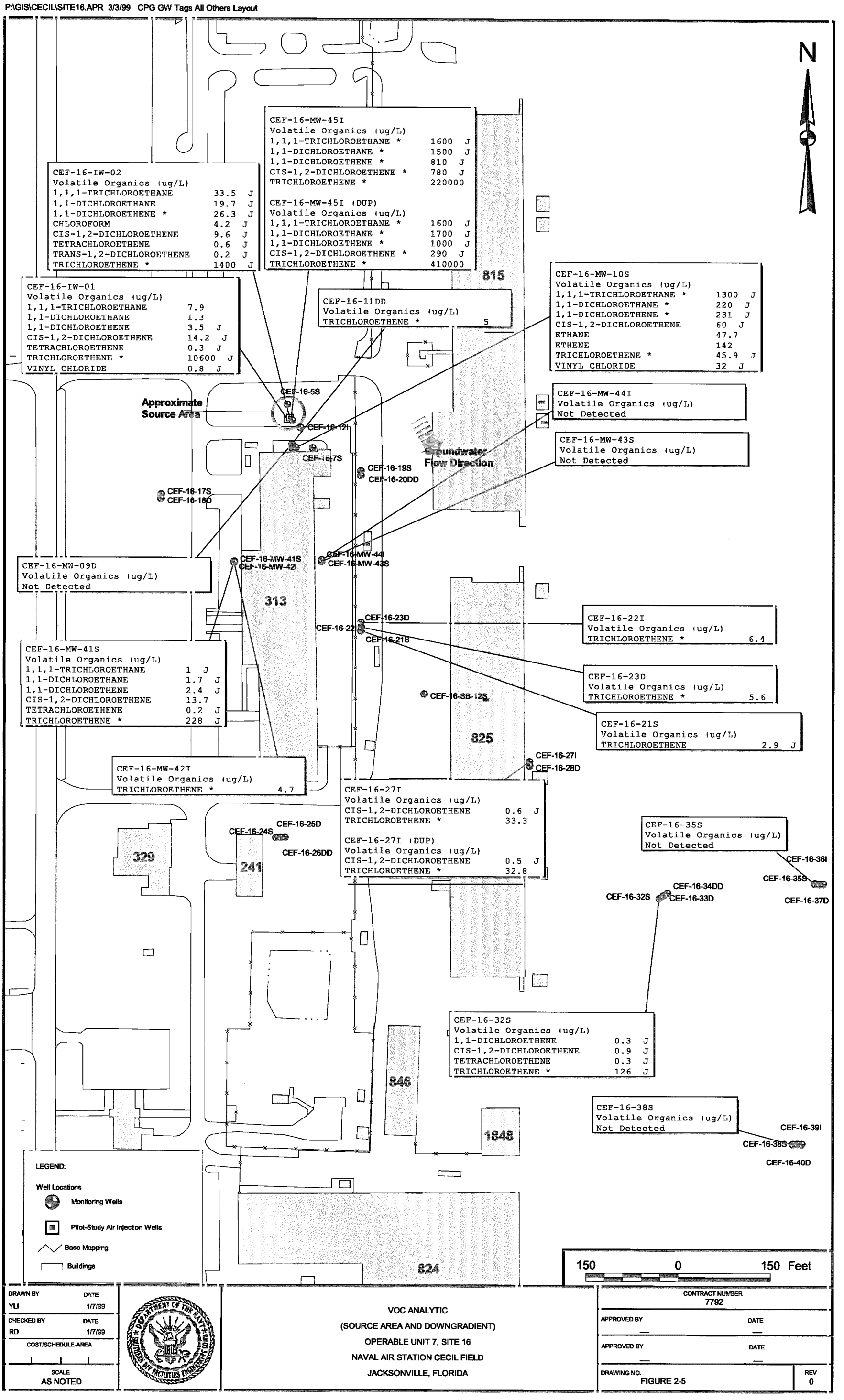

DRAWN BY	DATE
YLI	1/7/99
CHECKED BY	DATE
RD	1/7/99
COST/SCHEDULE-AREA	
SCALE	AS NOTED

VOC ANALYTIC
(SOURCE AREA AND DOWNGRADIENT)
OPERABLE UNIT 7, SITE 16
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NUMBER	
7792	
APPROVED BY	DATE
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APPROVED BY	DATE
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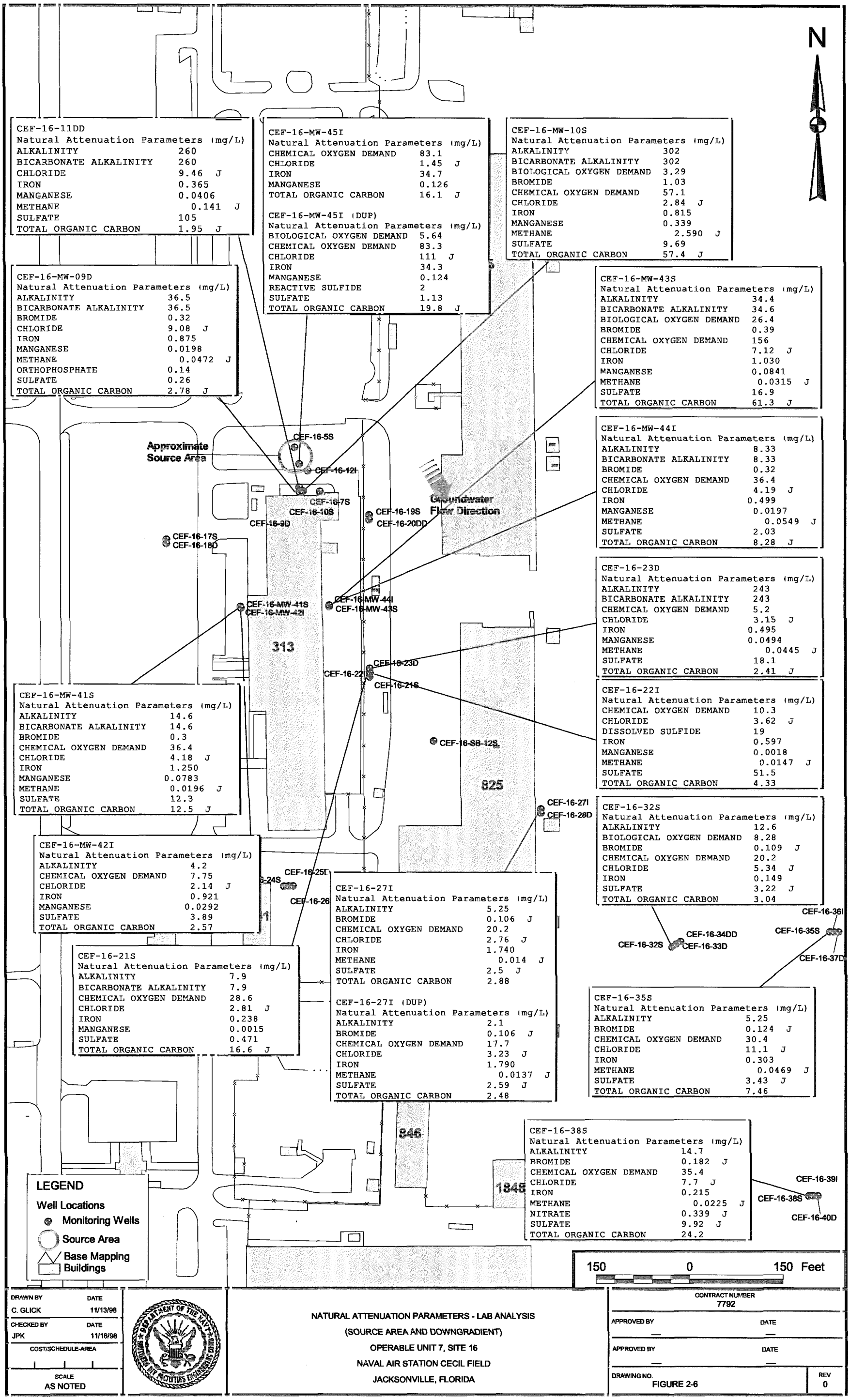

CEF-16-11DD
Natural Attenuation Parameters (mg/L)

ALKALINITY	260	
BICARBONATE ALKALINITY	260	
CHLORIDE	9.46	J
IRON	0.365	
MANGANESE	0.0406	
METHANE	0.141	J
SULFATE	105	
TOTAL ORGANIC CARBON	1.95	J

CEF-16-MW-09D
Natural Attenuation Parameters (mg/L)

ALKALINITY	36.5	
BICARBONATE ALKALINITY	36.5	
BROMIDE	0.32	
CHLORIDE	9.08	J
IRON	0.875	
MANGANESE	0.0198	
METHANE	0.0472	J
ORTHOPHOSPHATE	0.14	
SULFATE	0.26	
TOTAL ORGANIC CARBON	2.78	J

CEF-16-MW-45I
Natural Attenuation Parameters (mg/L)

CHEMICAL OXYGEN DEMAND	83.1	
CHLORIDE	1.45	J
IRON	34.7	
MANGANESE	0.126	
TOTAL ORGANIC CARBON	16.1	J

CEF-16-MW-45I (DUP)
Natural Attenuation Parameters (mg/L)

BIOLOGICAL OXYGEN DEMAND	5.64	
CHEMICAL OXYGEN DEMAND	83.3	
CHLORIDE	111	J
IRON	34.3	
MANGANESE	0.124	
REACTIVE SULFIDE	2	
SULFATE	1.13	
TOTAL ORGANIC CARBON	19.8	J

CEF-16-MW-10S
Natural Attenuation Parameters (mg/L)

ALKALINITY	302	
BICARBONATE ALKALINITY	302	
BIOLOGICAL OXYGEN DEMAND	3.29	
BROMIDE	1.03	
CHEMICAL OXYGEN DEMAND	57.1	
CHLORIDE	2.84	J
IRON	0.815	
MANGANESE	0.339	
METHANE	2.590	J
SULFATE	9.69	
TOTAL ORGANIC CARBON	57.4	J

CEF-16-MW-43S
Natural Attenuation Parameters (mg/L)

ALKALINITY	34.4	
BICARBONATE ALKALINITY	34.6	
BIOLOGICAL OXYGEN DEMAND	26.4	
BROMIDE	0.39	
CHEMICAL OXYGEN DEMAND	156	
CHLORIDE	7.12	J
IRON	1.030	
MANGANESE	0.0841	
METHANE	0.0315	J
SULFATE	16.9	
TOTAL ORGANIC CARBON	61.3	J

CEF-16-MW-44I
Natural Attenuation Parameters (mg/L)

ALKALINITY	8.33	
BICARBONATE ALKALINITY	8.33	
BROMIDE	0.32	
CHEMICAL OXYGEN DEMAND	36.4	
CHLORIDE	4.19	J
IRON	0.499	
MANGANESE	0.0197	
METHANE	0.0549	J
SULFATE	2.03	
TOTAL ORGANIC CARBON	8.28	J

CEF-16-23D
Natural Attenuation Parameters (mg/L)

ALKALINITY	243	
BICARBONATE ALKALINITY	243	
CHEMICAL OXYGEN DEMAND	5.2	
CHLORIDE	3.15	J
IRON	0.495	
MANGANESE	0.0494	
METHANE	0.0445	J
SULFATE	18.1	
TOTAL ORGANIC CARBON	2.41	J

CEF-16-22I
Natural Attenuation Parameters (mg/L)

CHEMICAL OXYGEN DEMAND	10.3	
CHLORIDE	3.62	J
DISSOLVED SULFIDE	19	
IRON	0.597	
MANGANESE	0.0018	
METHANE	0.0147	J
SULFATE	51.5	
TOTAL ORGANIC CARBON	4.33	

CEF-16-MW-41S
Natural Attenuation Parameters (mg/L)

ALKALINITY	14.6	
BICARBONATE ALKALINITY	14.6	
BROMIDE	0.3	
CHEMICAL OXYGEN DEMAND	36.4	
CHLORIDE	4.18	J
IRON	1.250	
MANGANESE	0.0783	
METHANE	0.0196	J
SULFATE	12.3	
TOTAL ORGANIC CARBON	12.5	J

CEF-16-32S
Natural Attenuation Parameters (mg/L)

ALKALINITY	12.6	
BIOLOGICAL OXYGEN DEMAND	8.28	
BROMIDE	0.109	J
CHEMICAL OXYGEN DEMAND	20.2	
CHLORIDE	5.34	J
IRON	0.149	
SULFATE	3.22	J
TOTAL ORGANIC CARBON	3.04	

CEF-16-MW-42I
Natural Attenuation Parameters (mg/L)

ALKALINITY	4.2	
CHEMICAL OXYGEN DEMAND	7.75	
CHLORIDE	2.14	J
IRON	0.921	
MANGANESE	0.0292	
SULFATE	3.89	
TOTAL ORGANIC CARBON	2.57	

CEF-16-27I
Natural Attenuation Parameters (mg/L)

ALKALINITY	5.25	
BROMIDE	0.106	J
CHEMICAL OXYGEN DEMAND	20.2	
CHLORIDE	2.76	J
IRON	1.740	
METHANE	0.014	J
SULFATE	2.5	J
TOTAL ORGANIC CARBON	2.88	

CEF-16-27I (DUP)
Natural Attenuation Parameters (mg/L)

ALKALINITY	2.1	
BROMIDE	0.106	J
CHEMICAL OXYGEN DEMAND	17.7	
CHLORIDE	3.23	J
IRON	1.790	
METHANE	0.0137	J
SULFATE	2.59	J
TOTAL ORGANIC CARBON	2.48	

CEF-16-21S
Natural Attenuation Parameters (mg/L)

ALKALINITY	7.9	
BICARBONATE ALKALINITY	7.9	
CHEMICAL OXYGEN DEMAND	28.6	
CHLORIDE	2.81	J
IRON	0.238	
MANGANESE	0.0015	
SULFATE	0.471	
TOTAL ORGANIC CARBON	16.6	J

CEF-16-35S
Natural Attenuation Parameters (mg/L)

ALKALINITY	5.25	
BROMIDE	0.124	J
CHEMICAL OXYGEN DEMAND	30.4	
CHLORIDE	11.1	J
IRON	0.303	
METHANE	0.0469	J
SULFATE	3.43	J
TOTAL ORGANIC CARBON	7.46	

CEF-16-38S
Natural Attenuation Parameters (mg/L)

ALKALINITY	14.7	
BROMIDE	0.182	J
CHEMICAL OXYGEN DEMAND	35.4	
CHLORIDE	7.7	J
IRON	0.215	
METHANE	0.0225	J
NITRATE	0.339	J
SULFATE	9.92	J
TOTAL ORGANIC CARBON	24.2	

DRAWN BY C. GLICK	DATE 11/13/98
CHECKED BY JPK	DATE 11/16/98
COST/SCHEDULE-AREA	
SCALE AS NOTED	

NATURAL ATTENUATION PARAMETERS - LAB ANALYSIS
(SOURCE AREA AND DOWNGRADIENT)
OPERABLE UNIT 7, SITE 16
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

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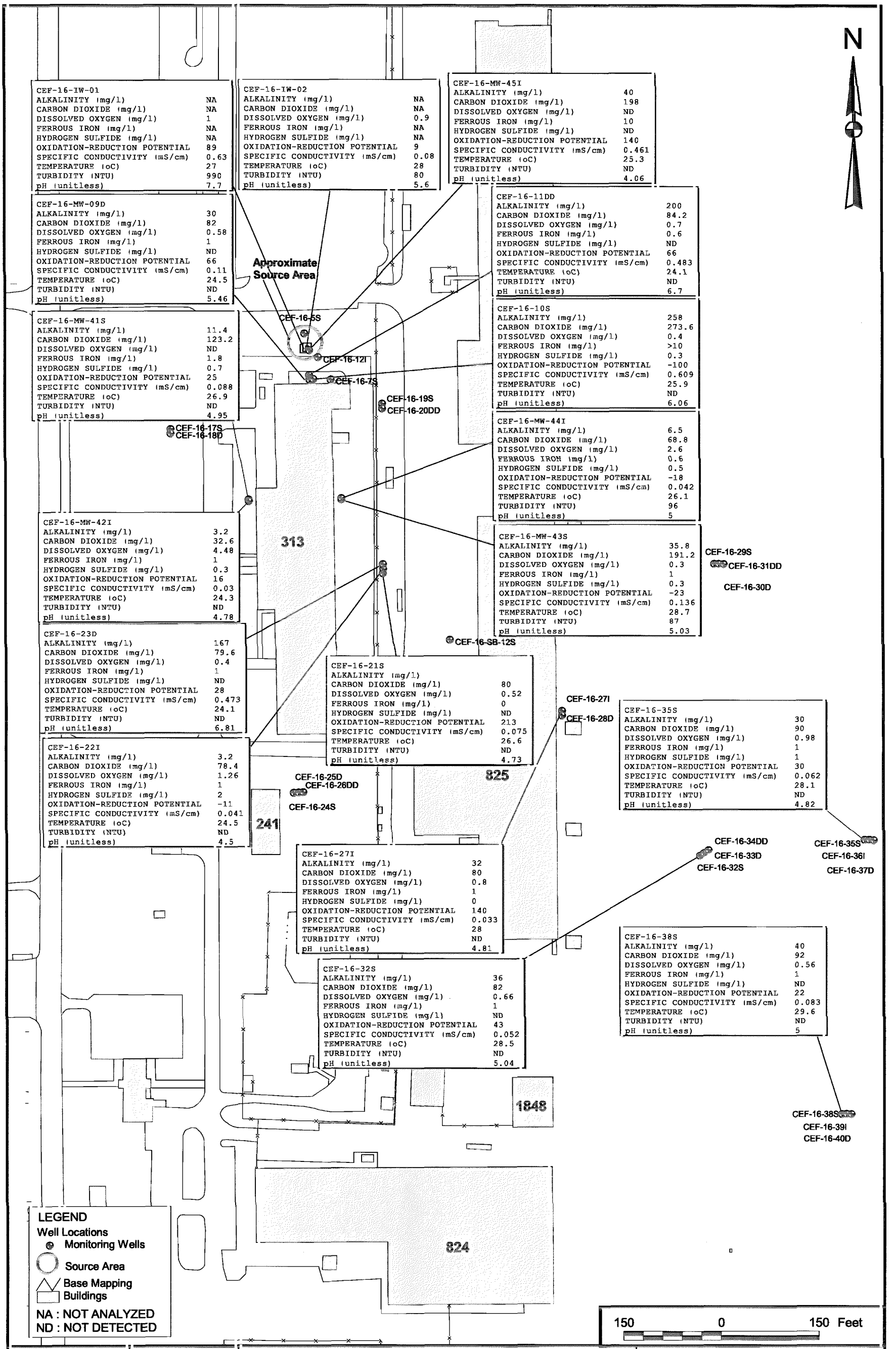

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JPK	11/13/98
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

NATURAL ATTENUATION PARAMETERS - FIELD ANALYSIS
(SOURCE AREA AND DOWNGRADIENT)
OPERABLE UNIT 7, SITE 16
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NUMBER 7792
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VOCs

The analytical results show that 1,1,1-trichloroethane (TCA), 1,1-dichloroethene (1,1-DCE), and trichloroethene (TCE) were detected above the clean-up levels in the groundwater samples from monitoring wells CEF-16-10S and CEF-16-45I. 1,1-DCE and TCE were detected above the clean-up levels in the groundwater samples from injection well IW-02. TCE was detected above the clean-up levels in the groundwater samples from injection well IW-01 and monitoring wells CEF-16-11DD, CEF-16-22I, CEF-16-23D, CEF-16-27I, CEF-16-32S, CEF-16-41S, and CEF-16-42I. The higher concentrations were detected in the source area shown on Figure 2-4 with a general trend of decreasing concentration in the direction of groundwater flow. The detection of these parameters was consistent with the findings of the previous sampling events, which also detected higher concentrations in the source area.

No VOCs were detected in the groundwater samples obtained from monitoring wells CEF-16-35S, a cross-gradient well and CEF-16-38S, a well downgradient of the plume identified during the RI. VOC's were also not detected in groundwater samples from monitoring wells CEF-16-09D, CEF-16-43S, and CEF-16-44I.

SVOCs

Bis(2-ethylhexyl)phthalate (BEHP) is the only SVOC COC identified in the RI. The analytical results for this sampling event show that BEHP was detected in only one monitoring well (CEF-16-27I) at a concentration above its clean-up level.

BEHP was detected in 25 out of 30 wells sampled during the RI ranging in concentration from 0.5 J to 20.5 µg/L. Concentrations in 12 of these samples were above the clean-up level. In September 1998, BEHP was detected in 12 of the 17 groundwater samples. However, only one sample was above the clean-up level (6 µg/L) at a concentration of 11 µg/L at monitoring well CEF-16-27I. These concentration levels of BEHP are a reflection of contamination from laboratory equipment, and therefore BEHP is not regarded as a COC.

Oxidation Reduction Potential

The oxidation reduction potential (redox potential) is a measure of the relative tendency of the groundwater solution to accept or donate electrons and can provide evidence of the type of biodegradation processes that are active in a particular plume or even within different portions of the same plume. However, great care must be taken during the evaluation of ORP data since most natural waters

are usually mixed potentials, which cannot be related to a single electron couple. Therefore, redox potential should only be used as a qualitative indicator of the overall oxidation-reduction state and as a general indication of the efficiency of the reductive dechlorination.

The redox potential in the groundwater samples from the source area ranged from -100 to +140 mV. These redox potentials are within the possible range for possible reductive dechlorination and may be associated with an iron and sulfate reducing metabolic pathways.

The redox potential in the groundwater samples in the downgradient plume area ranged from -23 to +213 mV. These redox potentials indicated less reducing but generally the same conditions as the source area for metabolic pathways.

The redox potential from the past sampling events indicated the metabolic pathway was methanogenic. The methanogenic condition corresponds to a highly reduced environment that is needed for optimal biodegradation of the chlorinated solvents. The August/September 1998 sampling results were approximately the same as the previous sampling events, however the redox potential suggests that iron reducing and sulfate reducing conditions exists at the site.

Dissolved Oxygen

The dissolved oxygen concentrations in the groundwater samples ranged from 0 to 4.48 mg/L. The concentration of dissolved oxygen in the source area range from 0 to 1.0 mg/L. Dissolved oxygen concentrations less than 0.5 mg/L indicate that anaerobic conditions exist and are necessary for reductive dechlorination to occur.

The groundwater samples from the downgradient area of the plume also indicated anaerobic conditions. The dissolved oxygen concentrations were 0.3 mg/L, 0.52 mg/L, and 0.66 mg/L in monitoring wells CEF-16-43S, CEF-16-21S, and CEF-16-32S, respectively. Two of the wells (CEF-16-42I and CEF-16-44I) that were installed during this monitoring event had dissolved oxygen concentrations greater than 2.5 mg/L, indicating aerobic conditions. However, this may be an anomaly that is a result of the recent installation and development of these monitoring wells.

The concentration of dissolved oxygen in the monitoring wells outside of the plume (CEF-16-35S and CEF-16-38S) ranged from 0.6 to 1 mg/L.

These dissolved oxygen concentrations were consistent with the findings in the previous sampling events. The dissolved oxygen concentration in the source area and downgradient plume indicated generally anaerobic conditions.

Nitrate and Nitrite

Nitrate and nitrite were not detected during the September 1998 sampling event as well as the past sampling events. This indicates that nitrate reduction is not a predominant microbial process at the site. Therefore, nitrate and nitrite analysis in future sampling events should be considered only for the first year to determine if seasonal variations are significant.

Ferrous Iron/Total Iron

Concentrations of ferrous iron ranged from 0.6 to greater than 10 mg/L in the source area and from 0 to 1.8 mg/L in the downgradient area of the plume. The monitoring wells outside the plume area had ferrous iron concentrations of 1 mg/L. An elevated concentration of ferrous iron was detected in monitoring well CEF-16-10S at the maximum concentration greater than 10 mg/L. This is an indication that ferric iron reduction is a predominant microbial process in this area. However, the concentration of ferrous iron was not elevated within the plume. This indicates that ferric iron reduction is probably not occurring within the plume and is probably not a predominant microbial process in that area. Ferrous iron concentrations in the past sampling events were less than 1 mg/L in the downgradient plume.

Total iron concentrations ranged from 0.365 to 34.7 mg/L in the source area and from 0.149 to 1.25 mg/L in the downgradient plume. The monitoring wells outside the plume area had total iron concentrations of 0.215 to 0.303 mg/L. Total iron concentrations were detected in all wells sampled, indicating a supply of iron is available to act as a potential electron receptor.

Total Manganese

Total manganese concentrations ranged from 20 to 399 µg/L in the source area and from below detection limits to 84 µg/L in the downgradient area of the plume. Total manganese was not detected in the groundwater samples outside the plume area. Manganese was not analyzed in the past sampling events. Manganese concentrations were detected in the wells sampled in the source and plume area, indicating a supply of manganese is available to act as a potential electron receptor. Because manganese was detected only in the source and plume areas, it is likely that manganese reduction accounts for some portion of the biodegradation potential at the site.

Sulfate, Sulfide, and Hydrogen Sulfide

The sulfate concentration in shallow groundwater samples increased from 9.7 mg/L in the source area at monitoring well CEF-16-10S to 16.9 mg/L in the downgradient plume at monitoring well CEF-16-43S. The sulfate concentration decreased to 0.5 mg/L in the groundwater sample from monitoring well CEF-16-21S in the downgradient direction of the plume and then increased to 9.9 mg/L in the groundwater sample from monitoring wells CEF-16-38S, a well downgradient and outside the plume. The decrease in concentration between monitoring wells CEF-16-43S and CEF-16-21S is an indication that a sulfate reducing condition may exist in the shallow groundwater in this area of the plume. The sulfate reducing condition is confirmed by an increase in hydrogen sulfide and/or sulfide concentration as well as carbon dioxide concentration which is generated as a result of the anaerobic bacteria using sulfate as an electron acceptor to degrade the chlorinated hydrocarbons.

The sulfate concentration in the intermediate groundwater samples increased from the source area to the downgradient plume and then decreased within the downgradient plume from monitoring well CEF-16-22I (51.5 mg/L) to CEF-16-27I (2.5 mg/L). The decrease in concentration between these monitoring wells is an indication that a sulfate reducing condition may exist in the intermediate groundwater. No other intermediate wells were sampled further downgradient to identify the extent of the sulfate reducing environment.

Dissolved sulfide was not detected in the shallow groundwater samples and the hydrogen sulfide concentrations did not show a pattern of increasing concentration to confirm a sulfate-reducing environment. Dissolved sulfide was detected in one intermediate groundwater sample (monitoring well CEF-16-22I) indicating an increase in sulfide concentration in an area where sulfate concentration is decreasing in the intermediate groundwater zone. The hydrogen sulfide concentrations also showed an increase between monitoring wells CEF-16-44I and CEF-16-22I, confirming the possibility of a sulfate-reducing environment existing between these wells in the intermediate groundwater zone.

The past sampling activities did not show a decrease in the sulfate concentration or an increase in the sulfide concentration over the length of the contaminant plume for the wells that were sampled. The past sampling events indicated that sulfate reduction was not a predominant biodegradation mechanism.

Orthophosphate

Orthophosphate was detected in only one groundwater sample. Due to the lack of phosphate as an electron acceptor in the groundwater, it is unlikely that phosphate reduction is a significant portion of the total biodegradation capacity of the aquifer. Phosphorus is an important nutrient for microbes and its

absence may limit the overall biodegradation capacity of the aquifer. Phosphate analysis in future sampling events should be considered only for the first year to determine if seasonal variations are significant.

Methane, Ethane, and Ethene

The presence of methane above background concentrations is indicative of a strong reducing environment. The presence of ethane and ethene (byproducts of TCE, DCE, and vinyl chloride biodegradation) indicates biodegradation has occurred. Methane, ethane, and ethene were detected in the groundwater sample from monitoring well CEF-16-10S, indicating that a reducing environment and subsequent biodegradation of the chlorinated hydrocarbons is occurring in this area. Vinyl chloride was also detected in this well at a concentration of 32 µg/L, also indicating biodegradation. Methane concentration decreased by two orders of magnitude in the downgradient direction of the contaminant plume (from monitoring wells CEF-16-10S to CEF-16-43S) and remained fairly constant downgradient of CEF-16-43S. Ethane, ethene and vinyl chloride were not detected in any of the other wells sampled during this sampling event.

The findings of this sampling event were consistent with findings of past sampling events. The concentration of methane was the highest in CEF-16-10S. The past sampling events and this sampling event indicated that methanogenic conditions exist in the source area and it is a predominant biodegradation mechanism. Ethene and ethane were also detected in the source area shallow aquifer. Ethane and ethene were not detected in any other monitoring well samples.

Carbon Dioxide

The concentration of carbon dioxide in the source area of both the shallow and the intermediate groundwater was more than twice the concentration detected in the downgradient plume. The carbon dioxide concentrations downgradient of the source area were generally observed to be within the range of the cross-gradient well. This is an indication that anaerobic biodedegradation is occurring in the source area, since carbon dioxide is a byproduct of the biodegradation processes. These findings are consistent with the findings of the past sampling events.

Alkalinity

The results of laboratory and field alkalinity analyses indicated that alkalinity concentrations in the source area exceeded the background/cross-gradient concentrations. In addition, the concentration decreased from the source area to the downgradient plume area in both the shallow and intermediate groundwater.

The alkalinity concentration in the downgradient monitoring wells was observed to be similar to that measured in the cross-gradient well. The decrease in the alkalinity in the downgradient direction of the plume is an indication that carbon dioxide is likely being generated as a biodegradation end product. The high concentration of carbon dioxide (producing carbonic acid) in the source area supports the alkalinity data. The alkalinity concentration also decreased between monitoring wells CEF-16-32S and CEF-16-35S. This decrease supports the carbon dioxide increase between these wells as discussed above. These findings are consistent with the findings of past sampling events.

Chloride

The chloride concentrations increased in the source area in both the shallow and intermediate groundwater. The increase in chloride concentration is another line of evidence that indicates reductive dechlorination is occurring. The past sampling activities concluded that the chloride concentrations were slightly elevated in the shallow and deep monitoring wells in the source area and that reductive dechlorination was occurring.

Organic Carbon

Total Organic Carbon (TOC) was analyzed during this sampling event. Dissolved organic carbon (DOC) was analyzed during past sampling events. Carbon acts an energy source for reductive dechlorination. Because chlorinated hydrocarbons are used as electron acceptors during reductive, there needs to be a sufficient supply of organic carbon as the primary substrate for microbial growth. Organic carbon concentrations greater than 20 mg/L in the aquifer indicate a sufficient supply of carbon to act as the primary substrate.

TOC concentrations range from 2 mg/L in monitoring well CEF-16-11DD to 57 mg/L in CEF-16-10S in the source area. The TOC concentration generally decreased in the downgradient direction of the contaminant plume and was less than 20 mg/L. The TOC concentration in the groundwater in the source area is present at sufficient concentrations to act as the primary substrate for reductive dechlorination.

The DOC concentrations detected during past sampling events were elevated within the source area and in the downgradient plume. It was concluded that a sufficient source of carbon was available to support reductive dechlorination in the source area and downgradient plume.

Biochemical Oxygen Demand and Chemical Oxygen Demand

The biochemical oxygen demand (BOD) and chemical oxygen demand (COD) provide a general indication of the amount of oxygen required to biologically and chemically degrade organic matter. BOD and/or COD were detected in the groundwater samples from the monitoring wells that showed concentrations of the chemicals of concern. The BOD and COD results are shown on Figure 2-6. There was no correlation between the concentrations of BOD and COD. BOD and COD analysis was not performed in the past sampling events.

Since the biodegradation of the chlorinated hydrocarbons occurs in an anaerobic system that is beneficial for reductive dechlorination, the analysis for these parameters is not required. BOD and COD analysis in future sampling events should not be considered.

pH, Temperature, and Specific Conductivity

The pH of the shallow groundwater followed a similar trend as the alkalinity concentrations discussed previously. The pH decreased from the source area to the downgradient plume area in the shallow groundwater. The pH increased slightly in the downgradient direction of the contaminant plume followed by a pH decrease between monitoring wells CEF-16-32S and CEF-16-35S. The pH increased outside the plume area beyond CEF-16-35S. The decrease in the pH in the downgradient direction of the plume, along with the decrease in the alkalinity, indicates the groundwater is becoming more acidic.

The pH of the groundwater ranged from 4.06 to 7.70. The past sampling events were consistent with this sampling event. This range of pH indicates the groundwater is neutral to slightly acidic and in general is amenable to biodegradation, with the ideal pH being in the range of 5 to 9.

The temperature of the groundwater ranged from 24.1 to 29.6°C, similar to the temperatures in the past sampling events. This temperature range is within the range of values acceptable for biodegradation to take place, with the ideal temperature being greater than 20°C.

The specific conductance values ranged from 0.030 to 0.63 ms/cm and in general decreased in the downgradient direction in the shallow, intermediate, and deep groundwater samples. The relatively minor fluctuation indicates that all groundwater samples were from a consistent source.

General Observations

The overall reduction of VOC concentrations in the source area and the downgradient plume in the area of monitoring well CEF-16-32S since the 1991 sampling event is the strongest line of evidence that natural attenuation is occurring. However, the VOC concentrations have not decreased since the February 1998 sampling event. In addition, results from the new monitoring well CEF-16-45I indicate that the TCE concentration in the source area is between 220,000 and 410,000 µg/L.

The interpretations from the geochemical data support natural attenuation in the form of reductive dechlorination. The byproduct indicators of biodegradation suggest reductive dechlorination is occurring in the source area and some areas of the downgradient plume (specifically in the area of monitoring well CEF-16-32S). The specific anaerobic processes include methanogenesis, sulfate reduction, and iron reduction.

The redox potential of the groundwater is within the range necessary for reductive dechlorination, and indicates that iron and sulfate reducing conditions are the likely the metabolic pathways for biodegradation. Furthermore, ferrous iron concentrations indicate that iron reduction is an active microbial process in the source area near CEF-16-10S and CEF-16-45I. Total iron was detected in all the wells indicating that a supply of iron is available to act as potential electron receptors. Similar to the total iron, total manganese was detected in the monitoring wells in the source area and downgradient plume. Therefore, manganese is also available to act as a potential electron receptor.

A sufficient supply of sulfate was detected in the shallow and intermediate groundwater to provide electron receptors for sulfate reduction. Dissolved sulfide ion concentrations were detected in one well, supporting the likelihood of a sulfate-reducing condition between monitoring wells CEF-16-43I and CEF-16-22I.

The potential byproducts of biodegradation (methane, vinyl chloride, ethane, ethene, carbon dioxide, and chloride) were detected in several groundwater samples. The results support the proposition that reductive dechlorination is occurring in the source area and that it is likely the result of methanogenic conditions.

2.3.2 Natural Attenuation Screening Matrix

In accordance with the Draft Region 4 Suggested Practices for Evaluation of a Site for Natural Attenuation (Biological Degradation) of Chlorinated Solvents (USEPA, 1997), the analytical data was evaluated quantitatively using the preliminary screening matrix to derive an interpretive score. The following table presents the range of possible scores and provides an interpretation for each score.

Score	Interpretation
0 to 5	Inadequate evidence for biodegradation of chlorinated organics
6 to 14	Limited evidence for biodegradation of chlorinated organics
15 to 20	Adequate evidence for biodegradation of chlorinated organics
>20	Strong evidence for biodegradation of chlorinated organics

The Region 4 screening approach is very similar to that presented in the Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater (U.S. EPA 1998). There are minor differences in the number of points awarded for methane, pH, ethene/ethane, and several daughter products.

The screening matrix was evaluated for the wells contaminated with TCE, monitoring well CEF-16-10S representing the shallow upper zone surficial aquifer source area, monitoring well CEF-16-35S representing the shallow upper zone surficial aquifer, and monitoring well CEF-16-45I representing the intermediate zone surficial aquifer source area. These contaminated wells were compared to monitoring well CEF-16-35S, which is a cross-gradient well and was assumed to represent background concentrations. The scores for the screening matrices range in value from 8 to 20. The preliminary screening matrices for these contaminated wells are shown on Tables 2-4, 2-5, 2-6, and 2-7.

Comparing these scores to the above table indicates that there is adequate evidence for the biodegradation of the chlorinated solvents at this site in the source area (near monitoring wells CEF-16-10S and CEF-16-45I). The score for the downgradient shallow aquifer (CEF-16-32S) and downgradient intermediate aquifer (CEF-16-27I and CEF-16-44I) indicates that there is limited evidence for the biodegradation of the chlorinated solvents. The score for the downgradient plumes are bordering the score range for inadequate evidence of biodegration.

It is anticipated that the operation of the AS/SVE system will affect the biodegradation processes of the source area and possibly the downgradient plume. The air sparging system forces oxygen into the source area creating aerobic conditions. This will tend to stop the anaerobic biodegradation processes in the source area. As a result, the available electron acceptor pool (ferric iron, sulfate, carbon dioxide, etc.) utilized during reductive dechlorination will not be consumed in the source area. Over time the electron acceptor pool will migrate in the direction of groundwater flow into the downgradient plume. The significant increase of electron acceptors in the downgradient plume will accelerate the reductive dechlorination of the downgradient plume by natural attenuation. It is anticipated that the screening matrix scores in the downgradient plume will increase after the groundwater remediation system in the source area is in operation.

TABLE 2-4

ANALYTICAL PARAMETERS AND WEIGHTING FOR PRELIMINARY NATRUAL ATTENUATION SCREENING MONITORING WELL CEF-16-10S (SOURCE AREA SURFICIAL AQUIFER) OPERABLE UNIT 7, SITE 16 NAS CECIL FIELD, JACKSONVILLE, FLORIDA

Analyte	Units	Contaminanted Zone Concentration	OU 7, Site 16* Concentration	Available Points	Site Points	Intrepretation
ORP (Eh)	mV	<50		1		Reductive pathway possible
	mV	<-100	**66**	2	**0**	Reductive pathway likely
Dissolved Oxygen	mg/L	<0.5		3		Tolerated; supresses reductive dechlorination at higher concentrations
	mg/L	>1	**0.58**	-3	**0**	Vinyl chloride may be oxidized aerobically, but reductive dechlorination will not occur
Nitrate	mg/L	<1	**ND**	2	**2**	May compete with reductive pathway at higher concentrations
Ferrous Iron (Fe2+)	mg/L	>1	**110**	3	**3**	Reductive pathway possible
Sulfate	mg/L	<20	**9.69**	2	**2**	May compete with reductive pathway at higher concentrations
Sulfide	mg/L	>1	**ND/0.3**	3	**0**	Reductive pathway possible
Methane	mg/L	>0.1		2		Ultimate reductive daughter product
	mg/L	>1		3		Vinyl chloride accumulates
	mg/L	<0.1	**2.5**	0	**3**	Vinyl chloride oxidizes
Ethene/Ethane	mg/L	>0.01		2		Daughter product of vinyl chloride/ethene
	mg/L	>0.1	**0.142/0.047**	3	**3**	Daughter product of vinyl chloride/ethene
Carbon Dioxide	mg/L	>2x BG(BG=90)	**273.6**	1	**1**	Ultimate oxidative daughter product
Chloride	mg/L	>2x BG(BG=11)	**2.84**	2	**0**	Daughter product of organic chlorine; compare chloride in plume to background conditions
Alkalinity	mg/L	>2x BG(BG=5/30)	**302/258**	1	**1**	Results from interaction of carbon dioxide with aquifer minerals
DOC	mg/L	>20	**57.4 (TOC)**	2	**2**	Carbon and energy source; drives dechlorination; can be natural or anthropogenic
pH	units	5<pH<9	**6.06**	-	**-**	Tolerated range for reductive pathway
Temperature	deg-C	>20	**25.9**	1	**1**	At T> 20EC, biochemical process is accelerated
Perchloroethene	ug/L	-	**ND**	-	**0**	Material released
Trichloroethene	ug/L	-	**45.9**	2 (b)	**0**	Material released or daughter product of perchloroethene
Dichloroethene	ug/L	-	**231**	2 (b)	**0**	Material released or daughter product of trichloroethene; if amount of cis-1,2-dichloroethene is greater than 80% of total dichloroethene, it is likely a daughter product of trichloroethene
Vinyl Chloride	ug/L	-	**32**	2 (b)	**2**	Material released or daughter product of dichloroethenes
Chloroethane	ug/L	-	**ND**	2 (b)	**0**	Daughter product of vinyl chloride under reducing conditions
1,1,1-Trichloroethane	ug/L	-	**1300**	-	**0**	Material released
1,1-dichloroethene	ug/L	-	**231**	-	**0**	Daughter product of TCE or chemical reaction of 1,1,1-trichloroethane
Total Score				33	**20**	Adequate Evidence

Reference: Draft Region IV Suggested Practices for Evalution of a Site for Natural Attenuation (Biological Degradation) of Chlorinated Solvents

* - Value may be an average of two or more numbers or a maximum detection.

(b) - Points awarded only if if it can be shown that the compound is a daughter product.

Background monitoring well is assumed to be CEF-16-35S which is cross-gradient from the plume

TABLE 2-5

ANALYTICAL PARAMETERS AND WEIGHTING FOR PRELIMINARY NATURAL ATTENUATION SCREENING
MONITORING WELL CEF-16-32S (DOWNGRADIENT SURFICIAL AQUIFER)
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD, JACKSONVILLE, FLORIDA

Analyte	Units	Contaminanted Zone Concentration	OU 7, Site 16* Concentration	Available Points	Site Points	Intrepretation
ORP (Eh)	mV	<50		1		Reductive pathway possible
	mV	<-100	43	2	1	Reductive pathway likely
Dissolved Oxygen	mg/L	<0.5		3		Tolerated; supresses reductive dechlorination at higher concentrations
	mg/L	>1	0.66	-3	0	Vinyl chloride may be oxidized aerobically, but reductive dechlorination will not occur
Nitrate	mg/L	<1	ND	2	2	May compete with reductive pathway at higher concentrations
Ferrous Iron (Fe2+)	mg/L	>1	1	3	3	Reductive pathway possible
Sulfate	mg/L	<20	3.22	2	2	May compete with reductive pathway at higher concentrations
Sulfide	mg/L	>1	ND/0.0	3	0	Reductive pathway possible
Methane	mg/L	>0.1		2		Ultimate reductive daughter product
	mg/L	>1		3		Vinyl chloride accumulates
	mg/L	<0.1	ND	0	0	Vinyl chloride oxidizes
Ethene/Ethane	mg/L	>0.01		2		Daughter product of vinyl chloride/ethene
	mg/L	>0.1	ND	3	0	Daughter product of vinyl chloride/ethene
Carbon Dioxide	mg/L	>2x BG (BG=90)	82	1	0	Ultimate oxidative daughter product
Chloride	mg/L	>2x BG(BG=11)	5.34	2	0	Daughter product of organic chlorine; compare chloride in plume to background conditions
Alkalinity	mg/L	>2x BG(BG=5/30)	12.6/36	1	0	Results from interaction of carbon dioxide with aquifer minerals
DOC	mg/L	>20	3.04 (TOC)	2	0	Carbon and energy source; drives dechlorination; can be natural or anthropogenic
pH	units	5<pH<9	5.04	-	-	Tolerated range for reductive pathway
Temperature	deg-C	>20	28.5	1	1	At T> 20EC, biochemical process is accelerated
Perchloroethene	ug/L	-	ND	-	0	Material released
Trichloroethene	ug/L	-	126	2 (b)	0	Material released or daughter product of perchloroethene
Dichloroethene	ug/L	-	0.3	2 (b)	0	Material released or daughter product of trichloroethene; if amount of cis-1,2-dichloroethene is greater than 80% of total dichloroethene, it is likely a daughter product of trichloroethene
Vinyl Chloride	ug/L	-	ND	2 (b)	0	Material released or daughter product of dichloroethenes
Chloroethane	ug/L	-	ND	2 (b)	0	Daughter product of vinyl chloride under reducing conditions
1,1,1-Trichloroethane	ug/L	-	ND	-	0	Material released
1,1-dichloroethene	ug/L	-	0.3	-	0	Daughter product of TCE or chemical reaction of 1,1,1-trichloroethane
Total Score				33	9	**Limited Evidence**

Reference: Draft Region IV Suggested Practices for Evaluation of a Site for Natural Attenuation (Biological Degradation) of Chlorinated Solvents

* - Value may be an average of two or more numbers or a maximum detection.

(b) - Points awarded only if if it can be shown that the compound is a daughter product.

Background monitoring well is assumed to be CEF-16-35S which is cross-gradient from the plume

TABLE 2-6

ANALYTICAL PARAMETERS AND WEIGHTING FOR PRELIMINARY NATURAL ATTENUATION SCREENING
MONITORING WELL CEF-16-45I (SOURCE AREA INTERMEDIATE AQUIFER)
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD, JACKSONVILLE, FLORIDA

Analyte	Units	Contaminanted Zone Concentration	OU 7, Site 16* Concentration	Available Points	Site Points	Intrepretation
ORP (Eh)	mV	<50		1		Reductive pathway possible
	mV	<-100	**140**	2	**0**	Reductive pathway likely
Dissolved Oxygen	mg/L	<0.5		3		Tolerated; supresses reductive dechlorination at higher concentrations
	mg/L	>1	**0**	-3	**3**	Vinyl chloride may be oxidized aerobically, but reductive dechlorination will not occur
Nitrate	mg/L	<1	**ND**	2	**2**	May compete with reductive pathway at higher concentrations
Ferrous Iron (Fe2+)	mg/L	>1	**10**	3	**3**	Reductive pathway possible
Sulfate	mg/L	<20	**ND/1.13**	2	**2**	May compete with reductive pathway at higher concentrations
Sulfide	mg/L	>1	**0**	3	**0**	Reductive pathway possible
Methane	mg/L	>0.1		2		Ultimate reductive daughter product
	mg/L	>1		3		Vinyl chloride accumulates
	mg/L	<0.1	**ND**	0	**0**	Vinyl chloride oxidizes
Ethene/Ethane	mg/L	>0.01		2		Daughter product of vinyl chloride/ethene
	mg/L	>0.1	**ND**	3	**0**	Daughter product of vinyl chloride/ethene
Carbon Dioxide	mg/L	>2x BG(BG=90)	**198**	1	**1**	Ultimate oxidative daughter product
Chloride	mg/L	>2x BG(BG=11)	**1.45/111**	2	**2**	Daughter product of organic chlorine; compare chloride in plume to background conditions
Alkalinity	mg/L	>2x BG(BG=5/30)	**ND/40**	1	**0**	Results from interaction of carbon dioxide with aquifer minerals
DOC	mg/L	>20	**16.1/19.8 (TOC)**	2	**0**	Carbon and energy source; drives dechlorination; can be natural or anthropogenic
pH	units	5<pH<9	**4.06**	-	**-**	Tolerated range for reductive pathway
Temperature	deg-C	>20	**25.3**	1	**1**	At T> 20EC, biochemical process is accelerated
Perchloroethene	ug/L	-	**ND**	-	**0**	Material released
Trichloroethene	ug/L	-	**>220000**	2 (b)	**0**	Material released or daughter product of perchloroethene
Dichloroethene	ug/L	-	**810/1000**	2 (b)	**1**	Material released or daughter product of trichloroethene; if amount of cis-1,2-dichloroethene is greater than 80% of total dichloroethene, it is likely a daughter product of trichloroethene
Vinyl Chloride	ug/L	-	**ND**	2 (b)	**0**	Material released or daughter product of dichloroethenes
Chloroethane	ug/L	-	**ND**	2 (b)	**0**	Daughter product of vinyl chloride under reducing conditions
1,1,1-Trichloroethane	ug/L	-	**1600**	-	**0**	Material released
1,1-dichloroethene	ug/L	-	**810/1000**	-	**0**	Daughter product of TCE or chemical reaction of 1,1,1-trichloroethane
Total Score				33	**15**	**Adequate Evidence**

Reference: Draft Region IV Suggested Practices for Evaluation of a Site for Natural Attenuation (Biological Degratation) of Chlorinated Solvents

* - Value may be an average of two or more numbers or a maximum detection.

(b) - Points awarded only if if it can be shown that the compound is a daughter product.

Background monitoring well is assumed to be CEF-16-35S which is cross-gradient from the plume

TABLE 2-7

ANALYTICAL PARAMETERS AND WEIGHTING FOR PRELIMINARY NATURAL ATTENUATION SCREENING MONITORING WELLS CEF-16-27I AND CEF-16-44I (DOWNGRADIENT INTERMEDIATE AQUIFER) OPERABLE UNIT 7, SITE 16 NAS CECIL FIELD, JACKSONVILLE, FLORIDA

Analyte	Units	Contaminanted Zone Concentration	OU 7, Site 16* Concentration	Available Points	Site Points	Intrepretation
ORP (Eh)	mV	<50		1		Reductive pathway possible
	mV	<-100	-15	2	1	Reductive pathway likely
Dissolved Oxygen	mg/L	<0.5		3		Tolerated; supresses reductive dechlorination at higher concentrations
	mg/L	>1	1.9	-3	0	Vinyl chloride may be oxidized aerobically, but reductive dechlorination will not occur
Nitrate	mg/L	<1	ND	2	0	May compete with reductive pathway at higher concentrations
Ferrous Iron (Fe2+)	mg/L	>1	0.8	3	1	Reductive pathway possible
Sulfate	mg/L	<20	26	2	0	May compete with reductive pathway at higher concentrations
Sulfide	mg/L	>1	1.25	3	3	Reductive pathway possible
Methane	mg/L	>0.1		2		Ultimate reductive daughter product
	mg/L	>1		3		Vinyl chloride accumulates
	mg/L	<0.1	0.03	0	2	Vinyl chloride oxidizes
Ethene/Ethane	mg/L	>0.01		2		Daughter product of vinyl chloride/ethene
	mg/L	>0.1	ND	3	0	Daughter product of vinyl chloride/ethene
Carbon Dioxide	mg/L	>2x BG(BG=90)	73	1	0	Ultimate oxidative daughter product
Chloride	mg/L	>2x BG(BG=11)	3.9	2	0	Daughter product of organic chlorine; compare chloride in plume to background conditions
Alkalinity	mg/L	>2x BG(BG=5/30)	4/5	1	0	Results from interaction of carbon dioxide with aquifer minerals
DOC	mg/L	>20	6 (TOC)	2	0	Carbon and energy source; drives dechlorination; can be natural or anthropogenic
pH	units	5<pH<9	4.75	-	-	Tolerated range for reductive pathway
Temperature	deg-C	>20	25	1	1	At T> 20EC, biochemical process is accelerated
Perchloroethene	ug/L	-	ND	-	0	Material released
Trichloroethene	ug/L	-	3.2	2 (b)	0	Material released or daughter product of perchloroethene
Dichloroethene	ug/L	-	ND	2 (b)	0	Material released or daughter product of trichloroethene; if amount of cis-1,2-dichloroethene is greater than 80% of total dichloroethene, it is likely a daughter product of trichloroethene
Vinyl Chloride	ug/L	-	ND	2 (b)	0	Material released or daughter product of dichloroethenes
Chloroethane	ug/L	-	ND	2 (b)	0	Daughter product of vinyl chloride under reducing conditions
1,1,1-Trichloroethane	ug/L	-	ND	-	0	Material released
1,1-dichloroethene	ug/L	-	ND	-	0	Daughter product of TCE or chemical reaction of 1,1,1-trichloroethane
Total Score				33	8	**Limited Evidence**

Reference: Draft Region IV Suggested Practices for Evaluation of a Site for Natural Attenuation (Biological Degradation) of Chlorinated Solvents

* - Value may be an average of two or more numbers or a maximum detection.

(b) - Points awarded only if if it can be shown that the compound is a daughter product.

Background monitoring well is assumed to be CEF-16-35S which is cross-gradient from the plume

2.3.3 Degradation Pathways

The monitoring wells in the source area (CEF-16-10S and CEF-16-45I) contain concentrations of TCE, the assumed source product, and many of the assumed reductive dechlorination daughter products, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, vinyl chloride, ethene, ethane, and carbon dioxide. Concentrations of the TCE and daughter products decrease significantly outside the source area in the downgradient direction in monitoring wells CEF-16-43S, CEF-16-44I, CEF-16-21S and CEF-16-22I.

Chlorinated solvent plumes exhibit three types of behavior depending on the type and amount of organic carbon in the aquifer. Type 1 behavior occurs where the primary substrate is anthropogenic carbon (BTEX, landfill leachate, etc.) and the degradation of this anthropogenic carbon drives reductive dechlorination. Type 2 behavior occurs in a chlorinated solvent plume where the primary substrate is native organic carbon which drives the reductive dechlorination (biodegradation) of the solvent. Type 3 behavior occurs in a chlorinated solvent plume where there is an inadequate source of carbon to drive reductive dechlorination, and therefore the dissolved oxygen that is typically present in an aquifer is not utilized and the plume remains aerobic. Under Type 3 behavior, reductive dechlorination will not occur.

Based on the RI and historical data, no BTEX or other anthropogenic carbon sources were detected in the investigations at OU7, Site 16. It is therefore assumed Type I behavior is not occurring at this site.

Total organic carbon was detected in the groundwater sample from monitoring well CEF-16-45I at an average concentration of 18.0 mg/L and the groundwater sample from monitoring well CEF-16-10S at a concentration of 57.4 mg/L. These total organic carbon concentrations, along with the lack of oxygen and concentrations of ferrous iron and sulfate, indicate the source area has conditions for Type 2 geochemical behavior. The Type 2 geochemical behavior for the intermediate surficial aquifer is limited to the source area.

The dissolved oxygen concentration is increasing in the intermediate surficial aquifer near monitoring well CEF-16-44I and CEF-16-22I to greater than 1 mg/L indicating the condition of the plume in the intermediate zone has changed to Type 3 geochemical behavior. The concentration of the TCE as well as the concentrations of the daughter products have decreased significantly. The biodegradation rate to remove the remaining TCE will be slow because reductive dechlorination will have slowed considerably in this area.

The Type 2 geochemical behavior for the shallow surficial aquifer extends at least 350 feet downgradient from the source area to monitoring well CEF-16-21S. The dissolved oxygen concentration is increasing in the groundwater in the shallow surficial aquifer near monitoring well CEF-16-32S to a concentration of 0.7 mg/L indicating the condition of the plume is changing to Type 3 geochemical behavior. The concentration of TCE as well as the concentrations of the daughter products has decreased significantly from CEF-16-10S to CEF-10-43S and CEF-16-21S. There is a rebound in the concentration of TCE in the groundwater sample from monitoring well CEF-16-32S and the biodegradation rate to remove the rebounded TCE will be slow because reductive dechlorination will be slowing in this area.

The major active reductive pathways appear to be iron reduction and methanogenesis with sulfate and manganese reduction as minor pathways. Iron reduction appears to be the predominant biodegradation mechanism in the intermediate groundwater in the source area, iron reduction and methanogenesis appear to be the predominant biodegradation mechanisms in the shallow groundwater in the source area, and sulfate reduction appears to be a biodegradation mechanism in the intermediate and shallow groundwater plume. The specific degradation mechanisms and pathways are discussed in additional detail in the following paragraphs.

The elevated concentration of ferrous iron in the shallow and intermediate groundwater samples from the monitoring wells CEF-16-10S and CEF-16-45I indicates the Type 2 behavior in the source area consists of an iron reduction zone. Ferric iron is being used as an electron acceptor resulting in the generation of ferrous iron and carbon dioxide. This iron-reduced zone in the groundwater is efficient for the reductive dechlorination of TCE to DCE and TCA to DCA, however, iron reduction is not efficient for reduction of DCE to vinyl chloride and DCA to chloroethane. Therefore, it is expected that DCE and DCA would accumulate and vinyl chloride and chloroethane would not accumulate in this area.

The shallow groundwater in the source area has an elevated concentration of methane. The elevated methane concentration indicates a zone of methanogenesis occurring as part of the Type 2 behavior in the source area. Methanogenesis uses carbon dioxide as an electron acceptor resulting in the generation of methane. This methanogenic zone is a highly reductive environment that is efficient for the reductive dechlorination of DCE to vinyl chloride, vinyl chloride to ethene and ethane, and DCA to chloroethane. Therefore vinyl chloride, ethene, ethane, and/or chloroethane are expected in this area or immediately downgradient of this area. Since vinyl chloride, ethene, and ethane are not detected downgradient of the source area in monitoring well CEF-16-43S and the plume is in an anaerobic state, the vinyl chloride is most likely being biodegraded by the following mechanisms:

- Oxidized by iron reducers to carbon dioxide and water,
- Reduced to ethene, ethane and carbon dioxide, and/or
- Reduced to ethene and ethane concentrations by the generation of cometabolic enzymes

The decrease in sulfate concentration in the shallow groundwater sample between monitoring wells CEF-16-43S and CEF-16-21S indicates the Type 2 behavior in this area of the plume may be developing into a sulfate reduction zone. Sulfate may be used as an electron acceptor, however the by-products (hydrogen sulfide and sulfide) generated from this mechanism were not increasing along the groundwater flow path.

The decrease in sulfate concentration with the corresponding increase in hydrogen sulfide and sulfide concentrations in the intermediate groundwater sample near monitoring well CEF-16-22I suggests the Type 2 behavior in this area of the plume consists of a sulfate reduction zone. Sulfate is being used as an electron acceptor resulting in the generation of hydrogen sulfide, sulfide, and carbon dioxide. This sulfate-reduction zone in the groundwater is efficient for the reductive dechlorination of TCE to DCE and DCE to vinyl chloride. However, the dissolved oxygen concentrations in monitoring wells CEF-16-44I, CEF-16-22I, and CEF-16-27I are greater than 0.5 mg/L, which is a marginally aerobic environment, suggesting a Type 3 behavior may be occurring in this area of the plume. The dissolved oxygen concentrations in monitoring wells CEF-16-32S increased to 0.7 mg/L, indicating a Type 3 behavior may also be developing in this area of the plume. Aerobic groundwater conditions can mineralize vinyl chloride and DCA into carbon dioxide and water, and reduce DCE into carbon dioxide and water through cometabolic processes.

2.3.4 Conclusions

Based upon the past and current plume configuration, and the results of geochemical testing, it is apparent that natural attenuation processes are occurring in the source area at Site 16. The chlorinated groundwater plume in the source area is exhibiting Type 2 geochemical behavior. Organic carbon in the source area is being used as the primary substrate to drive reductive dechlorination of the solvent mass. Iron reduction and methanogenesis appear to be the most active reductive pathway in this area. Sulfate and manganese reduction may be a minor reductive pathway in the intermediate and shallow groundwater plume. The apparent source materials, TCE and TCA, are being anerobically degraded to 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, 1,1-DCA, vinyl chloride, ethene, and ethane in the source area.

The screening matrix score indicated there was limited evidence for biodegradation of the chlorinated organics in the downgradient plume. However, It is anticipated that the screening matrix scores in the

downgradient plume will increase after the groundwater remediation system in the source area is in operation. The groundwater remediation system will eliminate the anaerobic biodegradation process in the source area and the available electron acceptor pool will migrate in the direction of groundwater flow into the downgradient plume, accelerating the remediation of the downgradient plume by natural attenuation.

Monitoring wells CEF-16-13S and CEF-16-14D should be analyzed during the first year of sampling to provide groundwater geochemical data from the background wells. Upon completion of the first year of sampling, the value for BOD, COD, nitrate, nitrite, and orthophosphate should be evaluated. Based on the August/September 1998 sampling event, the nitrate, nitrite, and orthophosphate concentrations are insignificant with respect to biodegradation.

3.0 AIR SPARGING/VAPOR EXTRACTION AND TREATMENT SYSTEM

The follow sections contain information on the design of the proposed AS/SVE and off-gas treatment system. The design of the air spaging system at OU 7, Site 16 is based in part on the results of an air sparging pilot study performed for OU 7, Site 16 at NAS Cecil Field.

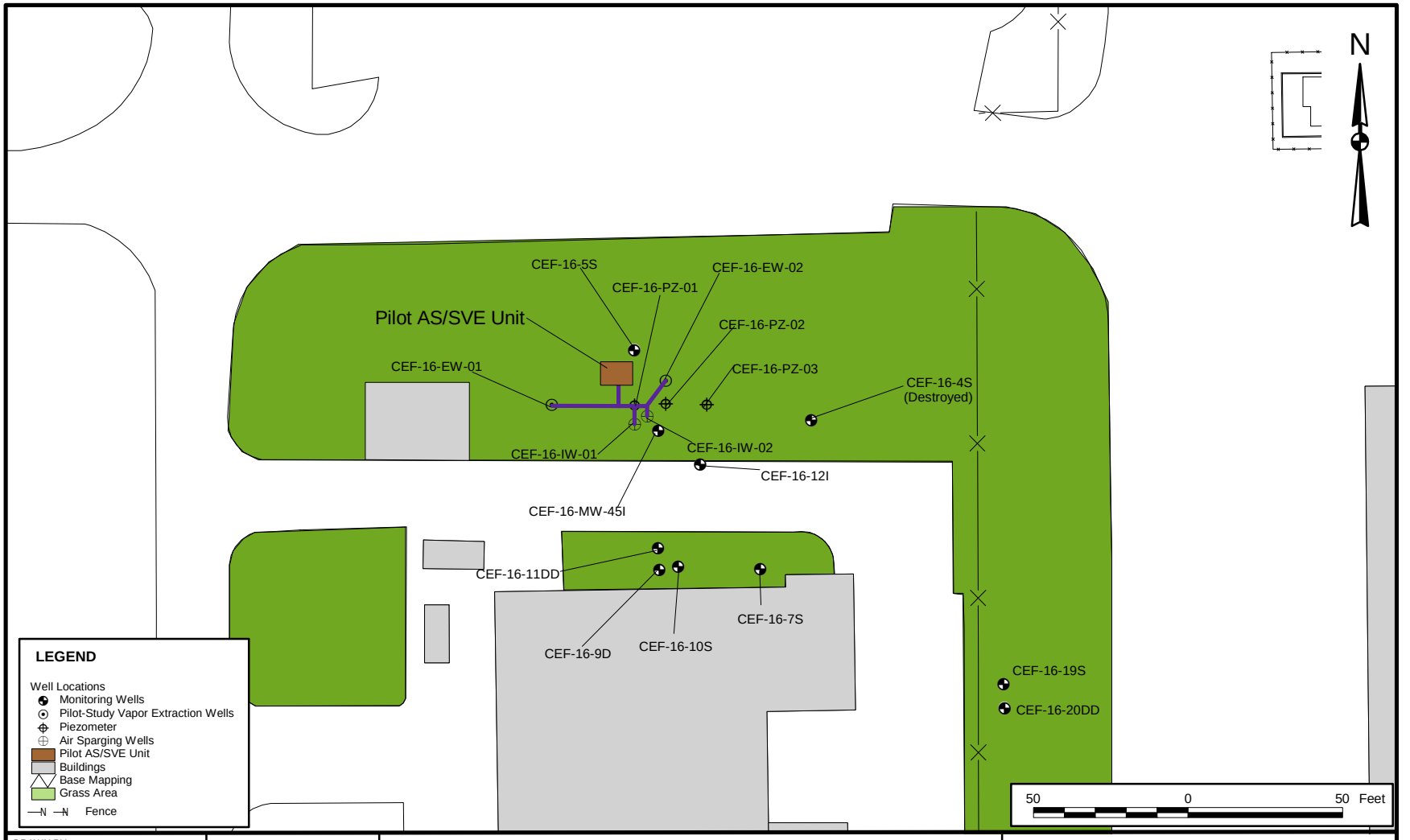
3.1 PILOT TEST SUMMARY

A pilot-scale AS/SVE test was conducted in September 1998 to determine the physical parameters needed for design of a full scale AS/SVE system at Site 16. The objective of the test was to determine the effective radius of influence for an air injection well screened at a depth of 55 to 57 feet below ground surface (bgs) and an air injection well screened at a depth of 90 to 95 feet bgs. The water table elevation is typically 6-7 feet bgs and fluctuates approximately one to two feet. The test also evaluated the radius of influence of vapor extraction wells installed in a non-paved area screened in the vadose zone with one-foot of screen below the water table. Samples of the extracted vapors were collected and analyzed to provide data to determine if off-gas treatment will be required and what technologies would be applicable. Figure 3-1 includes the location of the air injection, vapor extraction, and monitoring wells and piezometers used during the pilot-scale study. Detailed information and data collected during the pilot test are provided in Appendix B. A TCE solubility test was also conducted as part of this pilot test to determine the site specific solubility of TCE.

3.1.1 Vapor Extraction Tests

Two vapor extraction wells (EW-01 and EW-02) were installed approximately 40 feet apart in an area identified as the source of groundwater contamination. These wells were installed to a depth of seven feet bgs with a 4-foot screened interval (one foot below and three feet above the water table). Three piezometers (PZ-01 to PZ-03) were installed to a depth of eight feet bgs with a 5-foot screened interval (two feet below and three feet above the water table). These piezometers were located 7.6, 13.2 and 15.4 feet from extraction well EW02, and 26.7 feet or more from extraction well EW01. A total of seven tests were conducted, including two tests with well EW-01 operating alone, three tests with well EW-02 operating alone, and two tests with wells EW-01 and EW-02 operating together. Tests lasted from one to two hours.

The vacuum pump was operated at various settings, ranging from 30 to 70 inches of water, to determine the best operating vacuum and corresponding extracted vapor flow rate. During the tests, the vapor extraction lines were checked to determine if any significant quantity groundwater was being extracted. It



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COST/SCHEDULE-AREA	
SCALE	AS NOTED

PILOT SCALE AS/SVE SYSTEM LAYOUT

OPERABLE UNIT 7, SITE 16

NAVAL AIR STATION CECIL FIELD

JACKSONVILLE, FLORIDA

CONTRACT NUMBER	
7792	
APPROVED BY	DATE
APPROVED BY	DATE
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was determined that at a vacuum greater than 45 inches of water, significant extraction of groundwater occurred. At 45 inches of water the extracted vapor flow was approximately 10 scfm for well EW01 and 16 scfm for well EW02.

Based on the results of these tests, a vacuum of between 40 and 45 inches of water (as limited by fluctuation in water table elevation) is recommended. With this vacuum a vapor extraction flow rate of 10 to 15 scfm per well is anticipated, with a design figure of 10 scfm per well. The radius of influence of each extraction well is anticipated to be between 15 to 20 feet in the non-paved areas, with a design figure of 15 feet. For vapor extraction wells installed in paved areas or areas with non-permeable surfaces, it is anticipated that the radius of influence may extend to 30 feet or greater.

3.1.2 Air Injection Tests

Two air injection wells (IW-01 and IW-02) were installed approximately five feet apart in the area identified as the source of groundwater contamination. Well IW-01 was installed to a depth of 95 feet bgs and screened from 90 to 95 feet bgs. Well IW-02 was installed to a depth of 57 feet bgs and screened from 55 to 57 feet bgs. The flow and pressure of the injected air ranged from 10.6 to 14.5 scfm and 39 to 41 psig for well IW-01 and from 9.4 to 18.6 scfm and 28 to 36 psig for well IW-02. A total of eight air injection tests were conducted, including four tests with well IW-01 operating alone, two tests with well IW-02 operating alone, and two tests with wells IW-01 and IW-02 operating together. Tests lasted for two to six hours, except for one of the IW-01 tests (the third test), which was conducted overnight and lasted 13 hours.

The objective of the tests was to determine the area of the groundwater that was aerated by the air injection wells. The parameters evaluated to determine this radius of influence included changes in the groundwater elevation, dissolved oxygen (DO) concentration, oxidation/reduction potential (ORP), and organic vapors concentration. Physical observations (e.g., check for air bubbles) also provided a clue as to the reach of the injection wells. This data was collected from nine existing groundwater monitoring wells and from the pilot study vapor extraction and piezometers wells.

The data collected in all of the wells during operation of deep injection well IW-01 generally showed an increase in groundwater elevation, with wells located within a 50 to 60 feet radius from the air injection point showing increases in elevation ranging from approximately four inches to over one foot. Results from the measurements of DO concentration, ORP, and organic vapors concentration were highly variable; however, some general trends could be established. Wells screened at the water table interface generally showed an increase in organic vapors concentration, with major increases occurring in wells located within a 27 feet radius of the air injection point.

Results of the DO concentration measurements generally indicated an initial decrease that could result from circulation of the deeper low-DO groundwater towards the surface where the measurements were collected. Wells located approximately 50 to 60 feet downgradient of the air injection point did not generally show major changes in DO concentration; however, there were many anomalies and decreases in DO concentration which are difficult to evaluate. The overnight test showed that injection of 11.6 to 14.2 scfm of air in well IW-01 significantly increased DO concentration in downgradient wells, including an increase from 0.75 to 5.4 mg/L in well IW-02 (5 feet away), and from 3.25 to 5.6 mg/L in well 16-12I (27 feet away). Upgradient wells located at approximately the same distance from well IW-01 showed no significant change in DO concentration.

Results of ORP measurements generally showed a slight increase but provided no conclusive evidence with regard to radius of influence. Only one well (16-17S), located approximately 200 feet west-southwest from well IW-01 showed a significant decrease in ORP (from –51 to –88 mV).

The most conclusive evidence on the radius of influence and the actual area coming into contact with the injected air was provided by the physical observation of air bubbles in certain wells. The following observations were made after well IW-01 had been operating for 13 hours:

Well	Distance (feet)/Direction From IW-01	Screened Interval (feet bgs)	Air Bubble Observation
IW-02	5 ft/ west-southwest	55-57	Slow/minimum bubbles
16-45I	7.9 ft / east-southeast	27-32	Aggressive bubbling to top of well
16-12I	24.75 ft / southeast	71-81	Medium bubbles
16-5S	25 ft/ north	4-14	No bubbles
System Wells	<25 ft/ variable	at water table	No bubbles

Prior to testing of deep injection well IW-01, two tests were conducted that included the operation of the intermediate injection well IW-02 alone. The changes in groundwater elevation recorded during these two tests were similar to those measured during the testing of deep injection well IW-01 and, as with the testing of deep injection well IW-01, the DO concentration data was difficult to correlate to a radius of influence. ORP was not measured during these tests and no visual observations were performed to check for the presence of air bubbles. Organic vapors concentrations were measured at various points within a 25 feet radius of injection well IW-02 and all points showed an increase in vapor concentrations.

Simultaneous operation of air injection wells IW-01 and IW-02 provided results similar to those obtained when these wells were operated individually.

These results show that the radius of influence of air injection wells can be conservatively estimated to be 30 feet with a design air injection flow rate of 10 scfm per well.

3.1.3 TCE Solubility Testing

A groundwater sample collected during the "aquaprobe" investigation identified that the dissolved concentrations of TCE in the intermediate zone of the surficial aquifer exceeded the theoretical literature solubility value of 1,100 mg/L in one of the samples collected (GS-16-I2). Bench-scale treatability tests were performed to establish the site-specific solubility of TCE in groundwater at OU 7, Site 16 and compare it to its theoretical literature value to determine if site-specific factors such as chemical composition are significantly affecting the solubility of TCE. Following is a brief description of these tests and a summary of the test results.

Groundwater samples (CEF-16-13S and CEF-16-14D) were collected from two monitoring wells selected as representative of background surficial aquifer conditions at Site 16. Temperature and pH of these samples were field-measured and recorded. The samples were then maintained at 4°C without preservatives and shipped to an analytical laboratory (GP Environmental) in head-space free vials. At the laboratory, the temperature of the groundwater was re-adjusted to its in-situ value with a temperature-controlled bath. Aliquots of the temperature-adjusted groundwater were then used to completely fill 100 milliliters (ml) glass flasks in which 10 grams of 99 percent purity (Aldrich Chemical) TCE had been placed. The contents of the flasks were then mixed with a magnetic stirrer without entraining air until full dispersion of the TCE was visually observed. Agitation was continued for a period of 30 minutes, after which the aqueous and non-aqueous phases were allowed to separate by gravity and a sample of the aqueous phase was collected and analyzed for TCE. This procedure was then repeated for agitation times of two hours and six hours. The following table presents a summary of test results.

SUMMARY OF TCE SOLUBILITY TEST RESULTS
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD – JACKSONVILLE, FLORIDA

Sample	Temperature (°C)	TCE Concentration (mg/L)		
		30 Minutes Agitation	2 Hours Agitation	6 Hours Agitation
CEF-16-13S	23	1,290 1,230(1)	1,600	1,550
CEF-16-14D	23	1,580	1,600	1,590

1 Duplicate sample result.

The above results show that the actual solubility of TCE in groundwater at Site 16 has the potential to be significantly higher than its theoretical literature value of 1,100 mg/L. Results also show that, except for the 30-minute test with Sample CEF-16-13S, maximum TCE solubility does not appear to be particularly sensitive to agitation time.

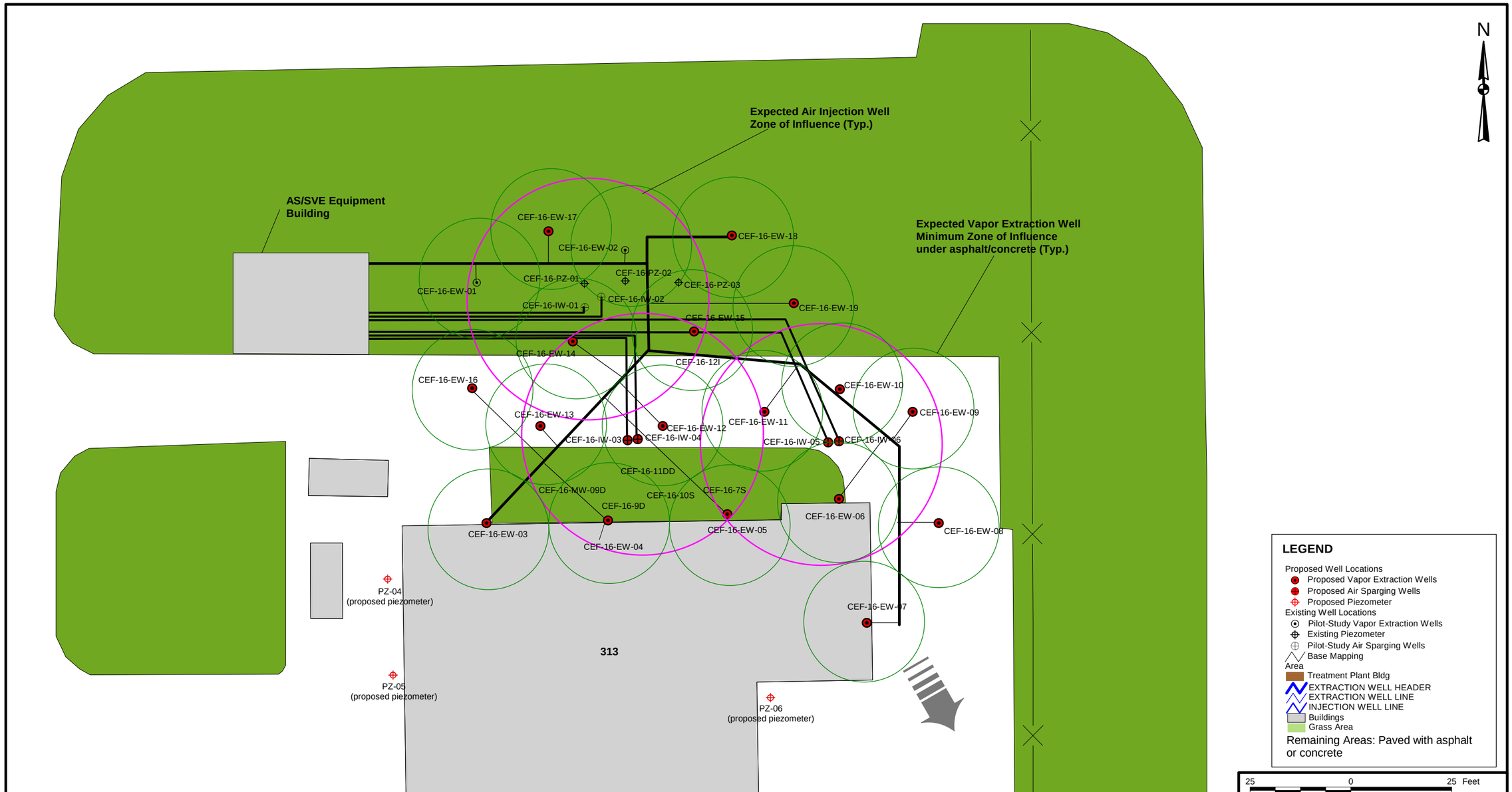
3.2 AIR SPARGING/VAPOR EXTRACTION WELL LAYOUT AND CONSTRUCTION

Figure 3-2 shows the design layout of the air sparging/vapor extraction system. Figure 3-3 shows the well cross sections.

Based on the results of the AS/SVE pilot test, a conservative design radius of influence equal to 30 feet will be used to locate deep and shallow air sparging wells. Based on this design radius of influence, each set of deep/shallow air sparging well pair will be installed at a spacing of 50 to 60 feet to provide adequate overlap of the sparging influence. Three sets of air sparging well pairs will be required to adequately treat the surficial aquifer in and around the suspected source area. One pair of wells will be the existing wells (CEF-16-IW-01 and CEF-16-IW-02) at the location of highest concentrations of TCE (suspected source area), used for the pilot-study. The other two pairs will be new air sparging wells (CEF-16-IW-03 and CEF-16-IW-04 and CEF-16-IW-05 and CEF-16-IW-06) installed at downgradient locations to intercept any potential migration of DNAPL or elevated groundwater contaminant concentrations from the suspected source area.

As shown on Figure 3-3, air sparging wells will be constructed of flush joint, threaded, 2-inch diameter Schedule 80 Polyvinyl Chloride (PVC) with 0.01-inch slot well screens. Within each nested pair of air sparging wells, the shallow air sparging wells will be installed to a depth of approximately 60 feet bgs, with

P:\GIS\CECIL\SITE16.APR 4-MAR-99 CPG LAYOUT WELL LOCATIONS CLOSE-UP



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DRAWN BY YLI	DATE 10/26/98
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AIR SPARGING / VAOPR EXTRACTION
SYSTEM LAYOUT
OPERABLE UNIT 7, SITE 16
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 7898	
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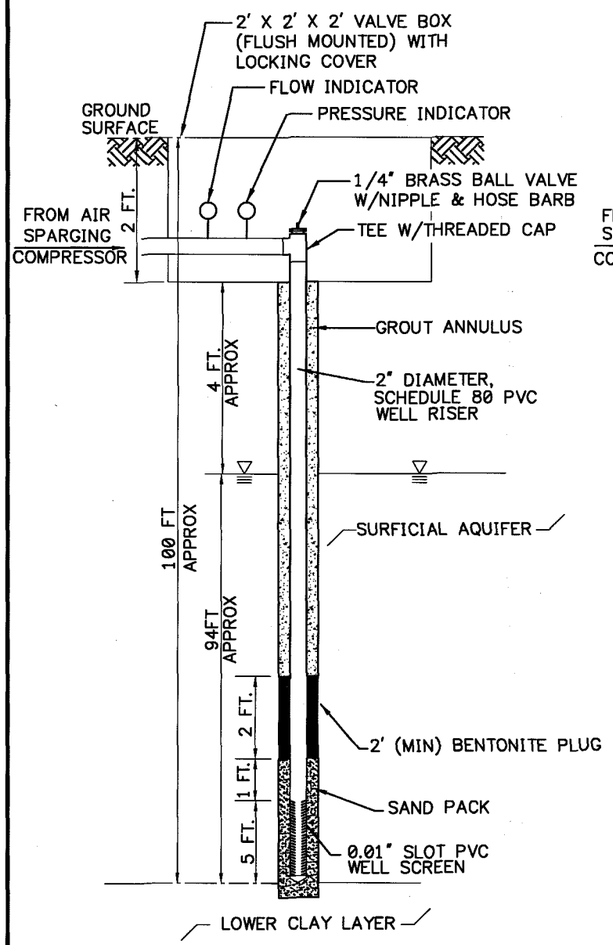

DEEP INJECTION WELL DETAIL
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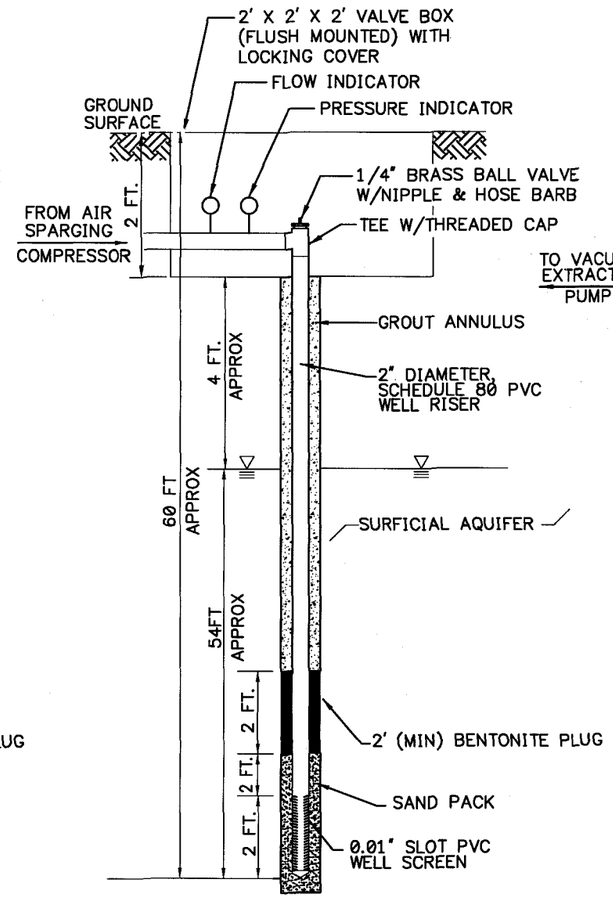

SHALLOW INJECTION WELL DETAIL
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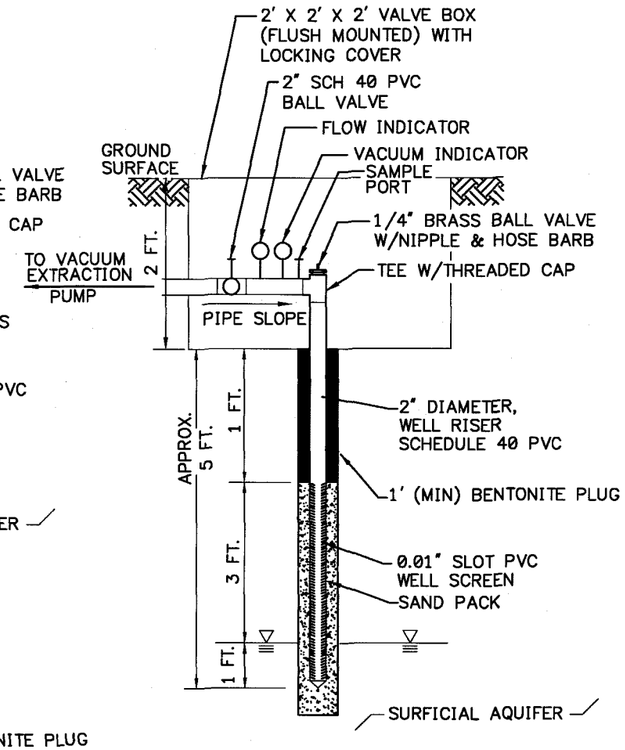

EXTRACTION WELL DETAIL
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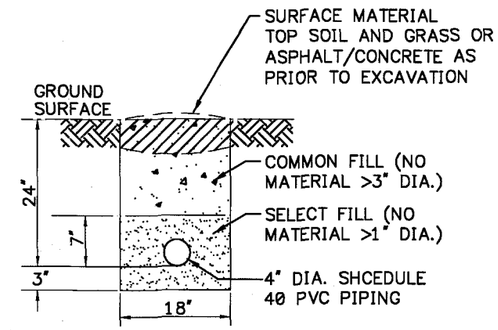

EXTRACTION HEADER TRENCH CROSS SECTION
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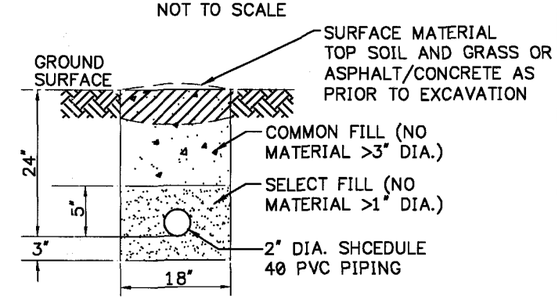

EXTRACTION OR INJECTION TRENCH LATERAL CROSS SECTION
NOT TO SCALE

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DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD

WELL INSTALLATION & PIPING DETAILS
AS/SVE TREATABILITY STUDY SYSTEM
SITE 16, OPERABLE UNIT 7
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 7792
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 3-3
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

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a screen at the 58 to 60 foot interval. The deep sparging well will be installed to a depth of 100 feet bgs with a screen at the 95 to 100 foot interval. The screen interval is to be placed above the clay confining unit and, if necessary, the depth of the screen will be adjusted based on observed field conditions.

Vapor extraction wells will be installed at 19 locations within the area of treatment (see Figure 3-2). The vapor extraction wells will be used to collect and convey the volatile emissions to a treatment system. As shown on Figure 3-3, vapor extraction wells will be constructed of flush joint, threaded, 2-inch diameter Schedule 40 PVC with a 4 feet long section of 0.01 inch slot well screen. As shown, wells will typically be installed with 3 feet of screen in the vadose zone, and 1 foot of screen below the water table. Since the water table depth is approximately six feet bgs with a fluctuation of one to two feet, the vapor extraction wells will be installed to a depth of approximately seven feet bgs.

Based on the results of the pilot study, a minimum radius of influence of 15 feet has been estimated for each vapor extraction well located in areas with permeable (grass or bare soil) surface. However, in those areas where the surface is less permeable (asphalt or concrete covered), the radius of influence is expected to be larger (up to 30 feet), with the maximum vacuum limitation of 45 inches that can be applied at any well. Thus, the zones of influence of extraction wells CEF-16-EW-07 and CEF-16-EW-08, that will be located in less permeable areas adjacent to the east side of Building 313, could extend under the building and collect any vapors that may be generated under that portion of the building. An area immediately adjacent to the northern side of Building 313, where extraction wells CEF-16-EW-03, CEF-16-EW-04, CEF-16-EW-05 and CEF-16-EW-06 will be located, is currently covered by grass. Therefore, in order to extend the zone of influence of these wells to include locations under the northern side of the building (to collect any vapors that may be generated in that area under the building), a less permeable barrier is proposed. This grass-covered area of approximately 1,700 square feet (85 ft x 20 ft) will be excavated down to a depth of 24 inches below the surface and graded to slope gently away from the building, towards the driveway's sub-base. A 30 mil polyethylene liner with a geonet drainage layer will be placed at the bottom. The liner will be sealed against the side of the building to minimize short-circuiting. The excavated area will be backfilled and seeded.

Vapor extraction wells will be installed using hollow-stem auger drilling techniques. This will prevent the sidewalls of the boring from becoming smeared with drilling mud, as this could limit collection of volatilized contaminants. Due to the depths of the air sparging wells, it is likely that mud rotary drilling techniques will be required for installation. As shown on Figure 3-3, all wells will be installed with a typical sand pack consisting of 20-40 grade silica sand; a pure sodium bentonite seal; and grouted annulus consisting of 94 pounds of Type I Portland Cement to 7 gallons of water to 10 percent (by weight) of pure sodium bentonite. Following installation of all air sparging wells, each well shall be fully developed so that the

drilling mud is removed from the aquifer and the well is functioning properly. The vapor extraction wells will be tested at the time of start up to verify adequate overlap of zones of influence.

Permanent piezometers (PZ-04, PZ-05, and PZ-06) will be used for verifying the presence of vacuum or sampling of vapors in the area adjacent to Building 313 and temporary piezometers (see Section 4.1.4) will be used for verifying adequate capture of vapors by the vapor extraction system. These piezometers will consist of 8 feet of 2-inch diameter Schedule 40 PVC with 5 feet of 20 slot PVC well screen. The piezometers will be installed with a 2-foot depth of benzonite plug and the remaining length (6-feet) of sand packing. The top of the piezometers will be flush-mounted with a sampling valve and provided with a locking vault. Since the water table depth is approximately six feet bgs with a fluctuation of one or two feet, the piezometers will be installed to a depth of approximately eight feet bgs.

The investigation-derived wastes, such as drill cuttings, drilling muds, development water, decontamination fluids, etc., generated during the installation of the air sparging wells, vapor extraction wells, and piezometers will be managed (i.e., collected, stored, and treated/disposed) in accordance with the Base-wide Generic Work Plan (TtNUS, 1998b).

3.3 TREATMENT SYSTEM

The air sparging and vapor extraction/treatment system will be installed in an equipment control area located northwest of Building 313 at the location indicated on Figure 3-2. The equipment control area will protect the equipment from inclement weather and vandalism. The equipment control area will be installed on a 6-inch thick, 12-foot wide by 25-foot long slab, of 3,000 psi concrete. A wooden canopy structure will be constructed over the slab to provide weather protection for the equipment. The equipment will be skid-mounted so that, if needed, it can be relocated or removed easily. The equipment control area will be surrounded by a 6-foot chain link fence with an 8-foot wide, double-swing, lockable gate. Signs will be posted to restrict site access during remedial system operation. The general arrangement of the equipment control area is shown on Figure 3-4.

3.3.1 Air Sparging Equipment and Controls

Air Sparging Compressor

The purpose of the Air Sparging Compressor (B-02) is to inject air into the groundwater in such a way as to cause volatilization of VOCs. For proper sizing of the Air Sparging Compressor, the required well head pressure and the line losses must be determined. The required well head pressure to evacuate the water column from the shallow air sparging well is 23 pounds per square inch (psi). This pressure is based on

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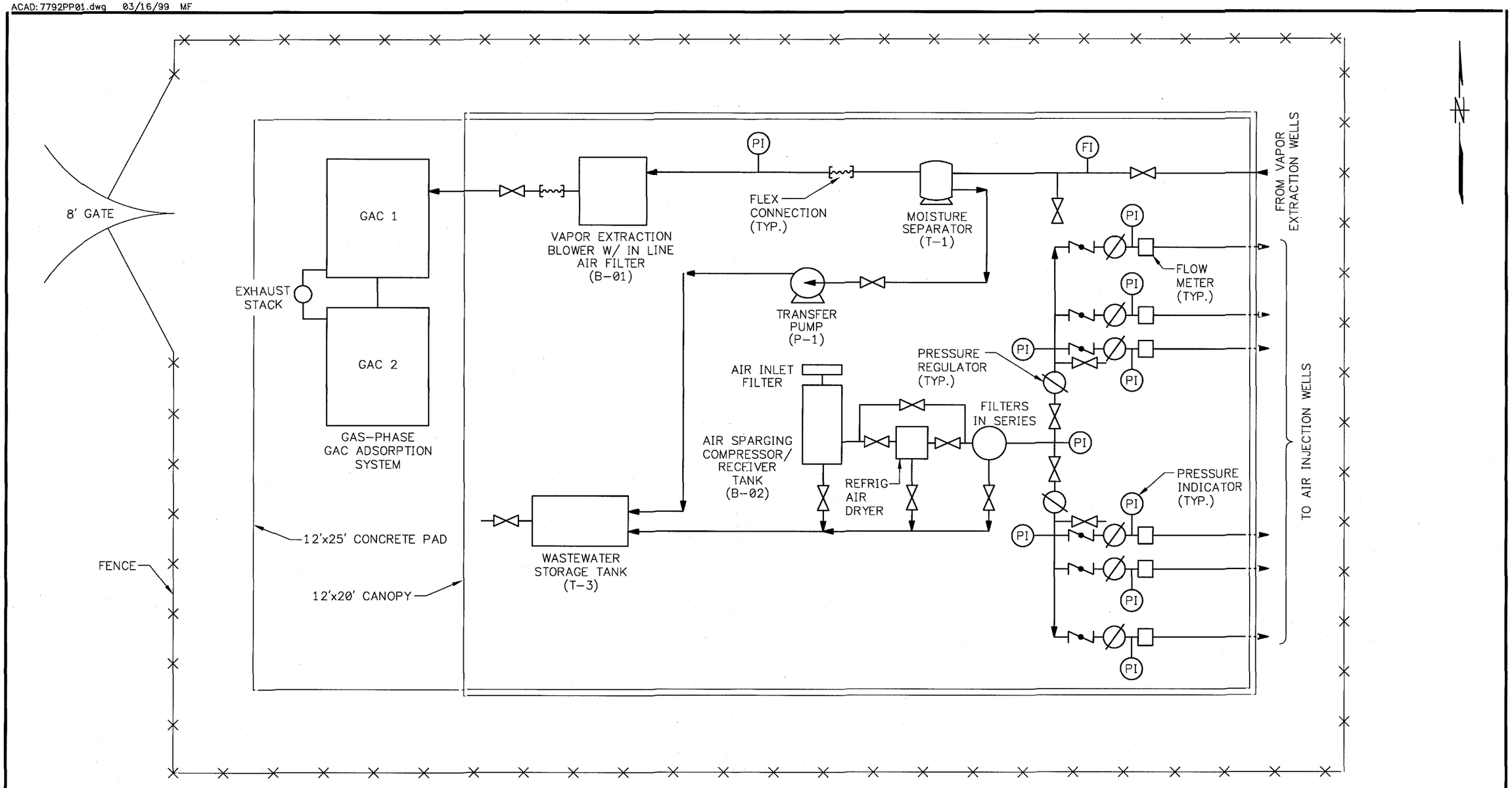

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CONCEPTUAL AIR SPARGING/VAPOR EXTRACTION SYSTEM EQUIPMENT CONTROL AREA LAYOUT
OPERABLE UNIT 7 SITE 16
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 7792
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DRAWING NO. FIGURE 3-4
REV. 0

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evacuating 53 feet of water column from the well. Line losses were calculated to be a maximum of 0.5 psi. In addition, it is anticipated that 3 psi will be lost through the flow meters and the well screen. Therefore, the total required pressure for breakthrough is 26.5 psi. Similarly, the total pressure required for the deep air sparging wells (based mainly on the 40 psi pressure needed to evacuate 93 feet of water column) and line/equipment losses is 44 psi. Appendix C contains the pressure loss calculations.

The Air Sparging Compressor (B-02) must also be sized to provide a flow rate of approximately 10 scfm (@ 23 psig for shallow wells or @ 40 psig for deep wells) per air sparging well, for a total minimum flow rate of 20 scfm per well pair and a total of 60 scfm for the three well pairs. Based on standard equipment availability and construction, the minimum compressor size that is capable of delivering the required pressure and adequate flow is a 75 scfm, rotary-vane type compressor equipped with a receiver tank.

The rating of the Air Sparging Compressor motor will be 20 horsepower and this motor will operate on a 480-volt, 3-phase electrical power supply. The compressor will be mounted on a 120-gallon receiver tank. The Air Sparging Compressor (B-02) and receiver tank will include the necessary emergency shut-offs and pressure relief valves. Figure 3-5 is the Piping and Instrumentation Diagram (PID) for the air sparging system and shows the location of the equipment controls. As shown, the system piping will consist of 2-inch ID galvanized steel for all aboveground applications. As such, all system valving and fittings will also be constructed of 2-inch diameter steel. Piping will be converted to 2-inch ID Schedule 80 PVC for below ground service, as shown on Figure 3-5. Table 3-1 summarizes the specifications for the air sparging system components. Table 3-2 is a listing and description of the air sparging system process control components.

The Air Sparging Compressor (B-02) shall be fitted with a condensate cyclone separator, a 1-micron coalescing air filter and a 0.01 micron oil retention filter in series to supply oil-free air, and an inlet filter/silencer. In addition, the Air Sparging Compressor will incorporate an integrated refrigerated dryer that will cool the compressed air and reduce the dew point to less than 40 degrees Fahrenheit (°F), to provide cool dry air. The refrigerated dryer will optimize oil removal and prevent excessive moisture accumulation that could lead to corrosion. The Air Sparging Compressor shall be capable of supplying air at 125 psi at a flow rate of 75 scfm. The discharge of the Air Sparging Compressor will be fitted with a pressure regulator to reduce pressures in the injection header pipe.

Due to compression and cooling, approximately 10 to 20 gallons per day (gpd) of water is expected to condense out of the receiver tank and refrigerator dryer, and this water is expected to contain small amounts of lubricating oil. This water will be periodically discharged under pressure into the Wastewater Storage Tank (T-3). Some additional amounts of lubricating oil captured by the coalescing filter will also

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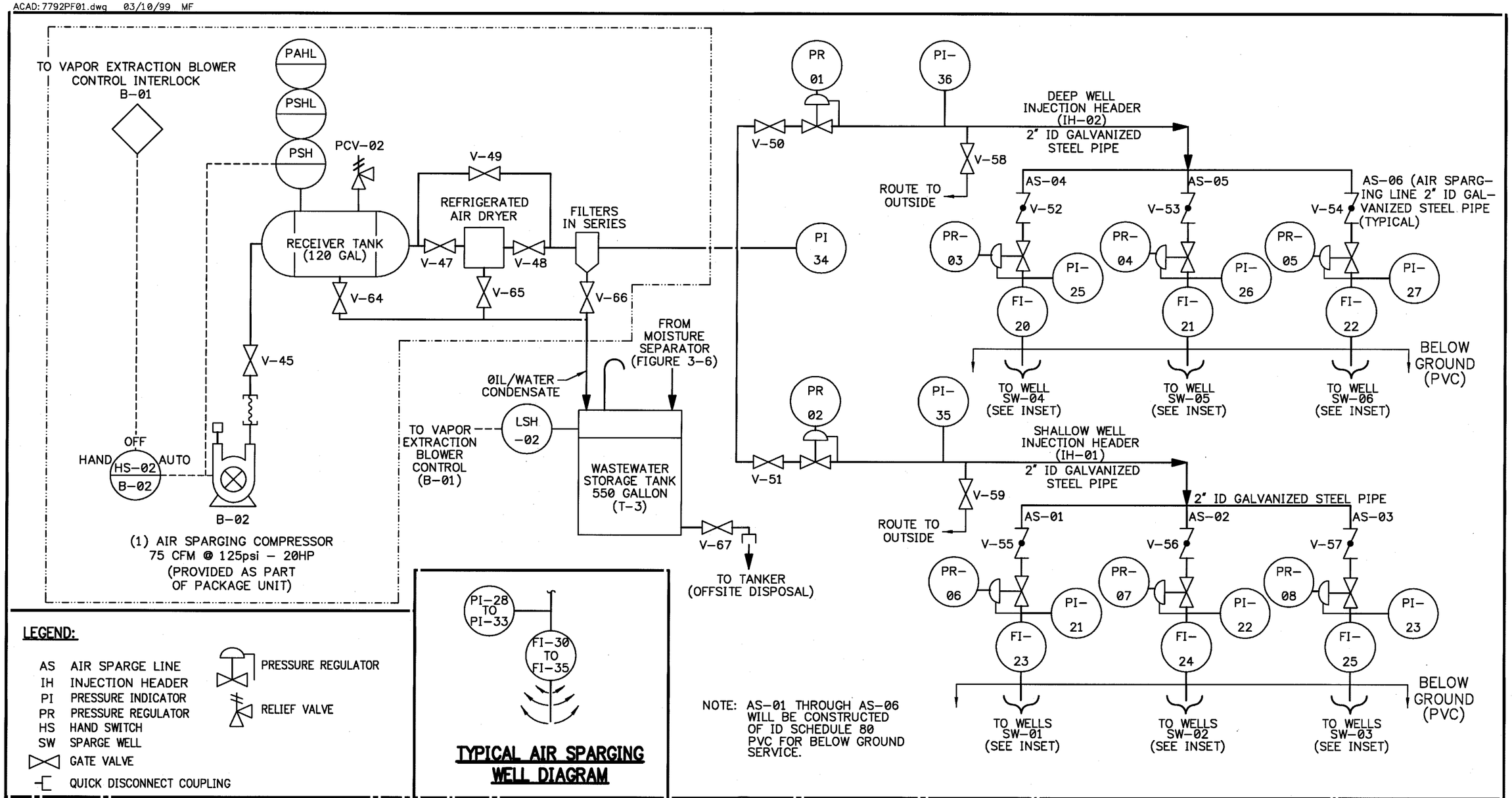

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AIR SPARGING SYSTEM
PIPING AND INSTRUMENTATION DIAGRAM
OPERABLE UNIT 7 SITE 16
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 7792
APPROVED BY DATE
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REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

TABLE 3-1

AIR SPARGING SYSTEM EQUIPMENT SPECIFICATIONS
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Item	Specifications
Air Sparging Rotary Vane Compressor	75 scfm, 125 psi 20 hp 480-volt, 3-phase
Compressor Accessories	Condensate cyclone separator 1-micron coalescing air filter and 0.01-micron oil retention filters in series Inlet filter/silencer Integrated refrigerated dryer Pressure relief valve
Controls	HANDS-OFF-AUTO SWITCH High Moisture Separator liquid level cutoff switch Low Moisture Separator liquid level turn-on switch High vacuum blower outlet temperature cutoff switch High Wastewater Storage Tank liquid level cutoff switch Equipment failure alarm
Flow Meters	0 – 50 scfm in individual air sparging lines
Pressure Regulators	150 psi minimum
Pressure Gauges	0 – 120 psi (air sparging header pipes) 0 – 50 psi (each air-sparging well)
Aboveground Pipe	2-inch Galvanized Steel
Aboveground Fittings/Valves	2-inch Steel or Brass
Underground pipe and fittings	2-inch ID Schedule 80 PVC
Air Sparing Wells	2-inch ID Schedule 80 PVC

TABLE 3-2

AIR SPARGING SYSTEM PROCESS CONTROL
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA
PAGE 1 OF 3

Component ID No.	Description	Location	Function
B-02	Air Sparging Compressor	Equipment Control Area	Supplies compressed air
HS-02	HAND-OFF-AUTO SWITCH	Air Sparging Compressor (operating/spare)	Operation of Air Sparging Compressor (B-02). Interlocks with HS-01 by shutting off HS-02 on Vapor Extraction Blower (B-01) failure.
FI-20	Flow Indicator	AS-04 Air Line	Indicates flow to AS-04
FI-21	Flow Indicator	AS-05 Air Line	Indicates flow to AS-05
FI-22	Flow Indicator	AS-06 Air Line	Indicates flow to AS-06
FI-23	Flow Indicator	AS-01 Air Line	Indicates flow to AS-01
FI-24	Flow Indicator	AS-02 Air Line	Indicates flow to AS-02
FI-25	Flow Indicator	AS-03 Air Line	Indicates flow to AS-03
FI-30 to FI-35	Flow Indicator	Air Sparge Well Vault Box	Indicate flow at wells
IH-01	2-inch diameter Galvanized Steel Pipe	Between compressor and low pressure sparge lines	Low Pressure Air Header
IH-02	2-inch diameter Galvanized Steel Pipe	Between compressor and High Pressure Sparge lines	High Pressure Air Header
PCV-02	Pressure Relief Valve	Air Sparging Compressor Receiver Tank	Relieves excess pressure from receiver tank
PI-21	Pressure Gauge	AS-01 Well Lateral	Indicates pressure in AS-01
PI-22	Pressure Gauge	AS-02 Well Lateral	Indicates pressure in AS-02
PI-23	Pressure Gauge	AS-03 Well Lateral	Indicates pressure in AS-03
PI-25	Pressure Gauge	AS-04 Air Line	Indicates pressure in AS-04
PI-26	Pressure Gauge	AS-05 Air Line	Indicates pressure in AS-05
PI-27	Pressure Gauge	AS-06 Air Line	Indicates pressure in AS-06
PI-28 to PI-33	Pressure Gauge	Air Sparge Well Vault Box	Indicate pressure at wells
PI-34	Pressure Gauge	"T" Connection	Indicates discharge pressure of Air Sparging Compressor prior to "T" connection
PI-35	Pressure Gauge	IH-01 Low Pressure Air Header	Indicates pressure in IH-01 after PR-02

TABLE 3-2

AIR SPARGING SYSTEM PROCESS CONTROL
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA
PAGE 2 OF 3

Component ID No.	Description	Location	Function
PI-36	Pressure Gauge	IH-02 High Pressure Air Header	Indicates pressure in IH-02 after PR-01
PR-01	Pressure Regulator	IH-02 High Pressure Air Header	Regulates pressure in IH-02
PR-02	Pressure Regulator	IH-02 Low Pressure Air Header	Regulates pressure to low-pressure sparge system in IH-01
PR-03	Pressure Regulator	AS-04 Well Lateral	Regulates pressure to AS-04
PR-04	Pressure Regulator	AS-05 Well Lateral	Regulates pressure to AS-05
PR-05	Pressure Regulator	AS-06 Well Lateral	Regulates pressure to AS-06
PR-06	Pressure Regulator	AS-01 Well Lateral	Regulates pressure to AS-01
PR-07	Pressure Regulator	AS-02 Well Lateral	Regulates pressure to AS-02
PR-08	Pressure Regulator	AS-03 Well Lateral	Regulates pressure to AS-03
PSH	High Pressure Switch	Air Sparging Compressor Receiver Tank	Trips HS-02 off upon excessively high pressure condition
PSHL/PAHL	High-Low Pressure Switch and alarm	Air Sparging Compressor Receiver Tank	Trips alarm on excessively high or low pressure condition
V-45	Gate Valves	Air Sparging Compressor Outlet	Opens or blocks air flow from compressor depending on selection of operating/spare unit
V-47, V-48	Gate Valves	Receiver Tank Outlet	Includes or isolates refrigerated airdryer
V-49	Gate Valve	Receiver Tank Outlet	Bypass of refrigerated air dryer
V-50	Gate Valve	High Pressure Air Header	Flow control valve
V-51	Gate Valve	Low Pressure Air Header	Flow control valve
V-52	Butterfly Valve	AS-04 Air Line	Control flow to AS-04
V-53	Butterfly Valve	AS-05 Air Line	Control flow to AS-05
V-54	Butterfly Valve	AS-06 Air Line	Control flow to AS-06
V-55	Butterfly Valve	AS-01 Air Line	Control flow to AS-01
V-56	Butterfly Valve	AS-02 Air Line	Control flow to AS-02
V-57	Butterfly Valve	AS-03 Air Line	Control flow to AS-03

TABLE 3-2

AIR SPARGING SYSTEM PROCESS CONTROL
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA
PAGE 3 OF 3

Component ID No.	Description	Location	Function
V-58	Gate Valve	IH-02 High Pressure Air Header	Bleed valve
V-59	Gate Valve	IH-01 Air Line	Bleed valve
V-64 to V-67	Gate Valve	Valves at Tanks (Receiver, Air Dryer, Filter, and Wastewater Storage Tank)	Flow control valves
AS-01[1]	2-inch diameter PVC Pipe	Air sparge line to well SW-01	Conveys air to shallow air sparge well
AS-02[1]	2-inch diameter PVC Pipe	Air sparge line to well SW-02	Conveys air to shallow air sparge well
AS-03[1]	2-inch diameter PVC Pipe	Air sparge line to well SW-03	Conveys air to shallow air sparge well
AS-04[1]	2-inch diameter PVC Pipe	Air sparge line to well SW-04	Conveys air to deep air sparge well
AS-05[1]	2-inch diameter PVC Pipe	Air sparge line to well SW-05	Conveys air to deep air sparge well
AS-06[1]	2-inch diameter PVC Pipe	Air sparge line to well SW-06	Conveys air to deep air sparge well
T-3	Wastewater Storage Tank	Air Sparging Compressor	Stores oil/water condensate from compressor/dryer/filter and moisture separator.
LSH-02	Level Switch	Wastewater Storage Tank	Stops Vapor Extraction Blower upon high level in Wastewater Storage Tank. Interlocks with HS-02.

1 Switch from 2-inch diameter galvanized steel to 2-inch Schedule 80 PVC for below ground service.

be discharged into the Wastewater Storage Tank. This tank will also receive a nominal amount (less than 2 gpd) of TCE-contaminated vapor condensate from the vapor extraction Moisture Separator. Approximately every 10 days, the Wastewater Storage Tank T-3 will be emptied via suction into a tanker and transported for off-site disposal at a wastewater treatment facility.

Air Sparging Controls

The Air Sparging Compressor (B-02) will be mounted on a receiver tank to provide a continuous supply of high pressure air. Operation of the Air Sparging Compressor will be controlled by an HAND-OFF-AUTO switch (HS-02) mounted on the skid. In the AUTO position, which is the normal mode of operation, the compressor will run continuously, but its operation will be interlocked with the HAND-OFF-AUTO switch on the Vapor Extraction Blower (B-01). If the Vapor Extraction Blower fails, then the Air Sparging Compressor will shut off and thereby prevent contaminant volatilization from continuing without vapor extraction and treatment. The receiver tank will also be equipped with a High/Low pressure switch (PSHL) that will trip a High/Low pressure alarm (PAHL) in the event of a preset excessively high pressure level or preset low pressure level below the required operating level for air sparging. The receiver tank will be equipped with a high pressure switch (PSH) that will shut off the operating compressor in the event of excessively high pressure beyond a maximum preset level. The receiver tank will also be equipped pressure-relief valve (PCV-02) that will vent the tank in case of an emergency condition if the pressure switch and alarm malfunction.

The output from the Air Sparging Compressor will be split through a "T" connection into two short headers: a low-pressure header (Shallow Injection Well Header, IH-01) and a high-pressure header (Deep Injection Well Header, IH-02). The pressure in each header will be controlled by pressure regulators (PR-01 and PR-02). A pressure indicator (PI-34) will indicate the discharge pressure of the Air Sparging Compressor prior to the "T" connection. Pressure indicators (PI-35 and PI-36) will indicate pressure in the low and high pressure headers (IH-01 and IH-02) after pressure regulation. Well laterals will be equipped with individual butterfly type valves (V-52 to V-57) to control the flows and individual pressure regulators (PR-03 through PR-08) to control the pressure of sparging air supplied to each well. Pressure and flow indicators are provided at the beginning of the laterals as well as individual well heads to verify that there are no leaks in joints. Flow meters (FI-20 to FI-25) capable of indicating flows within the range of 0-50 scfm will be installed in each air sparging lateral and air sparging well head to verify that the air flow is being uniformly distributed to all of the injection wells. Pressure regulators (PR-01 and PR-02) capable of handling a minimum of 150 psig and pressure gauges (PI-35 and PI-36) capable of reading in the range of 0-120 psig will be used in the headers. Pressure gauges (PI-21 to PI-23 and PI-25 to PI-27) capable of reading in the range of 0-50 psig will be installed at the individual air sparging laterals and pressure

gauges (PI-28 to PI-33), also capable of reading in the range of 0-50 psig, will be installed at the individual well heads to verify that injection pressures are at the required levels. Flow indicators (FI-30 to FI-35), capable of reading flows in the range of 0-50 scfm, will be installed at individual well heads to verify adequate flow rates.

3.3.2 Vapor Extraction and Treatment Equipment and Controls

The vapor extraction and treatment equipment will consist of a set of 19 vapor extraction wells, a Moisture Separator (T-1), a Vapor Extraction Blower (B-01), a Gas-Phase Ganular Activated Carbon (GAC) Adsorption System (GAC-1 and GAC-2), and controls. Figure 3-6 is a PID for the vapor extraction and treatment equipment. Table 3-3 provides a listing and summarizes the specifications for this equipment and Table 3-4 provides a listing and description of the controls associated with it.

Moisture Separator

The purpose of the Moisture Separator (T-1) is to remove excessive amounts of moisture that could damage the Vapor Extraction Blower (B-01). The Moisture Separator has an 80-gallon capacity with an automatic pumping option that discharges water to the Wastewater Storage Tank (T-3). The Moisture Separator will be connected to a 1 HP Transfer Pump (P-1) which will automatically discharge water collected in the Moisture Separator to the Wastewater Storage Tank. An intrinsically safe float switch in the Moisture Separator will shut down the Vapor Extraction Blower in the case of high liquid level condition. The blower will automatically turn on and drain the moisture separator until the low level float is triggered at which point the blower is shut off and the AS/SVE system is automatically restarted. The 550-gallon Wastewater Storage Tank will be equipped with a high liquid level indicator which will shut the AS/SVE system down until the tank is drained.

Vapor Extraction Blower

The purpose of the Vapor Extraction Blower (B-01) is to induce a flow of air from each of the vapor extraction wells. Based upon the results of the pilot-scale treatability study, the Vapor Extraction Blower will be designed to provide a maximum vacuum of 45 inches of water (equivalent of 3.3 inches Hg vacuum) at individual extraction wells. The Vapor Extraction Blower will also be sized to provide a vapor extraction rate of 10 scfm per well, for a total flow of 190 scfm from 19 wells. Pressure loss calculations are provided in Appendix C.

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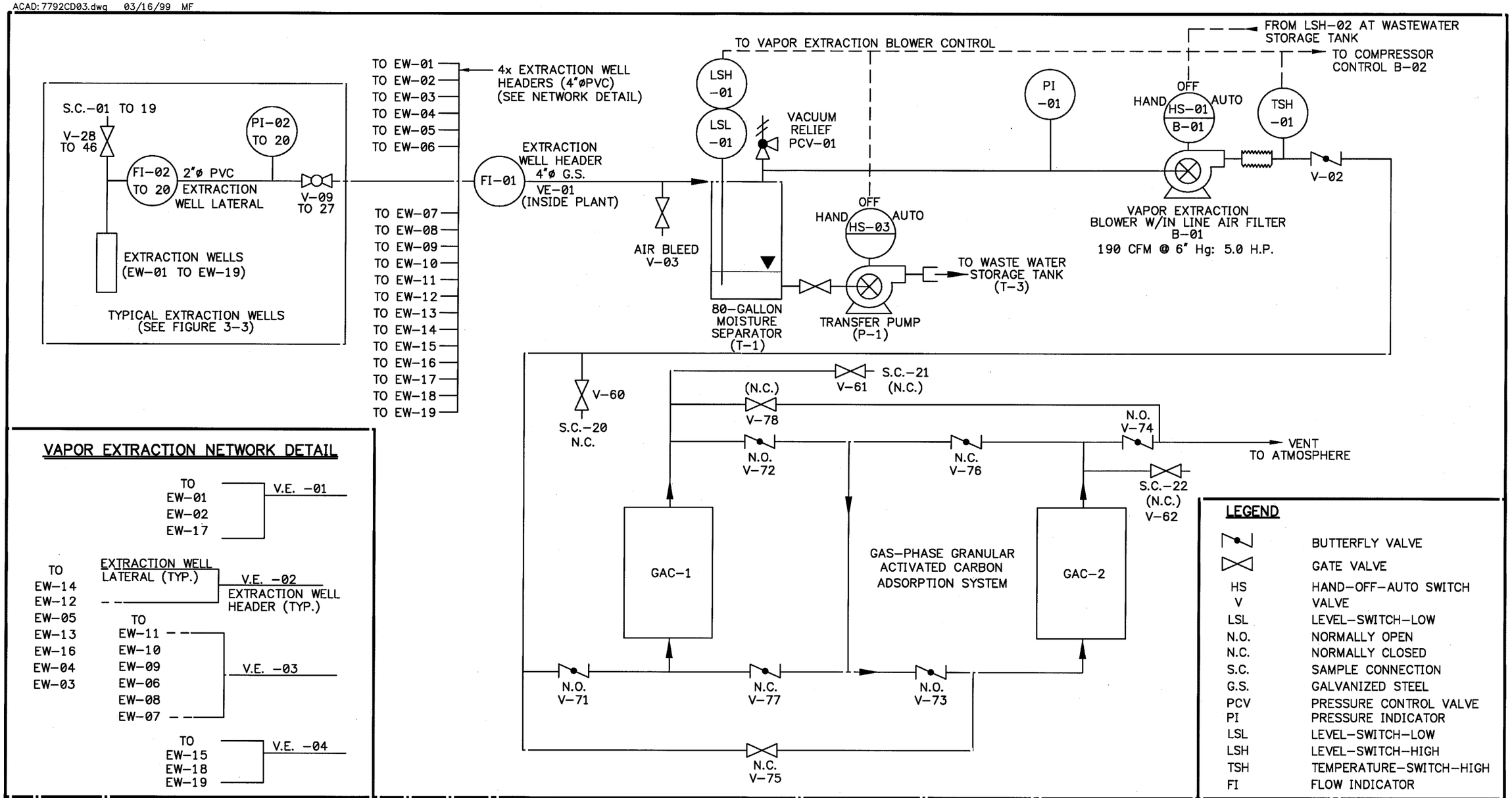

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COST/SCHED-AREA
SCALE AS NOTED

DEPARTMENT OF THE NAVY SOUTHERN DIV FACILITIES ENGINEERING COMD

VAPOR EXTRACTION AND TREATMENT PIPING AND INSTRUMENTATION DIAGRAM OPERABLE UNIT 7, SITE 16 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA

CONTRACT NO. 7792
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TABLE 3-3

VAPOR EXTRACTION AND TREATMENT EQUIPMENT SPECIFICATIONS
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Item	Specifications
Moisture Separator	Closed-top, vertical cylindrical carbon steel tank 80-gallon capacity, MS-80, 4-inch inlet, 4-inch outlet, 1-inch drain high-level and low-level switch, pressure relief valve, auto drain to holding tank including 1 HP pump
Vapor Extraction Blower	Positive displacement type, belt-drive 190 scfm @ 3psi/6.1 inches of mercury 5.0 HP motor, 480-volt, 3 phase Cartridge-type 1-micron inlet air filter
Off-Gas Treatment System (GAC)	Two 2,000 lb. GAC adsorber vessels operating in series, manifolded/valved for either vessel to be lead or lag
Controls	HAND-OFF-AUTO blower and pump operating switches High Moisture Separator liquid level cutoff switch Low Moisture Separator liquid level turn-on switch High vacuum blower outlet temperature cutoff switch High Wastewater Storage Tank liquid level cutoff switch Equipment failure alarm
Flow Meters	In line, rotameter type 0-400 scfm at treatment system inlet 0-20 scfm at each well head
Vacuum Gauges	0-10 inch mercury in main header 0-5 inch mercury at each well head
Aboveground Piping and Fittings	4-inch Schedule 40 galvanized steel
Underground Piping and Fittings	4-inch ID Schedule 40 PVC main header 2-inch ID Schedule 40 PVC individual well laterals

TABLE 3-4

VAPOR EXTRACTION AND TREATMENT PROCESS CONTROL
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA
PAGE 1 OF 2

Component ID No.	Description	Location	Function
B-01	Vapor Extraction Blower	Equipment Control Area	Creates vacuum for vapor extraction and pressure for supply of extracted vapors to off-gas treatment system.
HS-01	HAND-OFF-AUTO switch	Vapor Extraction Blower	Operation of Vapor Extraction Blower. Interlocks with LSH-01, LSL-01, LSH-02, and TSH-01. Interlock with HS-02.
HS-03	HAND-OFF-AUTO switch	Transfer Pump	Operation of Transfer Pump Interlocks with LSH-01, LSL-01, and HS-01
LSH-01	Level Switch, High	Moisture Separator	Stopping Vapor Extraction Blower upon high liquid level in Moisture Separator. Interlocks with HS-02 and TSH-01.
LSL-01	Level Switch, Low	Moisture Separator	Start Vapor Extraction Blower upon low liquid level to Moisture Separator. Interlocks with HS-02.
TSH-01	Temperature Switch, High	Vapor Extraction Blower	Stopping Vapor Extraction Blower upon high discharge temperature. Interlocks with HS-01 and LSH-01.
PCV-01	Pressure Relief Valve	Moisture Separator	Relief of excessive vacuum in Moisture Separator.
FI-01	Flow Indicator	Equipment Control Area Inlet prior to air-bleed valve	Indication of gas flow to vapor treatment system.
FI-02 to FI-20	Flow Indicators	Vapor extraction wellheads	Indication of gas flow at individual wellheads.
PI-01	Vacuum Gauge	Vapor Extraction Blower	Indication of vacuum upstream of Vapor Extraction Blower.
PI-02 to PI-20	Vacuum Gauges	Vapor extraction wellheads	Indication of vacuum at individual vapor extraction wellheads.
V-01 to V-02	Butterfly Valves	Vapor Extraction Blower	Isolation/Maintenance of Vapor Extraction Blower and Inlet Filter.
V-03	Gate Valve	Moisture Separator	Air Bleed

TABLE 3-4

VAPOR EXTRACTION AND TREATMENT PROCESS CONTROL
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA
PAGE 2 OF 2

Component ID No.	Description	Location	Function
V-09 to V-27	Ball Valves	Vapor extraction wellheads	Control of vapor flow from individual vapor extraction wells.
V-28 to V-46	Gate Valves	Vapor extraction wellheads	Collection of gas samples from individual vapor extraction wells.
V-60 to V-62	Gate Valves	Off-Gas Treatment System	Collection of gas samples upstream and downstream of off-gas treatment system.
V-71 to V-78	Gate Valve	Off-Gas Treatment System	Controls flow of off gas through GAC.
GAC-1, GAC-2	Off-Gas Treatment	Off-Gas Treatment System	Gas-Phase Granular Activated Carbon Adsorption System to treat off-gas.
T-1	Moisture Separator	Vapor Extraction Blower	Collects/Removes excessive amounts of water from vapor flow.
P-1	Transfer Pump	Moisture Separator	Pumps water from Moisture Separator to Wastewater Storage Tank.
VE-01	Vapor Extraction Header	Inside/Outside Equipment Control Area	Collects and conveys gases from VE-02, VE-03 and VE-04
VE-02, VE-03 and VE-04	Extraction Well Headers	Outside Equipment Control Area	Conveys extracted vapors from individual extraction well laterals to headers

The Vapor Extraction Blower will be of the positive displacement type with a minimum extraction capacity of 190 scfm and a vacuum rating of 3.0 psi or 6.1 inches of mercury. The blower motor will be rated for 5.0 horsepower and operate on a 480-volt, 3-phase electrical power supply. The pump-to-motor coupling will be of the belt type with multiple sheaves to allow for adjustments in the vapor extraction rate, as may be required by evolving conditions during the remedial action. The blower inlet will be equipped with a cartridge-type filter for protection against abrasive solid particles. The Vapor Extraction Blower, motor, inlet filter, Moisture Separator, and associated controls will be mounted on a single skid.

Gas-phase GAC Adsorption System

The purpose of the Gas-Phase GAC Adsorption System (GAC-1 and GAC-2) is to remove VOCs from the extracted vapors. The Gas-Phase GAC Adsorption System will be sized to treat a minimum of 190 scfm of air containing an estimated 750 parts per million per volume (ppmv) of VOCs. The estimated vapor-phase concentrations are based on current groundwater concentrations and the pilot-study air sampling and analysis results. The peak concentration is expected during the initial phase of operation. A GAC adsorption system was chosen based on results of the comparative analysis of three different vapor treatment technologies: (1) GAC, (2) solvent recovery (condensation) and (3) catalytic oxidation. Details of the analysis are presented in Appendix C.

The Gas-Phase GAC Adsorption System will consist of two adsorber vessels operating in series and containing 2,000 pounds of GAC each. The adsorber vessels will be manifolded and valved so that either vessel can be placed in the lead or lag position. When the GAC in the lead vessel becomes saturated, as evidenced by a breakthrough of VOCs in the off-gas from that vessel, this vessel will be taken out of service and replaced with a new one containing fresh GAC. The system will then be returned to operation with the vessel that had been in the lag position. Based upon the estimated concentrations of VOCs in the extracted vapors, it is anticipated that approximately 400 pounds of GAC per day will be saturated by the adsorption process and that the lead adsorber vessel will therefore require replacement every 5 days during the initial phase of operation. It is anticipated that this high rate of carbon usage will last for only a relatively short period of time and carbon change outs will become less frequent as treatment progresses.

Controls

Operation of the Vapor Extraction Blower will be controlled by a HAND-OFF-AUTO switch (HS-01) mounted on the blower skid. In the AUTO position, which is the normal mode of operation, the blower will be running continuously but its operation will be interlocked with the High Level Switches (LSH-01 and LSH-02) located in the Moister Separator and Wastewater Storage Tank and a high temperature switch (TSH-01) located in the discharge of the Vapor Extraction Blower. If these switches are tripped, the

vacuum extraction blower will stop, which in turn will activate an alarm, and also shut down the Air Sparging Compressor.

Operation of the Gas-Phase GAC Adsorption System will be controlled by manual valves, as previously described.

Vacuum will be monitored by gauges located immediately upstream of the Vapor Extraction Blower (PI-01) and at each individual vapor extraction well (PI-02 to PI-20).

Extracted vapor flow will be monitored by flow indicators located immediately upstream of the air bleed valve (V-60) and at each individual vapor extraction well (FI-02 to FI-19). As required, vapor flow will be adjusted at individual wellheads by using the manual ball valves (V-13 to V-30) provided for this purpose.

3.6 PIPING

Transfer Piping and Vault Boxes

All below ground system piping will be constructed of PVC. Pipe sizing will consider the head losses in the lines due to friction. Piping located outside the Equipment Control Area will be installed below grade to protect it throughout the duration of system operation. Piping will be buried a minimum of 2 feet below grade and shall be placed in bedding as necessary to protect the integrity of the pipe. Bedding and cover material shall consist of select fill and shall not contain any debris in excess of 1 inch in diameter. The remaining trench depth may be filled with common fill that does not contain any debris in excess of 3 inches in diameter. Material excavated from the trench meeting the requirements of select or common fill can be used as backfill.

Air sparging piping (2-inch diameter Schedule 80 PVC) will be installed from the Equipment Control Area to each sparging well. The tops of the wells will be completed in a 2-foot by 2-foot by 2-foot vault box. The vault box shall contain individual flow and pressure gauges. See Figure 3-2 for details. Vault boxes shall be constructed of galvanized steel and incorporate a locking cover. The boxes shall be placed even with grade and backfilled with select fill.

Vapor extraction piping (4-inch diameter Schedule 40 PVC headers and 2-inch diameter Schedule 40 PVC) well laterals will also be installed in individual trenches as described above. Each extraction well head and individual flow and pressure gauges will also be enclosed within vault boxes as described above. The vapor extraction well piping will also be provided with sample ports to allow sampling of vapors extracted from each well.

System piping from the Air Sparging Compressor to the individual air sparge lines and to the ground surface outside the Equipment Control Area will be constructed of 2-inch diameter galvanized steel pipe. System piping connecting the vapor extraction and treatment system inside the Equipment Control Area and to the ground surface outside the Equipment Control Area will be 4-inch diameter galvanized steel pipe. Galvanized steel pipes provide better mechanical integrity and heat dissipation.

3.7 POWER SOURCE

An electrical schematic for the for the compressor and vapor extraction units is included as Figure 3-7. Currently, it is assumed that permanent power can be made available at the site from the Building 313, which is approximately 50 feet away or a local connection

All electrical components shall be installed in accordance with National Electric Codes and local requirements. All equipment shall be grounded and wired to provide surge protection.

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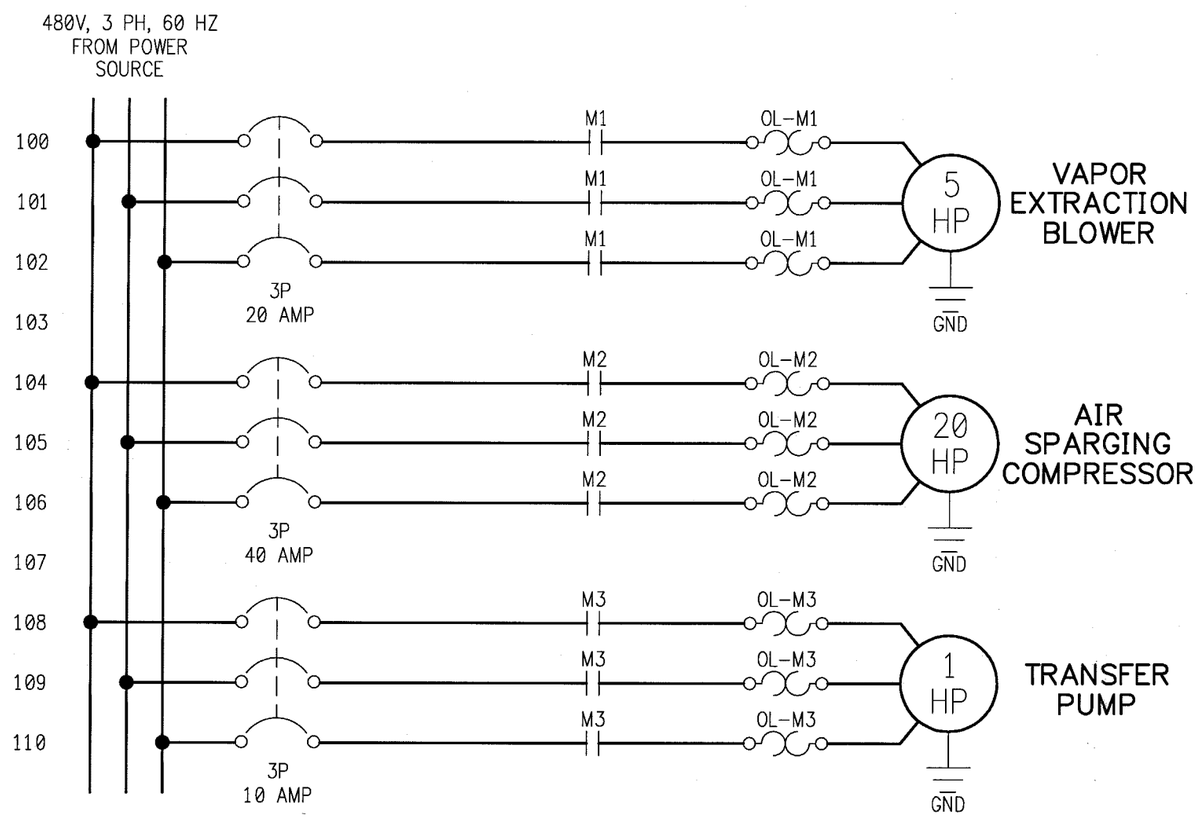
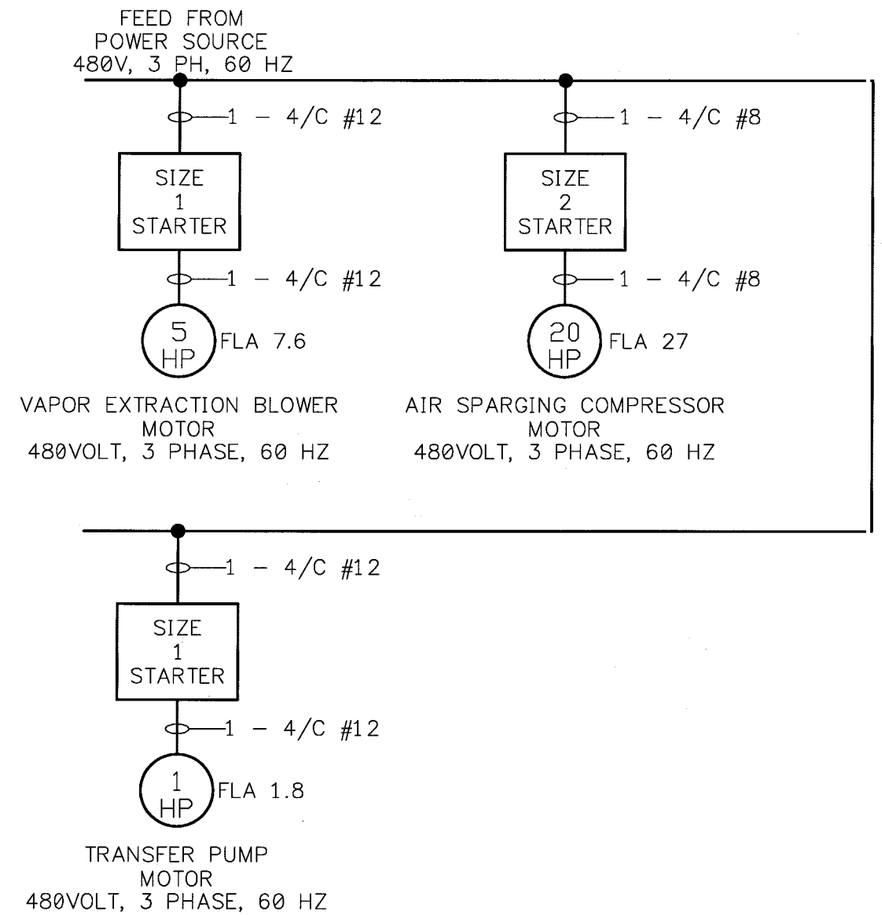


THREE LINE DIAGRAM



SINGLE LINE DIAGRAM

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SINGLE LINE DIAGRAM AND
ELECTRICAL SCHEMATIC DIAGRAM
OPERABLE UNIT 7 SITE 16
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

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4.0 SYSTEM STARTUP, OPERATION, AND MONITORING

Once installation of the AS/SVE system is completed, the system will undergo a startup period during which, operational problems will be corrected, the initial air sampling will be performed, and sparged air and extracted vapors flow rates will be equalized in the wells. Once the initial system troubleshooting is complete and the necessary adjustments have been made, normal operation will begin. The following sections describe the parameters to be monitored during system startup and operation. Long-term groundwater monitoring to determine the remedial action's effectiveness is discussed in Section 5.0.

4.1 SYSTEM STARTUP

4.1.1 Overview

Prior to system startup, a round of groundwater level measurements will be taken from all shallow monitoring wells in the treatment area (see Figure 2-3). Dissolved oxygen (DO), Oxidation/Reduction Potential (ORP), and headspace organic vapor concentration will be measured in selected wells. Physical observations (e.g. check for air bubbles) will also be conducted at the wells. This information will be compared to similar data collected after startup to determine the area of influence of the AS/SVE system.

The vapor extraction system will be started first. As determined by the pilot-scale test, a vacuum of up to 45 inches of water can be applied at vapor extraction wellheads without entraining an excessive amount of moisture. This "maximum" vacuum will be verified in the field and the vapor flow in each extraction well will be set at its maximum vacuum using a manual control valve.

Following initial operation of the vapor extraction system, the air sparging system will be started. The air flow rate into each air sparging well will be adjusted with a manual butterfly-type control valve so that all wells are receiving an equivalent air flow at a pressure that is sufficient to evacuate the water column in each well.

Off-gas will be evaluated using field instruments for compliance with health and safety requirements. Once this is completed, the vapor extraction wells will be checked to verify that excessive moisture is not being entrained and that each well is set at its optimal vacuum.

Immediately following complete system startup, a round of water levels will be collected and compared to the pre-startup levels to determine the influence of the system at the site. Various chemical parameters will also be evaluated, as discussed in Section 5.0.

The system will then be allowed to operate under these conditions for approximately 4 hours, at which time samples will be collected from the inlet and outlet of the Gas-Phase GAC Adsorption System and submitted to an offsite analytical laboratory for a quick turnaround off-gas treatment analysis of VOCs. These results will be used to determine the effectiveness of the Gas-Phase GAC Adsorption System and to verify that the rate of VOC emission from the AS/SVE system is in compliance with the State of Florida standards.

The following sections present detailed startup procedures that will be used to initiate system operation and monitoring of its performance.

4.1.2 Vapor Extraction and Treatment System Start-Up

A pre-startup system check will be conducted to verify that all components, including equipment, piping, and controls have been properly installed and are fully functional.

The following valves will be opened fully:

- V-09 to V-27: Manual flow control valves at vapor extraction wellheads,
- V-03: Air bleed valve immediately upstream of Moisture Separator,
- V-01 and V-02: Vapor Extraction Blower isolation valves, and
- V-71, V-72, V-73, and V-74: Valves to Gas-Phase GAC Adsorption System

The following valves will be closed fully:

- V –28 to V-46: Sample valves at vapor extraction wellheads,
- V-60, V-61, and V-62: Gas-Phase Gas Adsorption Systems sample valves, and
- V-75, V-76, V-77, and V-78: Gas-Phase GAC Adsorption System valves

The Vapor Extraction Blower (B-1) will then be started by turning its operating switch (HS-01) to the AUTO position. Once blower operation is established, the air bleed valve (V-03) will be gradually closed until the proper level of vacuum (40 - 45 inches of water) and total extraction air flow (190 cfm) are reached as indicated, respectively by the gauge (PI-01) located at the intake of the Vapor Extraction Blower and the flow meter (FI-01) located immediately upstream of the air bleed valve. Next, the manual ball-type control valves (V-09 to V-27) located at the extraction wellheads will be used to adjust the vapor flow from each extraction well to approximately 10 scfm, as indicated by the wellhead vapor flow meters (FI-02 to FI-20).

Once the system is operating and the vapor extraction flows are reasonably balanced, vapor samples will be collected from the wellhead sample valves (V-28 to V-46) using Tedlar bags to visually check for the presence of significant amounts of water droplets which would indicate excessive moisture entrainment. If this is observed on a localized basis, individual well vapor extraction rates will be decreased by using the wellhead flow control valves (V-09 to V-27). If this is a general phenomenon, the overall vapor extraction rate and vacuum level will be lowered by adjusting the air bleed valve (V-03).

4.1.3 Air Sparging System Start-Up

A pre-startup system check will be conducted to verify that all components, including equipment, piping, and controls have been properly installed and are fully-functional.

The following valves will be opened fully:

- V-45: Air Sparging Compressors block valve,
- V-47 and V-48: Refrigerated Air Dryer inlet and outlet valves,
- V-50: High-pressure air header block valve,
- V-51: Low-pressure air header block valve,
- V-52 to V-54: Deep (high-pressure) air sparging wells flow control valves, and
- V-55 to V-57: Shallow (low-pressure) air sparging wells flow control valves.

The following valves will be closed fully:

- V-49: Refrigerated Air Dryer bypass valve,
- V-58: High-pressure header bleed valve, and
- V-59: Low-pressure header bleed valve.

To provide sufficient air pressure to evacuate the water column from the deep (44 psi) and shallow (26.5 psi) air sparging wells, the high-pressure header pressure regulator (PR-01) will be set to approximately 50 psi and the low-pressure header pressure regulator (PR-02) will be set to approximately 30 psi.

The Air Sparging Compressor (B-02) will then be started by turning the operating switch to the AUTO position.

Once compressor operation has been established, lines have been purged, and pressures have essentially stabilized, which will require about 15 minutes, the air pressures of the high- and low-pressure headers will be checked and re-adjusted as necessary to 50 psi and 30 psi, respectively, by using the appropriate pressure regulator and pressure gauge (PR-01 and PI-36 for high-pressure, PR-02 and PI-35 for low-pressure). The air flow to individual air sparging wells will then be adjusted to 10 scfm by using the appropriate manual flow control valves (V-52 to V-57) and checked using flow meters (FI-20 to FI-25). As required, air pressures in individual wells will also need to be equalized and adjusted by using the appropriate pressure regulators (PR-03 to PR-08) and pressure gauges (PI-21 to PI-23 and PI-25 to PI-27).

Because all of the above adjustments will impact upon each other, initial balancing of the air sparging system will be an iterative process requiring several rounds of progressively smaller adjustments until conditions have been fully equalized.

As noted earlier, once the air sparging system has been started, it will impact the settings of the vapor extraction system which will have to be checked and re-adjusted as necessary. Also, at that time, a check of the interlock between the air sparging and vapor extraction systems will be conducted by briefly turning off the Vapor Extraction Blower and verifying that the operating Air Sparging Compressor automatically shuts off.

4.1.4 Vapor Treatment System Performance Test

To verify the adequate capture of extracted vapors by the vapor extraction system, samples of gas from temporary piezometers installed at selected locations and a set of six permanent piezometers is proposed. The temporary piezometers will be screened drive points inserted at several selected locations at the perimeter of the expected zones of extraction influence in the grass-covered areas. A set of baseline readings with a field screening instrument such as a flame ionization detector (FID) will be obtained first with the AS/SVE system shut off. Then, with the AS/SVE system in operation, the same locations will be tested for air pressure to identify if a vacuum exists. If no vacuum exits, then FID readings will be taken. If the FID readings during system operation are higher than the baseline readings, then samples of gas will be collected using a Summa canister and sent off-site for analysis to verify whether the concentrations of TCE, TCA and their degradation products are of potential concern to human health. The temporary piezometers will be used at radial distances of 30 to 50 feet from each injection well pair in the grass-covered areas. Three permanent piezometers (CEF-16-PZ-04, CEF-16-PZ-05, CEF-16-PZ-06) will be installed in the vicinity of Building 313 at the locations shown on Figure 3-1. These piezometers will be used to verify that the vapor extraction wells adjacent to the building are exerting an adequate vacuum

under the building, so that any VOCs that may be released under the building are captured by the vapor extraction system. These piezometers, along with piezometers CEF-16-PZ-01, CEF-16-PZ-02, and CEF-16-PZ-03, will be tested for baseline readings, vacuum, and operating readings, and if necessary, gas sampling and analysis as described earlier.

After the AS/SVE system has been operating for a minimum of 4 hours, tests will be performed to determine the effectiveness of the Gas-Phase GAC Adsorption System and verify compliance of the AS/SVE system emissions with the State of Florida regulations. These tests will consist of collecting gas samples from the sample valves located at the inlet and outlet of the Gas-Phase GAC Adsorption System (V-60 and V-61) and field-analyzing these for VOCs with the FID.

Additional samples will also be collected from the outlet of the Gas-Phase GAC Adsorption (V-61) for testing at an offsite analytical laboratory by using a Summa canister. The Summa canister is initially under a negative pressure and is filled from the sample port. The valve on the Summa canister is opened for approximately 15 to 30 seconds. Once the canister is full, the valve is closed and the hose and sample port plugged.

If fluctuation in water table elevations result in an excessive moisture entrainment (as revealed by periodic checks during vapor sampling), then the vacuum level at the vapor extraction wells will be adjusted accordingly.

The canister will be labeled with a unique sample identification number and submitted for analysis using gas chromatography, mass spectrometer Method TO-14 modified. The results of the analysis will be used to evaluate compliance with the air emission standards and effectiveness of the off-gas treatment. The extracted flow rate, in conjunction with the identified pre-treatment concentration will be used to established the pounds of VOCs being removed per day.

Measured VOC emission rate from the exhaust of the Gas-Phase GAC Adsorption System will also be evaluated using TSCREEN, an air dispersion modelling program. The resulting maximum 24-hour and annual average air concentrations will be compared to contaminant specific ambient reference concentrations (ARCs) to verify that emissions from the AS/SVE system do not pose a threat to public welfare and that no additional controls are required. If results exceed ARCs, the operating parameters of the AS/SVE system will be adjusted to reduce off-gas concentrations (e.g., reduce the system flow rate). FDEP's "Revised Guidance on Air Emissions from Petroleum Cleanup Sites" presents the alternative evaluation procedure (FDEP, 1996).

4.2 LONG-TERM SYSTEM OPERATION AND MONITORING

4.2.1 System Operation

Once the system reaches normal operation, a regular schedule of groundwater and air monitoring will be necessary, in addition to the regular checks of the system to balance air flows and pressures. Using system valving, the flows and pressures in each of the sparging wells can be balanced to provide an equal remedial effort.

At the end of each week for the first month of operation, air samples will be collected from the inlet and outlet of the Gas-Phase GAC Adsorption System. This data will be used to verify compliance with the State of Florida air emission standards. Field measurements with photoionization detector (PID) or FID will also be used to develop a correlation between field data and analytical values.

After the first month of operation, weekly checks of the system will continue to be necessary to verify operation. However, system evaluation can be performed on a monthly basis while air sampling may be reduced to quarterly events. Long-term groundwater monitoring will be performed in accordance with Section 5.0 of this report.

The following field checks and measurements will be performed monthly:

- sparging air and extracted vapor flows
- system operating pressures
- equipment operation hours
- equipment oil levels
- groundwater levels in site monitoring wells
- air monitoring readings

System adjustments and maintenance will be performed as needed during each site visit.

4.2.2 Equipment Maintenance

Equipment will be maintained in accordance with manufacturer's recommendations. During all site visits checks of the Air Sparging Compressor and Vapor Extraction Blower lubricating oil level, air filter, and belts will be made. The Gas-Phase GAC Adsorption System will be maintained per manufacturer's specifications.

4.3 REMEDIAL CLEANUP TIME

The remedial goal development considered reduction of TCE concentrations to be protective of human receptors in the unlikely event of ingestion of groundwater at the site as well as protection of surface water at Sal Taylor Creek where the TCE could ultimately discharge. A TCE concentration of 3 µg/L would be protective of the on-site receptor. Groundwater fate and transport modeling (ECTran model) was used to estimate the remedial cleanup goal range of residual TCE concentration at the source area that would attenuate to less than 3 µg/L when the contaminated groundwater plume reaches Sal Taylor Creek. According to the results of the modeling, taking into account sorption, dilution, advection, dispersion and anaerobic biodegradation, the current groundwater concentrations (408,000 µg/L) would be protective of Sal Taylor Creek. A theoretical half-life of 4.5 years was used for anaerobic degradation of TCE. However, in the most conservative scenario, if complete biodegradation is not sustained because of lack of substrate or other changes in the subsurface, then the source area concentrations may have to be as low as 49 µg/L in order to be protective of Sal Taylor Creek. Based on this information, the remedial cleanup goal is expected to be somewhere in between the 49 µg/L and the current groundwater concentration (408,000 µg/L). A remedial cleanup goal of 1,000 µg/L was selected for this design. This cleanup goal was selected using engineering judgement based on the above fate and transport modeling, technology capability, and conservatively assuming that limited natural attenuation is occurring. Further details of the remedial goal development and modeling are presented in Appendix D.

Typically, the determination of the location and amount of DNAPL is very difficult and DNAPL can be a continuing source of dissolved TCE for an unknown duration. At OU 7, Site 16, there is strong indication of the presence of DNAPL because TCE concentrations detected in a groundwater sample collected by direct push technology and analyzed onsite in the 1994 screening program were as high as 1,500 mg/L (similar to the concentration determined to be the site specific solubility limit of TCE based on the solubility testing in Section 3.1.3). However, the RI identified that DNAPL is not believed to be present in any significant volume, but as small streaks or globules scattered in narrow columns extending to approximately 40 feet beneath the former seepage pit. In August 1998, a monitoring well (CEF-16-45I), was installed at the same surveyed coordinate as the highest TCE concentration detected during the screening program in the source area and the groundwater sample was determined to contain 408 mg/L (duplicate sample contained 217 mg/L) of TCE. This groundwater sample was collected from a monitoring well and analyzed according to the quality assurance requirements of the Base-wide Generic Work Plan, that requires the data to be validated. These concentrations of TCE exceed 10 percent of TCE's solubility limit, and therefore according to a common "rule of thumb", there is strong indication of the presence of DNAPL. However, the groundwater sample concentrations are significantly less than the site specific

solubility limit. Therefore, the exact duration of remedial action by AS/SVE followed by natural attenuation cannot be estimated. The basis of the modeling and design will use the validated analytical result of 408 mg/L as the maximum TCE concentration.

The minimum duration for the AS/SVE system to reduce the TCE concentration from an average of 41 mg/L (mathematical average of TCE concentrations detected in the groundwater samples collected in the source area) to attain the 1 mg/L residual in the source area has been estimated to be 3 years. This estimate based on the design parameters as input to the "Air Sparging Model for Estimating Groundwater Cleanup Time and Rate" (Sellers and Schreiber, 1992). This model assumes that no DNAPL is present at the site since the RI indicated the volume of DNAPL is not significant and trying to predict the volume would be extremely difficult with any degree of accuracy. Using an initial maximum detected concentration of 408,000 μg/L, the remedial duration would increase to 4 years. Details of the AS/SVE cleanup rate modelling calculations are presented in Appendix E.

Following the attainment of 1 mg/L residual, the duration for natural attenuation to reduce source area concentrations to 3 μg/L is estimated to be approximately 15 years using the groundwater fate and transport model. The estimated duration for TCE concentrations to reduce to 3 μg/L in the downgradient plume by natural attenuation is approximately 30 years using the groundwater fate and transport model. The groundwater fate and transport model assumes that sorption, dilution, advection, dispersion, and anaerobic biodegradation occurs. However, if anaerobic biodegradation is not sustained, then the duration for natural attenuation could be as long as 48 years, as presented in Appendix D.

A residual TCE concentration of 1.0 mg/L was selected as the basis of design for which operation of the AS/SVE system could be discontinued and natural attenuation allowed to take over to complete remediation of the source area groundwater. A long-term groundwater-monitoring plan will be implemented to evaluate the effectiveness of the air sparging and to determine the appropriate time to begin site-wide natural attenuation. The BCT will make the decision based on the available data at the time as to when to discontinue the operation of the AS/SVE system.

5.0 LONG-TERM GROUNDWATER MONITORING

5.1 OVERVIEW

The objective of long-term groundwater monitoring is to evaluate the performance, progress and effectiveness of AS/SVE in the source area and natural attenuation in the downgradient area. To achieve this objective, this monitoring plan is designed to determine trends in contaminant levels over time, while also verifying that reduction is occurring. The monitoring plan includes groundwater sampling and analysis from selected monitoring wells (described in this section) and gas sampling and analysis from temporary and permanent piezometers (described in Section 4.1.4).

In the event that data collected under this monitoring plan indicate that either AS/SVE or natural attenuation are insufficient to protect human health and the environment, a contingency plan will be developed to augment or replace these remedies. This decision will be made as part of the 5-year review process.

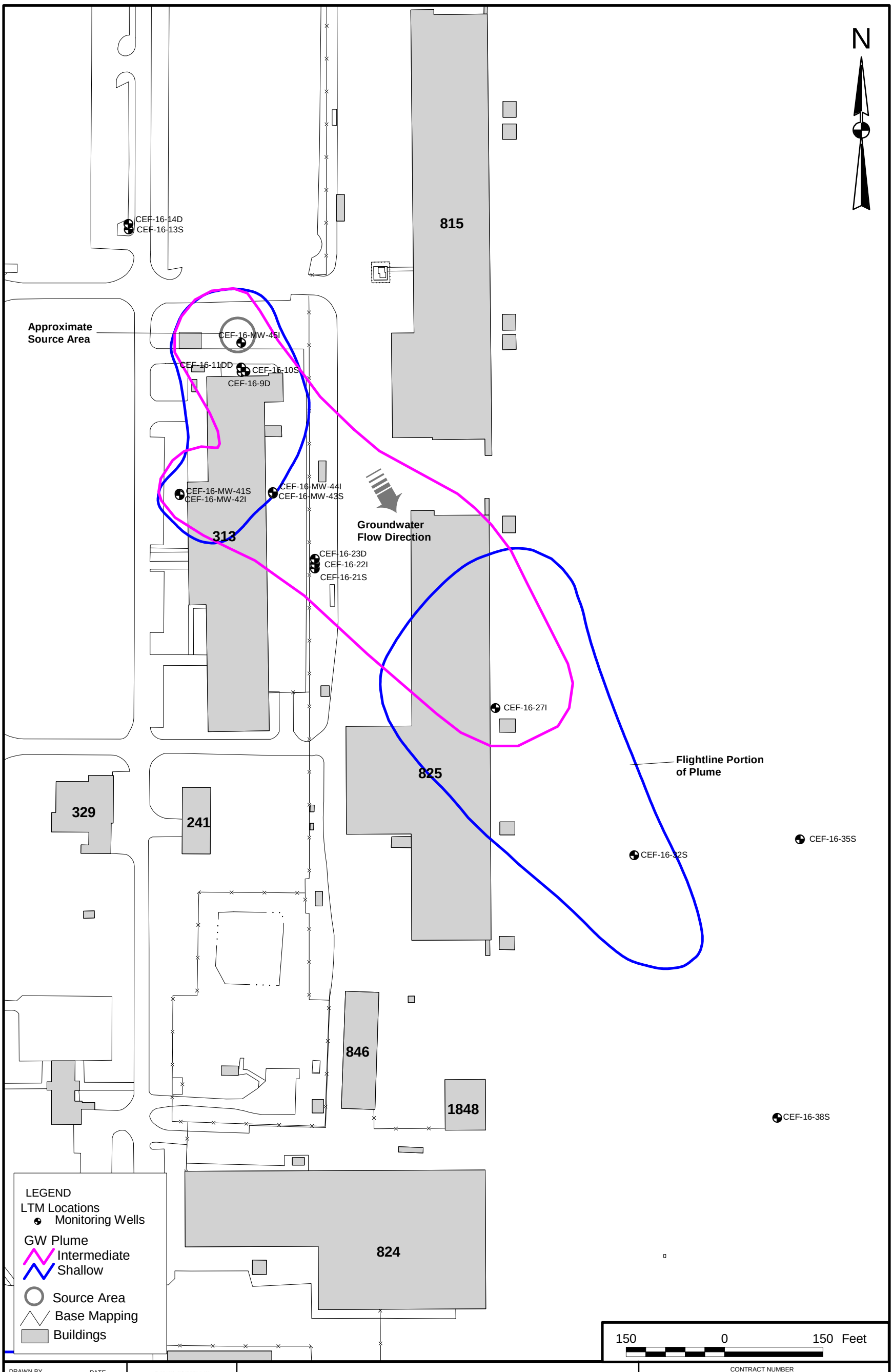
5.2 RECENT MONITORING WELL INSTALLATION

Five new monitoring wells, two clusters (shallow and intermediate depths) and one single well (intermediate depth), were installed in the surficial aquifer at the locations shown on Figure 5-1 to monitor the effectiveness of AS/SVE in the source area. Shallow depth wells CEF-16-GW41S and CEF-16-GW43S were screened at a depth interval of 10 to 15 feet bgs and intermediate depth wells CEF-16-GW42I, CEF-16-GW44I, and CEF-16-GW45I were screened at a depth interval of 27 to 32 feet bgs. The soil boring logs and monitoring well construction diagrams are included in Appendix F.

The new monitoring wells were installed and developed in accordance to the Southern Division, Naval Facilities Engineering Command's (SOUTHDIVNAVFACENGCOM's) "Monitoring Well Design, Installation, Construction, and Development Guidelines" (SOUTHDIVNAVFACENGCOM, 1997), U.S. EPA's "Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells" (U.S. EPA, 1990), and U.S. EPA Region IV Science and Ecosystem Support Division "Environmental Investigation Standard Operating Procedures and Quality Assurance Manual" (U.S. EPA Region IV, 1996).

All of the new wells except CEF-16-MW45I (stainless steel riser and screen) were constructed of flush joint, threaded, 2-inch ID Schedule 40 PVC. Well screens were 0.01-inch slot size. The wells were

P:\GIS\CECIL\SITE16.APR 3/4/99 CPG LAYOUT WELL LOCATION



DRAWN BY YLI	DATE 1/7/98	LONG-TERM GROUNDWATER MONITORING WELL LOCATIONS OPERABLE UNIT 7, SITE 16 NAVAL AIR STATION CECIL FIELD JACKSONVILLE, FLORIDA	CONTRACT NUMBER 7792
CHECKED BY RD	DATE 1/7/98		APPROVED BY DATE
COST/SCHEDULE-AREA			APPROVED BY DATE
SCALE AS NOTED			DRAWING NO. FIGURE 5-1 / REV 0

installed with a typical sand pack consisting of 20-40 grade silica sand, pure sodium bentonite seal, and grouted annulus.

5.3 LONG-TERM SAMPLING AND ANALYSIS

The following monitoring wells have been selected to monitor the effectiveness of AS/SVE in the source area and immediate vicinity and to monitor the effectiveness of natural attenuation in the downgradient area:

- CEF–16-GW41S
- CEF-16-GW43S
- CEF-16-GW42I
- CEF-16-9D
- CEF-16-10S
- CEF-16-11DD
- CEF-16-13S
- CEF-16-14D
- CEF-16-21S
- CEF-16-22I
- CEF-16-GW44I
- CEF-16-GW45I
- CEF-16-23D
- CEF-16-27I
- CEF-16-32S
- CEF-16-35S
- CEF-16-38S

Rationale for selection of the long-term monitoring wells is provided on Table 5-1.

Groundwater will be sampled and analyzed to verify that the contaminant mass and mobility are being effectively reduced. Water-level measurements will also be performed during each sampling event for all 17 monitoring wells. One round of samples will be collected and analyzed in accordance to the "Work Plan Addendum, Long-term Groundwater Sampling at Sites 3, 5, 8, and 16, NAS Cecil Field, Jacksonville, Florida" (TtNUS, 1998d). Samples will be analyzed for chlorinated VOCs, as shown on Table 5-2, and natural attenuation parameters, as shown on Tables 5-3 and 5-4.

The sample collected from well CEF-16-11 DD will be analyzed only in the first year and every five years to verify that contamination is not migrating into the deeper portion of the aquifer.

The contaminant concentrations are currently stable or decreasing based on the quarterly natural attenuation groundwater monitoring reports. Consideration for additional wells will be reviewed with the BCT based on the annual report. If necessary, additional existing wells may be included in the groundwater monitoring program to check on the eastern edges of the contaminant plume. However it is anticipated that the number of wells sampled in the future rounds may be reduced, depending on the

TABLE 5-1

MONITORING WELL LOCATIONS AND RATIONALE
LONG-TERM GROUNDWATER MONITORING
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD – JACKSONVILLE FLORIDA
PAGE 1 OF 2

Monitoring Well	Total Depth (feet bgs)	Screened Interval (feet bgs)	Rationale
CEF-16-GW41S	15	10-15	To monitor contaminant reductions in downgradient area as a result of air sparging. This well was selected to provide a sample location along the western edge of the downgradient portion of the source area plume area.
CEF-16-GW42I	32	27-32	To monitor contaminant reductions in downgradient area as a result of air sparging. This well was selected to provide a sample location along the western edge of the downgradient portion of the source area plume.
CEF-16-GW43S	15	10-15	To monitor contaminant reductions in downgradient area as a result of air sparging. This well was selected to provide a sample location along the eastern edge of the downgradient portion of the source area plume.
CEF-16-GW44I	32	27-32	To monitor contaminant reductions in downgradient area as a result of air sparging. This well was selected to provide a sample location along the eastern edge of the downgradient portion of the source area plume.
CEF-16-GW45I	32	27-32	To monitor contaminant reductions in the source area as a result of air sparging. This well was selected because the highest concentrations of TCE in the source area were detected at this location.
CEF-16-9D	101	91-101	To monitor contaminant reductions as a result of air sparging. This well was selected to provide a sample location in the deeper portion of the source area surficial aquifer.
CEF-16-10S	14	4-14	To monitor contaminant reductions as a result of air sparging. This well was selected to provide a sample location in the shallow portion of the source area surficial aquifer.
CEF-16-11DD	118	108-118	To monitor vertical migration of the plume.
CEF-16-13S	16	6-16	To obtain background groundwater geochemical data.
CEF-16-14D	101	91-101	To obtain background groundwater geochemical data.
CEF-16-21S	17	7-17	Evaluate contaminant concentrations outside of the area of influence of the air sparging wells and verify that aquifer has returned to anaerobic conditions in the shallow depth of downgradient portion of the source area plume.
CEF-16-22I	35	25-35	Evaluate contaminant concentrations outside of the area of influence of the air sparging wells and verify that aquifer has returned to anaerobic conditions in the intermediate depth of the downgradient portion of the source area plume.

TABLE 5-1

MONITORING WELL LOCATIONS AND RATIONALE
LONG-TERM GROUNDWATER MONITORING
OPERABLE UNIT 7, SITE 16
NAS CECIL FIELD – JACKSONVILLE FLORIDA
PAGE 2 OF 2

Monitoring Well	Total Depth (feet bgs)	Screened Interval (feet bgs)	Rationale
CEF-16-23D	99	89-99	Evaluate contaminant concentrations outside of the area of influence of the air sparging wells and verify that aquifer has returned to anaerobic conditions in the deeper zones of the downgradient portion of the source area plume.
CEF-16-27I	35	25-35	Monitor biodegradation of COCs over time in the intermediate depth of the flightline portion of the plume.
CEF-16-32S	17	7-17	Monitor biodegradation of COCs over time in the shallow portion of the aquifer in the flightline poriton of the plume.
CEF-16-35S	17	7-17	To verify that the identified plume is not expanding in the flightline portion of the plume
CEF-16-38S	17	7-17	To verify that the identified plume is not expanding in the flightline portion of the plume.

TABLE 5-2

SUMMARY OF CHEMICALS OF CONCERN ANALYTICAL REQUIREMENTS
LONG-TERM GROUNDWATER MONITORING
OPERABLE UNIT 7 SITE 16
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Parameter	Sample Container	Container Volume	Preservation[1]	Maximum Holding Time	Analytical Methodology
TCL Chlorinated VOCs	Glass, black phenolic plastic screw cap, Teflon-lined	2x40 mL	Cool to 4°C, dark, HCl to pH < 2	14 days	U.S. EPA-CLP SOW for Organic Analysis, Low Concentration (Doc. #OLC02.0)
Bis(2-ethylhexyl)phthalate	Amber glass, Teflon-lined cap	1000 ml	Cool to 4°C; dark	Extraction 7 days; analysis within 40 days	SW-846, 8270C

NOTES:

1 Preservation agents: HCl = Hydrochloric acid

TABLE 5-3

NATURAL ATTENUATION PARAMETERS
FIELD ANALYTICAL METHODS
NAS CECIL FIELD, JACKSONVILLE, FLORIDA
PAGE 1 OF 2

Parameter	Method[2]/ Reference	Data Use	Sample Volume, Container, & Preservation
Temperature	Direct-reading thermometer	Biological processes are temperature dependent.	100-250 ml in glass or plastic container. Analyze immediately
Dissolved Oxygen	HACH Test Kit Number OX-DT - Digital Titration - Azide modification of Winkler Method (HACH Method 8215)	Concentration of less than 1 mg/L indicates anaerobic conditions.	Follow test kit instructions. Analyze Immediately to nearest 0.2 mg/L
pH	Direct-reading meter	Biological processes are pH sensitive.	100-250 ml in glass or plastic container. Analyze immediately
Conductivity	Direct-reading meter	General water quality parameter used to verify that site samples are obtained from the same groundwater system.	100-250 ml in glass or plastic container. Analyze immediately
Alkalinity/Dissolved Inorganic Carbon (DIC)	HACH Test Kit Number AL-DT - Digital Titration - Phenolphthalein and Total Method (HACH Method 8203)	DIC concentrations, in comparison to the total alkalinity, provides an indication of the amount of CO_2 generated during aerobic or anaerobic reduction of a hydrocarbon.	Follow test kit instructions. Analyze immediately to determine carbonate, bicarbonate, and hydroxide ions to the nearest 10 mg/L
Ferrous Iron (Fe^{+2})	HACH Test Kit Number IR-18C - Color Disc - 1,10 Phenanthroline Method	Presence of ferrous iron may indicate presence of an anaerobic degradation process due to depletion of oxygen, nitrate, and manganese.	Follow test kit instructions. Analyze immediately to nearest 0.2 mg/L
Hydrogen Sulfide (H_2S)	HACH Test Kit Number HS-C - Color Chart - Effervescence of H_2S	Provides evidence of sulfate-based anaerobic degradation. May also indicate natural H_2S production.	Follow test kit instructions. Do not aerate or agitate. Analyze immediately. Analyze to nearest 0.1 mg/L
Oxidation-Reduction Potential (ORP)	Direct-Reading Meter	ORP provides information on RE/DOX conditions and to interpret the nature and state of chemical compounds and biological conditions. ORP typically ranges from +200mV in normal aerobic, oxidizing conditions to -400mV in strongly anaerobic, reductive conditions.	10-250 ml in glass container filling from the bottom. Do not aerate or agitate. Analyze immediately.

TABLE 5-3

NATURAL ATTENUATION PARAMETERS
FIELD ANALYTICAL METHODS
NAS CECIL FIELD, JACKSONVILLE, FLORIDA
PAGE 2 OF 2

Parameter	Method[2]/ Reference	Data Use	Sample Volume, Container, & Preservation
Carbon Dioxide (CO_2)	HACH Test Kit Number CA-DT - Digital Titration - Sodium Hydroxide & Phenolphthalein Method (HACH Method 8205)	May be compared with background values as an indication of aerobic and anaerobic process. Is produced during aerobic respiration as well as anaerobic processes. Is utilized during methanogenesis.	Follow test kit instructions. Do not aerate or agitate. Analyze immediately. Analyze to nearest 0.1 mg/L

NOTES:

1 Table adapted from overview of the Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater (Wiedemeier, 1996).
2 Method refers to U.S. EPA test methods. Standard Methods are based on Standard Methods for the Examination of Water and Wastewater (Olesceri, et al, 1992)

TABLE 5-4

NATURAL ATTENUATION PARAMETERS
FIXED-BASED LABORATORY METHODS
NAS CECIL FIELD, JACKSONVILLE, FLORIDA
PAGE 1 OF 2

Parameter	Method[2]/ Reference	Data Use	Sample Volume, Container, & Preservation
Alkalinity	EPA 310.1. Manual titrimetric	General water quality parameter used to verify that site samples are obtained from the same groundwater system and to measure the buffering capacity of the groundwater.	100-250 ml in glass or plastic container. Cool to 4°C. Analyze within 14 days.
Iron, Manganese (Dissolved)	SW-846 6010B	Iron and manganese can act as electron acceptors during biodegradation.	250 ml in plastic container. Collect filtered and unfiltered aliquots. HNO_3 to pH <2. Cool to 4°C. Analyze within 6 months.
Nitrate (NO_3^-) (only during year 1)	EPA 300	Potential substrate for microbial respiration. May compete as an electron acceptor if present at moderate concentrations (>1 mg/L).	250 ml in plastic container. Cool to 4°C. Analyze within 48 hours.
Nitrite (NO_2^-) (only during year 1)	EPA 300	Provides additional information on microbial and geochemical conditions.	250 ml in plastic container. Cool to 4°C. Analyze within 48 hours.
Orthophosphate (PO_4) (only during year 1)	EPA 300	Potential substrate for microbial respiration. Provides additional information on microbial and geochemical conditions.	250 ml in plastic container. Filter if turbid. Cool to 4°C. Analyze within 48 hours.
Sulfate (SO_4^{-2})	EPA 300	Potential substrate for microbial respiration. May compete as an electron acceptor if present at moderate concentrations (>20 mg/L).	250 ml in plastic container. Cool to 4°C. Analyze within 28 days.
Chloride (Cl^-)	EPA 300	Provides direct evidence of dechlorination. Provides additional information on geochemical conditions.	250 ml in plastic container. Cool to 4°C. Analyze within 28 days.
Dissolved Sulfide (S^{-2})	EPA 376.1	Provides evidence of sulfate-based anaerobic degradation.	1 liter in plastic container. NaOH to pH >9. Cool to 4°C. Analyze within 7 days.
Methane, Ethane, Ethene	RSK SOP-147 & 175	Presence of methane indicates biological degradation via an anaerobic pathway utilizing CO_2 as an electron acceptor. Ethane and ethene also indicate biological degradation of chlorinated VOCs.	40 ml in volatile organic analyte (VOA) vial with Teflon lined septum. HCl to pH <2. Cool to 4°C. Analyze within 14 days.

TABLE 5-4

NATURAL ATTENUATION PARAMETERS
FIXED-BASED LABORATORY METHODS
NAS CECIL FIELD, JACKSONVILLE, FLORIDA
PAGE 2 OF 2

Parameter	Method[2]/ Reference	Data Use	Sample Volume, Container, & Preservation
Biochemical Oxygen Demand 5-day (BOD-5) (only during year 1)	EPA 405.1	Provides a general indication of the amount of oxygen required to biologically and chemically stabilize organic matter.	2 liter HDPE. Cool to 4°C. Analyze within 48 hours.
Chemical Oxygen Demand (COD) (only during year 1)	EPA 410.1	Provides an indication of the amount of oxygen required to chemically degrade (oxidize) organic compounds, regardless of the biological capacity to degrade the substances.	125 ml HDPE. H_2SO_4 to pH < 2.0. Cool to 4°C. Analyze within 28 days.
Total Organic Carbon (TOC)	E 415.1	Indicates if the groundwater has a sufficient supply of carbon to act as the primary substrate. Collect from well located upgradient of site.	125 ml HDPE. H_2SO_4 to pH < 2.0. Cool to 4°C. Analyze within 28 days.

NOTES:

1 Table adapted from overview of the Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater (Wiedemeier, 1996).
2 Method refers to U.S. EPA test methods. Standard Methods are based on Standard Methods for the Examination of Water and Wastewater (Clesceri, et al, 1992)

results of the first year of monitoring. The selection of wells for the future monitoring will depend on the detection of natural attenuation parameters and chlorinated hydrocarbons in the initial rounds. Following the results of the future rounds of monitoring, it may be possible to reduce the number of wells to a representative set, plus CEF-16-38S (downgradient well) and CEF-16-35S (cross-gradient well) that will be retained for monitoring for the duration of the project. The representative set of wells for each monitoring year will be refined based on the locations where indications of biodegradation natural attenuation (chlorinated hydrocarbon and natural attenuation parameters) are strongest from the previous rounds.

Monitoring results will be tabulated and presented to the BCT in annual reports. If natural attenuation is determined to be occurring at an unacceptable rate, then further remedial measures may be considered.

During the first 5-year period, sampling and analysis of the long-term monitoring well network (see Section 5.3) will be conducted quarterly for the first year and semiannually for the next four years. The first year quarterly sampling event should be conducted in order to determine if there are significant temporal changes as a result of seasonal variation. If the data collected during this initial period supports the observed efficiency of natural attenuation (documentation that the plume is either in a steady-state condition or declining), the monitoring frequency may be reduced. If data collected at any time during the monitoring program indicate plume migration or a risk to human health and the environment, the sampling frequency should be adjusted accordingly and a contingency plan should be developed.

5.4 EVALUATION CRITERIA

The primary evaluation criterion to determine the effectiveness of AS/SVE and natural attenuation will be a decrease in the concentrations of COCs detected in the groundwater, in particular those of TCE and 1,1-DCE. Remediation will be deemed to have been achieved when these concentrations have reached the cleanup goals.

In addition, testing results for the parameters listed in Tables 5-3 and 5-4 will be used to verify whether natural attenuation is taking place and to evaluate the possibility of reaching cleanup goals. The following guidelines will be used for this evaluation:

Oxidation/Reduction Potential (ORP): Dechlorination of VOCs generally requires reductive conditions. ORP values of less than +50 millivolts (mV) indicate that reducing conditions are possible and values of less than –100 (mV) indicate a high possibility of reducing conditions.

Dissolved Oxygen (DO): Values of 0.5 milligrams per liter (mg/L) or greater indicate aerobic conditions; unfavorable conditions for reductive dechlorination for TCE and 1,1-DCE. However, if values exceed 1.0 mg/L, certain chlorinated VOCs, such as vinyl chloride, may be aerobically degraded.

Nitrates (NO_3^-): Values of 1.0 mg/L or greater indicate that reductive dechlorination may be inhibited.

Ferrous Iron (Fe^{2+}): Values greater than 1.0 mg/L indicate that reductive dechlorination is possible.

Sulfates (SO_4^{2-}): Values greater than 20 mg/L indicate that reductive dechlorination may be inhibited.

Sulfides (S^{2-}): Values greater than 1.0 mg/L indicate that reductive dechlorination is possible.

Methane (CH_4): Values greater than 1.0 mg/L indicate that reductive dechlorination is potentially occurring but that vinyl chloride may accumulate.

Carbon Dioxide (CO_2), Chlorides (Cl^-), Alkalinity (as $CaCO_3$): Values greater than twice background levels indicate that complete degradation of organic COCs may be occurring.

5.5 LONG-TERM MONITORING REPORTS

Upon completion of each round of sampling, a brief data summary report will be prepared documenting the investigative activities that were performed, presenting the analytical data generated, and making recommendations for the next round. Annually, a comprehensive monitoring report will be prepared that presents the nature and extent of chemical and geochemical (when applicable) results. Monitoring results will be tabulated and presented to the BCT in the form of annual reports. If natural attenuation is determined to be occurring at an unacceptable rate, then further remedial measures may be considered.

The annual reports will also evaluate the source area contaminant removal achieved by AS/SVE, score the natural attenuation process for the downgradient area, and provide conclusions and recommendations for future actions, as may be required. Initially, scoring of the natural attenuation process will be performed in accordance to the Technical Protocol for Evaluating Natural Attenuation of Chlorinated Solvents in Groundwater (U.S. EPA, 1998). Scoring protocol will be regularly updated based upon review of the most recent literature. If scoring shows limited evidence (6 to 14 points) or inadequate evidence (0 to 5 points) for natural attenuation of chlorinated organic compounds, and it appears that contaminant reduction is not occurring or contamination is migrating, a recommendation will be made that the selected

remedy be reevaluated. Long-term monitoring reports will be submitted to the Cecil Field Partnering Team.

5.6 INSTITUTIONAL CONTROLS

Institutional controls will consist of administrative measures taken to prevent exposure of human receptors to the groundwater in the surficial aquifer. The Navy will submit annual reminders of these restrictions and plans will be sent to all owners or residents of properties affected by contaminated groundwater. A formal request will be made to the agencies administrating the well installation permit program in Duval County to not issue permits for installation of drinking water wells that would pump water from the surficial aquifer.

5.7 FIVE-YEAR REVIEWS

Five-year reviews will be conducted at Site 16 in accordance with CERCLA, Section 121(c) and the NCP, Section 300.430(f)4(ii).

5.7.1 Background

Five-year reviews are conducted at sites where remedial action results in hazardous substances, pollutants, or contaminants (i.e., COCs) remaining on site. Remedial action at Site 16 does not immediately remove all contaminants from the site; therefore residual contaminants will remain on site until the AS/SVE and natural attenuation have been successfully completed.

Typically U.S. EPA conducts 5-year reviews. However, remedial action at NAS Cecil Field is being implemented under a Federal Facility Agreement (FFA) and, as such, the Navy is responsible for conducting these reviews.

5.7.2 Purpose

Five-year reviews are conducted to evaluate whether or not the remedies selected in the ROD remain protective of human health and the environment.

5.7.3 Execution

The 5-year review process will consist of the following:

- Review of background documents concerning Site 16, including long-term monitoring reports;

- Identification and review of new regulatory standards as may have been promulgated since the signing of the ROD or since the previous 5-year review;

- Site visit to conduct a visual inspection;

- Preparation of a 5-year review report, including conclusions and recommendations for future actions as may be required.

5.7.4 Reporting

A report will be prepared at the end of each 5-year review period. The 5-year review reports will include the following elements:

- An introduction, including a summary of site characteristics;

- A brief discussion of RAOs and discussion of the applicable or relevant and appropriate requirements (ARARs);

- A description of monitoring and maintenance activities at the site;

- A presentation of monitoring results, including an evaluation of changes in monitoring parameters;

- An evaluation of how well the selected remedy has protected human health and the environment, including a formal statement of protectiveness of human health and the environment, a determination of remaining risks, and an analysis of potential deterioration of the remedy;

- A presentation of cost incurred;

- A summary description of the site visit;

- Documentation of areas of noncompliance, as may apply;

- Recommendations for future response actions, as may be required.

The 5-year review reports will be submitted to the Navy, U.S. EPA Region IV, and the FDEP.

5.8 QUALITY ASSURANCE/QUALITY CONTROL

To reduce sources of error during the implementation of the work outlined in this document, as well as during long-term monitoring, all activities will be carried out in accordance with the Master Quality Assurance Project Plan (QAPP) for NAS Cecil Field.

6.0 COST ESTIMATE

The capital costs for construction of the air sparging system and installation of the vapor extraction and off-gas treatment system, are estimated to be $542,350. Operation and maintenance costs for 1 year are estimated to be $169,650. Therefore, the total cost for system installation and the first year of operation is $712,000. Currently, it is anticipated that TtNUS will provide system monitoring, and groundwater monitoring under the existing Contract Task Order No. 051. The detailed cost estimate for construction and 1 year of operation and maintenance is provided in Appendix G.

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APPENDIX A

ANALYTICAL LABORATORY RESULTS

Tetra Tech NUS

INTERNAL CORRESPONDENCE

PITT-10-8-218

TO:	M. SPERANZA	DATE:	NOVEMBER 6, 1998
FROM:	GRETCHEN PHIPPS	COPIES:	DV FILE

SUBJECT: **INORGANIC DATA VALIDATION-IRON, MANGANESE AND MISCELLANEOUS**
CTO 051 - CECIL FIELD
SDG – 9809102 AND SDG – 9809110

SAMPLES: 5/Aqueous/

CEF-16-41S-01	CEF-16-09D-01	CEF-16-10S-01
CEF-16-43S-01	CEF-16-44I-01	

Overview

The sample set for CTO 051, NAS Cecil Field, SDG 9809102 and SDG 9809110, consists five (5) aqueous environmental samples.

All samples were analyzed for iron, manganese, o-phosphate, dissolved sulfide, alkalinity, bicarbonate alkalinity, biological oxygen demand (BOD), bromide, chemical oxygen demand (COD), chloride, nitrate, nitrite, sulfate, total organic carbon (TOC) and carbonate alkalinity. The samples were collected by Tetra Tech NUS on September 14 and 15, 1998 and analyzed by GP Environmental Services.

Iron and manganese analyses were conducted using SW-846 method 6010B. BOD analyses were conducted using EPA method 405.1. COD analyses were conducted using EPA method 410.1. Chloride, Bromide, Nitrate, Nitrite, 0-Phosphate and Sulfate analyses were conducted using EPA method 300. Dissolved sulfide analyses were conducted using EPA method 376.1. Alkalinity analyses were conducted using EPA method 310.1.

The data was evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
• Calibration Verifications
• Laboratory Blank Analyses

* - All quality control criteria were met for this parameter.

The attached Tables 1 and 2 summarizes the validation recommendations which were based on the following information:

Calibration Verifications

A Continuing Calibration Verification (CCV) Percent Recovery (%R) for chloride analyses was <90% quality control limit. The positive result reported for chloride analyses were qualified as estimated, "J".

A CCV %R for nitrate analyses was<90% quality control limit. The nondetected results reported for nitrate analyses were qualified as estimated, "UJ".

A CCV %R for TOC analyses was <90% quality control limit. The positive results reported for TOC analyses were qualified as estimated, "J".

Laboratory Blank Analyses

Affected samples: All

Analyte	Maximum Concentration	Action Level(aqueous)
Iron	38.9µg/L	194.5µg/L

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. No action was taken since the results for iron were greater than the action level.

Executive Summary

Laboratory Performance: CCV %R's for chloride, nitrate and TOC analyses were <90% quality control limit.

Other Factors Affecting Data Quality: None.

The Data for these analyses were reviewed with reference to the "National Functional Guidelines for Organic and Inorganic Review", February 1994 and the NFESC document entitles "Navy Installation Restoration Laboratory Quality Assurance Guide." (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A Phipps

Tetra Tech NUS
Gretchen A. Phipps

Tetra Tech NUS
Joseph A. Samchuck
Quality Control Officer

Attachments:

1. Appendix A - Qualified Analytical Data
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Cecil Field
SDG 9809102
SDG 9809110

Table 1 - RECOMMENDATION SUMMARY

Iron	
Manganese	
O-phosphate	
Dissolved sulfide	
Alkalinity	
Bicarbonate alkalinity	
BOD	
Bromide	
COD	
Chloride	J[1]
Nitrate	J[1]
Nitrite	
Sulfate	
TOC	J[1]
Carbonate alkalinity	

If the field is left blank, the qualifier is A - Accept data.

A[1] - Accept data, but qualify results less than the blank action level as nondetected, "U", as a result of laboratory blank contamination.

J[1] Accept data, but qualify positive and nondetected results as estimated, "J" and "UJ", respectively, as the result of CCV %R.

APPENDIX A
Qualified Analytical Results

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809110

SAMPLE NUMBER:	CEF-16-09D-01	CEF-16-10S-01	CEF-16-43S-01	CEF-16-44I-01
SAMPLE DATE:	09/15/98	09/15/98	09/15/98	09/15/98
LABORATORY ID:	9809110 - 04	9809110 - 03	9809110 - 01	9809110 - 02
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	ug/L	ug/L	ug/L	ug/L
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
IRON	875			815			1030			499		
MANGANESE	19.8			339			84.1			19.7		

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809110

SAMPLE NUMBER:	CEF-16-09D-01	CEF-16-10S-01	CEF-16-43S-01	CEF-16-44I-01
SAMPLE DATE:	09/15/98	09/15/98	09/15/98	09/15/98
LABORATORY ID:	9809110 - 04	9809110 - 03	9809110 - 01	9809110 - 02
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	mg/L	mg/L	mg/L	mg/L
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
ALKALINITY	36.5			302			34.4			8.33		
BICARBONATE ALKALINITY	36.5			302			34.6			8.33		
BIOLOGICAL OXYGEN DEMAND	2.0	U		3.29			26.4			2.0	U	
BROMIDE	0.32			1.03			0.39			0.32		
CARBONATE ALKALINITY	1.0	U		1.0	U		1.0	U		1.0	U	
CHEMICAL OXYGEN DEMAND	5.0	U		57.1			156			36.4		
CHLORIDE	9.08	J	C	2.84	J	C	7.12	J	C	4.19	J	C
NITRATE	0.10	UJ	C	0.10	UJ	C	0.20	UJ	C	0.10	UJ	C
NITRITE	0.10	U		0.10	U		0.20	U		0.10	U	
ORTHOPHOSPHATE	0.14			0.10	U		0.20	U		0.10	U	
SULFATE	0.26			9.69			16.9			2.03		
SULFIDE	2.0	U		2.0	U		2.0	U		2.0	U	
TOTAL ORGANIC CARBON	2.78	J	C	57.4	J	C	61.3	J	C	8.28	J	C

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809102

SAMPLE NUMBER:	CEF-16-41S-01			
SAMPLE DATE:	09/14/98	/ /	/ /	/ /
LABORATORY ID:	9809102 - 01			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	ug/L			
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
IRON	1250											
MANGANESE	78.3											

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809102

SAMPLE NUMBER:	CEF-16-41S-01											
SAMPLE DATE:	09/14/98			/ /			/ /			/ /		
LABORATORY ID:	9809102 - 01											
QC_TYPE:	NORMAL											
% SOLIDS:	0.0 %			100.0 %			100.0 %			100.0 %		
UNITS:	mg/L											
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
ALKALINITY	14.6											
BICARBONATE ALKALINITY	14.6											
BIOLOGICAL OXYGEN DEMAND	2.0	U										
BROMIDE	0.30											
CARBONATE ALKALINITY	1.0	U										
CHEMICAL OXYGEN DEMAND	36.4											
CHLORIDE	4.18	J	C									
NITRATE	0.10	UJ	C									
NITRITE	0.10	U										
ORTHOPHOSPHATE	0.10	U										
SULFATE	12.3											
SULFIDE	2.0	U										
TOTAL ORGANIC CARBON	12.5	J	C									

Qualifier Codes:

a	=	Lab Blank Contamination
b	=	Field Blank Contamination
c	=	Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
d	=	MS/MSD Noncompliance
e	=	LCS/LCSD Noncompliance
f	=	Lab Duplicate Imprecision
g	=	Field Duplicate Imprecision
h	=	Holding Time Exceedance
i	=	ICP Serial Dilution Noncompliance
j	=	GFAA PDS - GFAA MSA's r < 0.995
k	=	ICP Interference - include ICSAB % R's
l	=	Instrument Calibration Range Exceedance
m	=	Sample Preservation
n	=	Internal Standard Noncompliance
o	=	Poor Instrument Performance (i.e., base-time drifting)
p	=	Uncertainty near detection limit (< 2 x IDL for inorganics and < CRQL for organics)
q	=	Other problems (can encompass a number of issues)
r	=	Surrogates Recovery Noncompliance
s	=	Pesticide/PCB Resolution
t	=	% Breakdown Noncompliance for DDT and Endrin.
u	=	Pest/PCD % between columns for positive results.
v	=	Non-linear calibrations, tuning r < 0.995 (correlation coefficient)

APPENDIX B
Results as reported by the Laboratory

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

415-01

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: NUS102

Matrix (soil/water): WATER Lab Sample ID: 9809102-01

Level (low/med): LOW Date Received: 09/15/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	1250			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	78.3			P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				

Color Before: YELLOW Clarity Before: CLOUDY Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

09D-01

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: NUS110

Matrix (soil/water): WATER Lab Sample ID: 9809110-04

Level (low/med): LOW Date Received: 09/16/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	875			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	19.8			P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

FORM I - IN

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

10S-01

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: NUS110

Matrix (soil/water): WATER Lab Sample ID: 9809110-03

Level (low/med): LOW Date Received: 09/16/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	815			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	339			P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				

Color Before: YELLOW Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

FORM I - IN

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

43S-01

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: NUS110

Matrix (soil/water): WATER Lab Sample ID: 9809110-01

Level (low/med): LOW Date Received: 09/16/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	1030			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	84.1			P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				

Color Before: YELLOW Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

44I-01

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: NUS110

Matrix (soil/water): WATER Lab Sample ID: 9809110-02

Level (low/med): LOW Date Received: 09/16/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	499			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	19.7			P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				

Color Before: YELLOW Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

RUN SUMMARY SHEET
O-Phosphate (as phosphorus)

DATA FILE: NUS91698
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/16/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	0		-0.076	-0.076	0.100	mg/L			
2	0.1 PPM	S1	847		0.039	0.039	0.100	mg/L			
3	0.5 PPM	S2	4456		0.527	0.527	0.100	mg/L			
4	1.0 PPM	S3	8528		1.08	1.08	0.100	mg/L			
5	3.0 PPM	S4	23790		3.15	3.15	0.100	mg/L			
6	5.0 PPM	S5	36615		4.88	4.88	0.100	mg/L			
7	FOR CL AND SO4 ONLY										
8	FOR NO3 ONLY										
9	FOR NO2 ONLY										
10	BLANK	ICB	0		-0.076	-0.076	0.100	mg/L			
11	9809102-01	CEF-16-415-01	116		-0.060	-0.060	0.100	mg/L			
12	9809102-01	CEF-16-415-01	0		-0.076	-0.762	1.00	mg/L			
13	9809110-04	CEF-16-09D-01	1575		0.137	0.137	0.100	mg/L			
14	9809110-04	CEF-16-09D-01	275		-0.039	-0.390	1.00	mg/L			
15	9809110-03	CEF-16-10S-01	0		-0.076	-0.076	0.100	mg/L			
16	9809110-03	CEF-16-10S-01	0		-0.076	-0.762	1.00	mg/L			
17	9809110-01	CEF-16-43S-01	546		-0.002	-0.004	0.200	mg/L			
18	9809110-01	CEF-16-43S-01	116		-0.060	-1.21	2.00	mg/L			
19	FOR CL AND SO4 ONLY										
20	FOR NO3 ONLY										
21	FOR NO2 ONLY										
22	CCB1	CCB1	0		-0.076	-0.076	0.100	mg/L			
23	9809110-02	CEF-16-44I-01	0		-0.076	-0.076	0.100	mg/L			
24	9809110-02	CEF-16-44I-01	0		-0.076	-0.762	1.00	mg/L			
25	9809110-02D	CEF-16-44I-01D	0		-0.076	-0.076	0.100	mg/L		0.000	
26	9809110-02D	CEF-16-44I-01D	0		-0.076	-0.762	1.00	mg/L		0.000	
27	9809110-02S	CEF-16-44I-01S	18080		2.37	4.75	0.200	mg/L	94.9		
28	9809110-02S	CEF-16-44I-01S	18326		2.41	48.1	2.00	mg/L	96.3		
29	FOR CL AND SO4 ONLY										
30	FOR NO3 ONLY										
31	FOR NO2 ONLY										
32	CCB2	CCB2	0		-0.076	-0.076	0.100	mg/L			

L Wardell TW 10-9-98
Analyst / Date

Lab Supervisor / Date

RUN SUMMARY SHEET
Sulfide

ATA FILE: S2_91898
NSTRUMENT FILE:
INSTRUMENT: WET_LAB
ANALYZED: 09/18/1998

eq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	ICB	0		0.000	0.000	2.00	mg/L			
2	PREP BLANK	PB	0		0.000	0.000	2.00	mg/L			
3	9808266-01	W1	0		0.000	0.000	2.00	mg/L			
4	9808266-01D	W1D	0		0.000	0.000	2.00	mg/L		DIV BY	
5	9808266-02	W2	0		0.000	0.000	2.00	mg/L			
6	9809031-01	AD-6833	0		0.000	0.000	2.00	mg/L			
7	9809102-01	CEF-16-41S-01	0		0.000	0.000	2.00	mg/L			
8	9809110-01	CEF-16-43S-01	0		0.000	0.000	2.00	mg/L			
9	9809110-02	CEF-16-44I-01	0		0.000	0.000	2.00	mg/L			
10	9809110-03	CEF-16-10S-01	0		0.000	0.000	2.00	mg/L			
11	9809110-04	CEF-16-09D-01	0		0.000	0.000	2.00	mg/L			
12	9809117-01	CEF-16-45I-01	0		0.000	0.000	2.00	mg/L			
13	BLANK	CCB	0		0.000	0.000	2.00	mg/L			
14	9809117-02	CEF-16-11DD-01	0		0.000	0.000	2.00	mg/L			
15	9809117-03	CEF-16-21S-01	0		0.000	0.000	2.00	mg/L			
16	9809117-04	CEF-16-23D-01	0		0.000	0.000	2.00	mg/L			
17	9809117-05	CEF-16-DP1-01	0		0.000	0.000	2.00	mg/L			
18	9809082-02	E03-SD03-01-121	0		0.000	0.000	34.7	mg/Kg			
19	9809082-03	E03-SD03-01-122	0		0.000	0.000	14.1	mg/Kg			
20	9809082-04	E03-SD03-01-123	0		0.000	0.000	13.1	mg/Kg			
21	9809082-05	E03-SD03-01-124	3		3.00	21.3	14.2	mg/Kg			
22	9809082-06	E03-SD03-00-125	0		0.000	0.000	2.00	mg/L			
23	BLANK	CCB	0		0.000	0.000	2.00	mg/L			
24	9809082-07	E03-SD03-00-126	0		0.000	0.000	2.00	mg/L			
25	9809082-08	E03-SD00-01-127	0		0.000	0.000	27.1	mg/Kg			
26	9809082-08D	E03-SD00-01-127	0		0.000	0.000	27.2	mg/Kg		DIV BY	
27	BLANK	CB	0		0.000	0.000	2.00	mg/L			

JH 9-21-98
Analyst / Date

9-21-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Alkalinity

DATA FILE: ALK91898
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/18/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0127	WC0127	220.8		221	221	1.00	mg/L	94.0		
2	BLANK	ICB	0		0.000	0.000	1.00	mg/L			
3	9809082-02	E03-SD03-01-121	8.3		8.30	74.4	8.97	mg/Kg			
4	9809082-03	E03-SD03-01-122	4.2		4.20	15.8	3.75	mg/Kg			
5	9809082-03D	E03-SD03-01-122	4.2		4.20	15.8	3.75	mg/Kg		0.000	
6	9809082-04	E03-SD03-01-123	4.2		4.20	14.8	3.51	mg/Kg			
7	9809082-05	E03-SD03-01-124	4.2		4.20	15.5	3.69	mg/Kg			
8	9809082-06	E03-SD03-00-125	2.1		2.10	2.10	1.00	mg/L			
9	9809082-07	E03-SD03-00-126	0		0.000	0.000	1.00	mg/L			
10	9809082-08	E03-SD00-01-127	4.2		4.20	28.7	6.83	mg/Kg			
11	PREP BLANK	PREP BLANK	0		0.000	0.000	2.00	mg/Kg			
12	9809102-01	CEF-16-415-01	14.6		14.6	14.6	1.00	mg/L			
13	WC0127	WC0127	222.9		223	223	1.00	mg/L	94.9		
14	BLANK	BLANK	0		0.000	0.000	1.00	mg/L			
15	9809110-01	CEF-16-43S-01	34.4		34.4	34.4	1.00	mg/L			
16	9809110-02	CEF-16-44I-01	8.33		8.33	8.33	1.00	mg/L			
17	9809110-03	CEF-16-10S-01	302		302	302	1.00	mg/L			
18	9809110-04	CEF-16-09D-01	36.5		36.5	36.5	1.00	mg/L			
19	9809117-01	CEF-16-45I-01	0		0.000	0.000	1.00	mg/L			
20	9809117-02	CEF-16-11DD-01	260.4		260	260	1.00	mg/L			
21	9809117-03	CEF-16-21S-01	7.9		7.90	7.90	1.00	mg/L			
22	9809117-04	CEF-16-23D-01	242.7		243	243	1.00	mg/L			
23	9809117-05	CEF-16-DP1-01	0		0.000	0.000	1.00	mg/L			
24	9809117-04D	CEF-16-23D-01D	244.8		245	245	1.00	mg/L		0.862	
25	WC0127	WC0127	222.9		223	223	1.00	mg/L	94.9		
26	BLANK	BLANK	0		0.000	0.000	1.00	mg/L			
27	9809113-02	E19-GW03-19-113	49		49.0	49.0	1.00	mg/L			
28	9809113-05	E19-GW03-38-111	56.2		56.2	56.2	1.00	mg/L			
29	9809113-05D	E19-GW03-38-111	54.2		54.2	54.2	1.00	mg/L		3.62	
30	9809113-07	E19-GW99-18-115	40.6		40.6	40.6	1.00	mg/L			
31	9809113-09	E19-GW99-14-117	52.1		52.1	52.1	1.00	mg/L			
32	WC0127	WC0127	237		237	237	1.00	mg/L	101		
33	BLANK	BLANK	0		0.000	0.000	1.00	mg/L			
34	9809096-02	E19-GW01-19-098	4.2		4.20	4.20	1.00	mg/L			
35	9809096-02D	E19-GW01-19-098	4.2		4.20	4.20	1.00	mg/L		0.000	
36	9809096-04	E19-GW02-23-100	4.2		4.20	4.20	1.00	mg/L			
37	9809096-06	E19-GW02-23-102	2.1		2.10	2.10	1.00	mg/L			
38	9809096-08	E19-GW02-23-104	4.2		4.20	4.20	1.00	mg/L			

LM
Analyst / Date

Chris Brown 10-9-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Alkalinity

DATA FILE: ALK91898
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/18/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
39	9809096-10	E19-GW99-13-106	2.1		2.10	2.10	1.00	mg/L			
40	9809096-12	E19-GW99-13-108	5.2		5.20	5.20	1.00	mg/L			
41	9809098-02	E38-GW04-39-041	62.5		62.5	62.5	1.00	mg/L			
42	9809098-04	E38-GW04-31-043	45.8		45.8	45.8	1.00	mg/L			
43	WC0127	WC0127	237		237	237	1.00	mg/L	101		
44	BLANK	BLANK	0		0.000	0.000	1.00	mg/L			

LM
Analyst / Date

Chris Beaty 10-9-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Bicarbonate Alkalinity

DATA FILE: ALK91898
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/18/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
2	BLANK	ICB			0.000	0.000	1.00	mg/L			
3	9809082-02	E03-SD03-01-121			0.000	0.000	8.97	mg/Kg			
4	9809082-03	E03-SD03-01-122			0.000	0.000	3.75	mg/Kg			
5	9809082-03D	E03-SD03-01-122			0.000	0.000	3.75	mg/Kg		DIV BY	
6	9809082-04	E03-SD03-01-123			0.000	0.000	3.51	mg/Kg			
7	9809082-05	E03-SD03-01-124			0.000	0.000	3.69	mg/Kg			
8	9809082-06	E03-SD03-00-125			0.000	0.000	1.00	mg/L			
9	9809082-07	E03-SD03-00-126			0.000	0.000	1.00	mg/L			
10	9809082-08	E03-SD00-01-127			0.000	0.000	6.83	mg/Kg			
11	PREP BLANK	PREP BLANK			0.000	0.000	2.00	mg/Kg			
12	9809102-01	CEF-16-415-01	14.6		14.6	14.6	1.00	mg/L			
13	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
14	BLANK	BLANK			0.000	0.000	1.00	mg/L			
15	9809110-01	CEF-16-43S-01	34.6		34.6	34.6	1.00	mg/L			
16	9809110-02	CEF-16-44I-01	8.33		8.33	8.33	1.00	mg/L			
17	9809110-03	CEF-16-10S-01	302.0		302	302	1.00	mg/L			
18	9809110-04	CEF-16-09D-01	36.5		36.5	36.5	1.00	mg/L			
19	9809117-01	CEF-16-45I-01	0		0.000	0.000	1.00	mg/L			
20	9809117-02	CEF-16-11DD-01	260.4		260	260	1.00	mg/L			
21	9809117-03	CEF-16-21S-01	7.9		7.90	7.90	1.00	mg/L			
22	9809117-04	CEF-16-23D-01	242.7		243	243	1.00	mg/L			
23	9809117-05	CEF-16-DP1-01	0		0.000	0.000	1.00	mg/L			
24	9809117-04D	CEF-16-23D-01D	244.8		245	245	1.00	mg/L		0.862	
25	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
26	BLANK	BLANK			0.000	0.000	1.00	mg/L			
27	9809113-02	E19-GW03-19-113	49		49.0	49.0	1.00	mg/L			
28	9809113-05	E19-GW03-38-111	56.2		56.2	56.2	1.00	mg/L			
29	9809113-05D	E19-GW03-38-111	54.2		54.2	54.2	1.00	mg/L		3.62	
30	9809113-07	E19-GW99-18-115	40.6		40.6	40.6	1.00	mg/L			
31	9809113-09	E19-GW99-14-117	52.1		52.1	52.1	1.00	mg/L			
32	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
33	BLANK	BLANK			0.000	0.000	1.00	mg/L			
34	9809096-02	E19-GW01-19-098	4.2		4.20	4.20	1.00	mg/L			
35	9809096-02D	E19-GW01-19-098	4.2		4.20	4.20	1.00	mg/L		0.000	
36	9809096-04	E19-GW02-23-100	4.2		4.20	4.20	1.00	mg/L			
37	9809096-06	E19-GW02-23-102	2.1		2.10	2.10	1.00	mg/L			
38	9809096-08	E19-GW02-23-104	4.2		4.20	4.20	1.00	mg/L			

LM
Analyst / Date

Chris Beaty 10-9-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Bicarbonate Alkalinity

DATA FILE: ALK91898
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/18/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
39	9809096-10	E19-GW99-13-106	2.1		2.10	2.10	1.00	mg/L			
40	9809096-12	E19-GW99-13-108	5.2		5.20	5.20	1.00	mg/L			
41	9809098-02	E38-GW04-39-041	62.5		62.5	62.5	1.00	mg/L			
42	9809098-04	E38-GW04-31-043	45.8		45.8	45.8	1.00	mg/L			
43	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
44	BLANK	BLANK			0.000	0.000	1.00	mg/L			

LM
Analyst / Date

Chris Beard 10-9-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Biological Oxygen Demand

DATA FILE: BOD92298
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/21/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	UNSEEDED BLAN	UBLK	1.3	0.8	1.05	1.05	2.00	mg/L			33.7
2	SEEDED BLANK	SBLK	1.1	0.9	1.00	1.00	2.00	mg/L			14.1
3	WC0231	G/GA	151.3	172.3	162	162	2.00	mg/L	80.9		9.18
4	WC0149	ERA 8067	65.9	56.3	61.1	61.1	2.00	mg/L	73.7		11.1
5	9809102-01	CEF-16-415-01	0		0.000	0.000	2.00	mg/L			
6	9809110-02	CEF-16-44I-01	0		0.000	0.000	2.00	mg/L			
7	9809110-04	CEF-16-09D-01	0		0.000	0.000	2.00	mg/L			
8	9809110-04D	CEF-16-09D-01D	0		0.000	0.000	2.00	mg/L		DIV BY	
9	9809110-01	CEF-16-43S-01	2.644		2.64	26.4	20.0	mg/L			
10	9809110-03	CEF-16-10S-01	3.29		3.29	3.29	2.00	mg/L			

VF 10/9/98
Analyst / Date

Chris Beaty 10-9-98
Lab Supervisor / Date

RUN SUMMARY SHEET
BROMIDE BY IC METHOD 300

DATA FILE: NUS91698
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/16/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	975		0.103	0.103	0.100	mg/L			
2	0.1 PPM	S1	1847		0.158	0.158	0.100	mg/L			
3	0.5 PPM	S2	6575		0.460	0.460	0.100	mg/L			
4	1.0 PPM	S3	13476		0.900	0.900	0.100	mg/L			
5	3.0 PPM	S4	44963		2.91	2.91	0.100	mg/L			
6	5.0 PPM	S5	78842		5.07	5.07	0.100	mg/L			
7	FOR CL AND SO4 ONLY										
8	FOR NO3 ONLY										
9	FOR NO2 ONLY										
10	BLANK	ICB	0		0.041	0.041	0.100	mg/L			
11	9809102-01	CEF-16-41S-01	4075		0.301	0.301	0.100	mg/L			
12	9809102-01	CEF-16-41S-01	0		0.041	0.406	1.00	mg/L			
13	9809110-04	CEF-16-09D-01	4313		0.316	0.316	0.100	mg/L			
14	9809110-04	CEF-16-09D-01	0		0.041	0.406	1.00	mg/L			
15	9809110-03	CEF-16-10S-01	15527		1.03	1.03	0.100	mg/L			
16	9809110-03	CEF-16-10S-01	3272		0.249	2.49	1.00	mg/L			
17	9809110-01	CEF-16-43S-01	2394		0.193	0.387	0.200	mg/L			
18	9809110-01	CEF-16-43S-01	0		0.041	0.812	2.00	mg/L			
19	FOR CL AND SO4 ONLY										
20	FOR NO3 ONLY										
21	FOR NO2 ONLY										
22	CCB1	CCB1	0		0.041	0.041	0.100	mg/L			
23	9809110-02	CEF-16-44I-01	4373		0.320	0.320	0.100	mg/L			
24	9809110-02	CEF-16-44I-01	0		0.041	0.406	1.00	mg/L			
25	9809110-02D	CEF-16-44I-01D	6275		0.441	0.441	0.100	mg/L		31.9	
26	9809110-02D	CEF-16-44I-01D	0		0.041	0.406	1.00	mg/L		0.000	
27	9809110-02S	CEF-16-44I-01S	39988		2.59	5.18	0.200	mg/L	97.3		
28	9809110-02S	CEF-16-44I-01S	37938		2.46	49.2	2.00	mg/L	98.4		
29	FOR CL AND SO4 ONLY										
30	FOR NO3 ONLY										
31	FOR NO2 ONLY										
32	CCB2	CCB2	0		0.041	0.041	0.100	mg/L			

Tracy E Wardell TW 10-9-98
Analyst / Date

Lab Supervisor / Date

RUN SUMMARY SHEET
Chemical Oxygen Demand

DATA FILE: COD00298
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 10/02/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0149	WC0149	64.9		64.9	130	10.0	mg/L	94.1		
2	BLANK	BLANK	0		0.000	0.000	5.00	mg/L			
3	9809119-01	YR-8-4	67.5		67.5	67.5	5.00	mg/L			
4	9809102-01	CEF-16-41S-01	36.4		36.4	36.4	5.00	mg/L			
5	9809102-01D	CEF-16-41S-01D	39.0		39.0	39.0	5.00	mg/L		6.90	
6	9809102-01S	CEF-16-41S-01S	93.5		93.5	93.5	5.00	mg/L	114		
7	9809110-01	CEF-16-43S-01	155.8		156	156	5.00	mg/L			
8	9809110-02	CEF-16-44I-01	36.4		36.4	36.4	5.00	mg/L			
9	9809110-03	CEF-16-10S-01	57.1		57.1	57.1	5.00	mg/L			
10	9809110-04	CEF-16-09D-01	0		0.000	0.000	5.00	mg/L			
11	9809117-01	CEF-16-45I-01	83.1		83.1	83.1	5.00	mg/L			
12	9809117-02	CEF-16-11DD-01	0		0.000	0.000	5.00	mg/L			
13	9809117-03	CEF-16-21S-01	28.6		28.6	28.6	5.00	mg/L			
14	9809117-04	CEF-16-23D-01	5.2		5.20	5.20	5.00	mg/L			
15	9809117-05	CEF-16-DP1-01	83.3		83.3	83.3	5.00	mg/L			
16	WC0149	WC0149	67.53		67.5	135	10.0	mg/L	97.9		
17	BLANK	BLANK	0		0.000	0.000	5.00	mg/L			

SN
Analyst / Date

Chris Beaty 10-6-98
Lab Supervisor / Date

5009

RUN SUMMARY SHEET
CHLORIDE BY IC METHOD 300

DATA FILE: NUS91698
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/16/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	3979		-0.017	-0.017	0.100	mg/L			
2	0.1 PPM	S1	122608		0.297	0.297	0.100	mg/L			
3	0.5 PPM	S2	173544		0.433	0.433	0.100	mg/L			
4	1.0 PPM	S3	354496		0.913	0.913	0.100	mg/L			
5	3.0 PPM	S4	1110108		2.92	2.92	0.100	mg/L			
6	5.0 PPM	S5	1917233		5.06	5.06	0.100	mg/L			
7	WC0217 x100	WC0217 x100	558546		1.45	145	10.0	mg/L	78.2		
8	FOR NO3 ONLY										
9	FOR NO2 ONLY										
10	BLANK	ICB	1225		-0.025	-0.025	0.100	mg/L			
11	9809102-01	CEF-16-415-01	2293230		6.06	6.06	0.100	mg/L			
12	9809102-01	CEF-16-415-01	168156		0.418	4.18	1.00	mg/L			
13	9809110-04	CEF-16-09D-01	4211106		11.1	11.1	0.100	mg/L			
14	9809110-04	CEF-16-09D-01	352801		0.908	9.08	1.00	mg/L			
15	9809110-03	CEF-16-10S-01	1080118		2.84	2.84	0.100	mg/L			
16	9809110-03	CEF-16-10S-01	229583		0.581	5.81	1.00	mg/L			
17	9809110-01	CEF-16-43S-01	1351842		3.56	7.12	0.200	mg/L			
18	9809110-01	CEF-16-43S-01	125347		0.305	6.09	2.00	mg/L			
19	CCV1 x100	CCV1 x100	562124		1.46	146	10.0	mg/L	78.7		
20	FOR NO3 ONLY										
21	FOR NO2 ONLY										
22	CCB1	CCB1	37351		0.071	0.071	0.100	mg/L			
23	9809110-02	CEF-16-44I-01	1588352		4.19	4.19	0.100	mg/L			
24	9809110-02	CEF-16-44I-01	116782		0.282	2.82	1.00	mg/L			
25	9809110-02D	CEF-16-44I-01D	1586672		4.18	4.18	0.100	mg/L		0.107	
26	9809110-02D	CEF-16-44I-01D	117201		0.283	2.83	1.00	mg/L		0.393	
27	9809110-02S	CEF-16-44I-01S	1710065		4.51	9.02	0.200	mg/L	96.6		
28	9809110-02S	CEF-16-44I-01S	912222		2.39	47.8	2.00	mg/L	90.0		
29	CCV2 x100	CCV2 x100	569078		1.48	148	10.0	mg/L	79.7		
30	FOR NO3 ONLY										
31	FOR NO2 ONLY										
32	CCB2	CCB2	2329		-0.022	-0.022	0.100	mg/L			

L Wordell TW 10-9-98
Analyst / Date

Lab Supervisor / Date

RUN SUMMARY SHEET
NITRATE BY IC

DATA FILE: NUS91698
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/16/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	0		-0.003	-0.003	0.100	mg/L			
2	0.1 PPM	S1	5627		0.125	0.125	0.100	mg/L			
3	0.5 PPM	S2	23403		0.532	0.532	0.100	mg/L			
4	1.0 PPM	S3	42785		0.975	0.975	0.100	mg/L			
5	3.0 PPM	S4	128254		2.93	2.93	0.100	mg/L			
6	5.0 PPM	S5	220697		5.04	5.04	0.100	mg/L			
7	FOR CL AND SO4 ONLY										
8	WC0217 x5	WC0217 x5	63666		1.45	7.26	0.500	mg/L	87.5		
9	FOR NO2 ONLY										
10	BLANK	ICB	0		-0.003	-0.003	0.100	mg/L			
11	9809102-01	CEF-16-415-01	1508		0.031	0.031	0.100	mg/L			
12	9809102-01	CEF-16-415-01	205		0.001	0.015	1.00	mg/L			
13	9809110-04	CEF-16-09D-01	390		0.006	0.006	0.100	mg/L			
14	9809110-04	CEF-16-09D-01	132		0.000	-0.002	1.00	mg/L			
15	9809110-03	CEF-16-10S-01	2141		0.046	0.046	0.100	mg/L			
16	9809110-03	CEF-16-10S-01	1511		0.031	0.313	1.00	mg/L			
17	9809110-01	CEF-16-43S-01	411		0.006	0.012	0.200	mg/L			
18	9809110-01	CEF-16-43S-01	0		-0.003	-0.064	2.00	mg/L			
19	FOR CL AND SO4 ONLY										
20	CCV1 x5	CCV1 x5	68241		1.56	7.78	0.500	mg/L	93.8		
21	FOR NO2 ONLY										
22	CCB1	CCB1	0		-0.003	-0.003	0.100	mg/L			
23	9809110-02	CEF-16-44I-01	200		0.001	0.001	0.100	mg/L			
24	9809110-02	CEF-16-44I-01	0		-0.003	-0.032	1.00	mg/L			
25	9809110-02D	CEF-16-44I-01D	290		0.003	0.003	0.100	mg/L		85.8	
26	9809110-02D	CEF-16-44I-01D	0		-0.003	-0.032	1.00	mg/L		0.000	
27	9809110-02S	CEF-16-44I-01S	121576		2.78	5.55	0.200	mg/L	111		
28	9809110-02S	CEF-16-44I-01S	115671		2.64	52.8	2.00	mg/L	106		
29	FOR CL AND SO4 ONLY										
30	CCV2 x5	CCV2 x5	69612		1.59	7.94	0.500	mg/L	95.7		
31	FOR NO2 ONLY										
32	CCB2	CCB2	0		-0.003	-0.003	0.100	mg/L			

L Wardell TW 10-9-98
Analyst / Date

Lab Supervisor / Date

RUN SUMMARY SHEET
NITRITE BY IC

DATA FILE: NUS91698
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/16/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	0		-0.017	-0.017	0.100	mg/L			
2	0.1 PPM	S1	9562		0.102	0.102	0.100	mg/L			
3	0.5 PPM	S2	39004		0.466	0.466	0.100	mg/L			
4	1.0 PPM	S3	80786		0.983	0.983	0.100	mg/L			
5	3.0 PPM	S4	257338		3.17	3.17	0.100	mg/L			
6	5.0 PPM	S5	396941		4.90	4.90	0.100	mg/L			
7	FOR CL AND SO4 ONLY										
8	FOR NO3 ONLY										
9	WC0207 x2	WC0207 x2	254507		3.13	6.27	0.200	mg/L	90.8		
10	BLANK	ICB	0		-0.017	-0.017	0.100	mg/L			
11	9809102-01	CEF-16-415-01	0		-0.017	-0.017	0.100	mg/L			
12	9809102-01	CEF-16-415-01	0		-0.017	-0.169	1.00	mg/L			
13	9809110-04	CEF-16-09D-01	0		-0.017	-0.017	0.100	mg/L			
14	9809110-04	CEF-16-09D-01	0		-0.017	-0.169	1.00	mg/L			
15	9809110-03	CEF-16-10S-01	0		-0.017	-0.017	0.100	mg/L			
16	9809110-03	CEF-16-10S-01	0		-0.017	-0.169	1.00	mg/L			
17	9809110-01	CEF-16-43S-01	0		-0.017	-0.034	0.200	mg/L			
18	9809110-01	CEF-16-43S-01	0		-0.017	-0.337	2.00	mg/L			
19	FOR CL AND SO4 ONLY										
20	FOR NO3 ONLY										
21	CCV1 x2	CCV1 x2	284727		3.51	7.02	0.200	mg/L	102		
22	CCB1	CCB1	0		-0.017	-0.017	0.100	mg/L			
23	9809110-02	CEF-16-44I-01	0		-0.017	-0.017	0.100	mg/L			
24	9809110-02	CEF-16-44I-01	0		-0.017	-0.169	1.00	mg/L			
25	9809110-02D	CEF-16-44I-01D	0		-0.017	-0.017	0.100	mg/L		0.000	
26	9809110-02D	CEF-16-44I-01D	0		-0.017	-0.169	1.00	mg/L		0.000	
27	9809110-02S	CEF-16-44I-01S	261714		3.22	6.45	0.200	mg/L	129		
28	9809110-02S	CEF-16-44I-01S	243202		2.99	59.9	2.00	mg/L	120		
29	FOR CL AND SO4 ONLY										
30	FOR NO3 ONLY										
31	CCV2 x2	CCV2 x2	261412		3.22	6.44	0.200	mg/L	93.3		
32	CCB2	CCB2	0		-0.017	-0.017	0.100	mg/L			

LWardell TW 10-9-98
Analyst / Date

Lab Supervisor / Date

RUN SUMMARY SHEET
SULFATE BY IC METHOD 300

DATA FILE: NUS91698
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/16/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	0		0.032	0.032	0.100	mg/L			
2	0.1 PPM	S1	34663		0.174	0.174	0.100	mg/L			
3	0.5 PPM	S2	124758		0.544	0.544	0.100	mg/L			
4	1.0 PPM	S3	199023		0.848	0.848	0.100	mg/L			
5	3.0 PPM	S4	713964		2.96	2.96	0.100	mg/L			
6	5.0 PPM	S5	1220339		5.04	5.04	0.100	mg/L			
7	WC0217 x100	WC0217 x100	588630		2.45	245	10.0	mg/L	97.5		
8	FOR NO3 ONLY										
9	FOR NO2 ONLY										
10	BLANK	ICB	1660		0.038	0.038	0.100	mg/L			
11	9809102-01	CEF-16-415-01	3075603		12.7	12.7	0.100	mg/L			
12	9809102-01	CEF-16-415-01	291899		1.23	12.3	1.00	mg/L			
13	9809110-04	CEF-16-09D-01	55939		0.261	0.261	0.100	mg/L			
14	9809110-04	CEF-16-09D-01	10905		0.076	0.764	1.00	mg/L			
15	9809110-03	CEF-16-10S-01	2322029		9.56	9.56	0.100	mg/L			
16	9809110-03	CEF-16-10S-01	228369		0.969	9.69	1.00	mg/L			
17	9809110-01	CEF-16-43S-01	2105541		8.67	17.3	0.200	mg/L			
18	9809110-01	CEF-16-43S-01	197596		0.843	16.9	2.00	mg/L			
19	CCV1 x100	CCV1 x100	609026		2.53	253	10.0	mg/L	101		
20	FOR NO3 ONLY										
21	FOR NO2 ONLY										
22	CCB1	CCB1	0		0.032	0.032	0.100	mg/L			
23	9809110-02	CEF-16-44I-01	485801		2.03	2.03	0.100	mg/L			
24	9809110-02	CEF-16-44I-01	61750		0.285	2.85	1.00	mg/L			
25	9809110-02D	CEF-16-44I-01D	486006		2.03	2.03	0.100	mg/L		0.042	
26	9809110-02D	CEF-16-44I-01D	54685		0.256	2.56	1.00	mg/L		10.7	
27	9809110-02S	CEF-16-44I-01S	842463		3.49	6.98	0.200	mg/L	99.1		
28	9809110-02S	CEF-16-44I-01S	621155		2.58	51.6	2.00	mg/L	97.5		
29	CCV2 x100	CCV2 x100	606339		2.52	252	10.0	mg/L	100		
30	FOR NO3 ONLY										
31	FOR NO2 ONLY										
32	CCB2	CCB2	0		0.032	0.032	0.100	mg/L			

TWardell TW 10-9-98
Analyst / Date

Lab Supervisor / Date

RUN SUMMARY SHEET
Total Organic Carbon

DATA FILE: TOC93098
INSTRUMENT FILE: INSTRUMENT: DOHRMAN ANALYZED: 09/30/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0149	ICV	48.17		48.2	48.2	1.00	mg/L	89.4		
2	BLANK	ICB	0		0.000	0.000	1.00	mg/L			
3	9809119-01	YR-8-4	8.11		8.11	8.11	1.00	mg/L			
4	9809063-01	TF2-4	2.92		2.92	2.92	1.00	mg/L			
5	9809063-03	TF2-4D	2.64		2.64	2.64	1.00	mg/L			
6	9809063-05	TF2-5	3.26		3.26	3.26	1.00	mg/L			
7	9809069-01	TF1-4	7.51		7.51	7.51	1.00	mg/L			
8	9809069-03	TF1-4D	10.30		10.3	10.3	1.00	mg/L			
9	9809069-05	TF1-5	5.68		5.68	5.68	1.00	mg/L			
10	9809108-01	TF1-4	8.96		8.96	8.96	1.00	mg/L			
11	9809108-03	TF1-4D	9.06		9.06	9.06	1.00	mg/L			
12	9809108-05	TF1-5	7.68		7.68	7.68	1.00	mg/L			
13	WC0149	CCV	45.82		45.8	45.8	1.00	mg/L	85.0		
14	BLANK	CCB	0		0.000	0.000	1.00	mg/L			
15	9809102-01	CEF-16-41S-01	12.50		12.5	12.5	1.00	mg/L			
16	9809110-01	CEF-16-43S-01	61.28		61.3	61.3	1.00	mg/L			
17	9809110-02	CEF-16-44I-01	8.28		8.28	8.28	1.00	mg/L			
18	9809110-03	CEF-16-10S-01	57.37		57.4	57.4	1.00	mg/L			
19	9809110-04	CEF-16-09D-01	2.78		2.78	2.78	1.00	mg/L			
20	9809110-04D	CEF-16-09D-01D	2.93		2.93	2.93	1.00	mg/L		5.25	
21	9809110-04S	CEF-16-09D-01S	21.40		21.4	21.4	1.00	mg/L	93.1		
22	9809117-01	CEF-16-45I-01	16.06		16.1	16.1	1.00	mg/L			
23	9809117-02	CEF-16-11DD-01	1.95		1.95	1.95	1.00	mg/L			
24	9809117-03	CEF-16-21S-01	16.61		16.6	16.6	1.00	mg/L			
25	WC0149	CV	49.76		49.8	49.8	1.00	mg/L	92.3		
26	BLANK	CB	0		0.000	0.000	1.00	mg/L			

Chris Beaufin DCB 10/1/98
Analyst / Date

Tracy L Wardell 10-6-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Carbonate Alkalinity

DATA FILE: ALK91898
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/18/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
2	BLANK	ICB			0.000	0.000	1.00	mg/L			
3	9809082-02	E03-SD03-01-121			0.000	0.000	8.97	mg/Kg			
4	9809082-03	E03-SD03-01-122			0.000	0.000	3.75	mg/Kg			
5	9809082-03D	E03-SD03-01-122			0.000	0.000	3.75	mg/Kg		DIV BY	
6	9809082-04	E03-SD03-01-123			0.000	0.000	3.51	mg/Kg			
7	9809082-05	E03-SD03-01-124			0.000	0.000	3.69	mg/Kg			
8	9809082-06	E03-SD03-00-125			0.000	0.000	1.00	mg/L			
9	9809082-07	E03-SD03-00-126			0.000	0.000	1.00	mg/L			
10	9809082-08	E03-SD00-01-127			0.000	0.000	6.83	mg/Kg			
11	PREP BLANK	PREP BLANK			0.000	0.000	2.00	mg/Kg			
12	9809102-01	CEF-16-415-01	0		0.000	0.000	1.00	mg/L			
13	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
14	BLANK	BLANK			0.000	0.000	1.00	mg/L			
15	9809110-01	CEF-16-43S-01	0		0.000	0.000	1.00	mg/L			
16	9809110-02	CEF-16-44I-01	0		0.000	0.000	1.00	mg/L			
17	9809110-03	CEF-16-10S-01	0		0.000	0.000	1.00	mg/L			
18	9809110-04	CEF-16-09D-01	0		0.000	0.000	1.00	mg/L			
19	9809117-01	CEF-16-45I-01	0		0.000	0.000	1.00	mg/L			
20	9809117-02	CEF-16-11DD-01	0		0.000	0.000	1.00	mg/L			
21	9809117-03	CEF-16-21S-01	0		0.000	0.000	1.00	mg/L			
22	9809117-04	CEF-16-23D-01	0		0.000	0.000	1.00	mg/L			
23	9809117-05	CEF-16-DP1-01	0		0.000	0.000	1.00	mg/L			
24	9809117-04D	CEF-16-23D-01D	0		0.000	0.000	1.00	mg/L		DIV BY	
25	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
26	BLANK	BLANK			0.000	0.000	1.00	mg/L			
27	9809113-02	E19-GW03-19-113	0		0.000	0.000	1.00	mg/L			
28	9809113-05	E19-GW03-38-111	0		0.000	0.000	1.00	mg/L			
29	9809113-05D	E19-GW03-38-111	0		0.000	0.000	1.00	mg/L		DIV BY	
30	9809113-07	E19-GW99-18-115	0		0.000	0.000	1.00	mg/L			
31	9809113-09	E19-GW99-14-117	0		0.000	0.000	1.00	mg/L			
32	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
33	BLANK	BLANK			0.000	0.000	1.00	mg/L			
34	9809096-02	E19-GW01-19-098	0		0.000	0.000	1.00	mg/L			
35	9809096-02D	E19-GW01-19-098	0		0.000	0.000	1.00	mg/L		DIV BY	
36	9809096-04	E19-GW02-23-100	0		0.000	0.000	1.00	mg/L			
37	9809096-06	E19-GW02-23-102	0		0.000	0.000	1.00	mg/L			
38	9809096-08	E19-GW02-23-104	0		0.000	0.000	1.00	mg/L			

LM
Analyst / Date

Chris Bean 10-9-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Carbonate Alkalinity

DATA FILE: ALK91898
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/18/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
39	9809096-10	E19-GW99-13-106	0		0.000	0.000	1.00	mg/L			
40	9809096-12	E19-GW99-13-108	0		0.000	0.000	1.00	mg/L			
41	9809098-02	E38-GW04-39-041	0		0.000	0.000	1.00	mg/L			
42	9809098-04	E38-GW04-31-043	0		0.000	0.000	1.00	mg/L			
43	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
44	BLANK	BLANK			0.000	0.000	1.00	mg/L			

LM
Analyst / Date

Chris Bean 10-9-98
Lab Supervisor / Date

APPENDIX C
Support Documentation

KIRK TECH NAS, INC.

Brown & Root Environmental

REPORT TO ADDRESS: 7018 AC Skinner Pkwy Ste 250
Jacksonville, FL 32256

TELEPHONE: 904-281-0400 FAX: 904-281-0070

SITE MANAGER: Tom Nicotera
PROJECT NAME: NAS Cecil Field
BRE PROJECT NO.: 7792 CODE:
P.O. NO.:

SHIPPED TO: Gaithersburg MD.
Cof Environmental Services
(LABORATORY NAME, CITY)

PAGE 1 OF 2

CHAIN OF CUSTODY RECORD

SAMPLED BY (PRINT): Tom Nicotera + Don Westerhoff
SAMPLER SIGNATURE: Tom Nicotera + [signature]

LABORATORY ANALYSIS

☐ STANDARD TAT ☐ RUSH
☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☒ 7 DAYS
RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	VOC (PRES. HCl)	GASSES (PRES. HCl)	SVOC	DOC (PRES. H2SO4)	Metals (PRES. HNO3)	Anions	BOD	COD (PRES. NaOH)	Sulfide (PRES. NaOH)	NUMBER OF CONTAINERS
	9-15-98	12:00	CEF-16-435-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-15-98	13:00	CEF-16-44I-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-15-98	15:00	CEF-16-105-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-15-98	18:00	CEF16-09D-01		X	GW	3	3	1	1	1	1	1	1	1	13
TOTAL NUMBER OF CONTAINERS							12	12	4	4	4	4	4	4	4	52

COMMENTS: Samples put on ice to 4°C

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE)	SEAL INTACT?	DATE / TIME	EMPTY BOTTLES RECEIVED BY (SIGNATURE)	SEAL INTACT?	DATE / TIME
①	YES NO N/A		② Tom Nicotera	(YES) NO N/A	9-1-98 17:00
RELINQUISHED BY (SIGNATURE)	SEAL INTACT?	DATE / TIME	RECEIVED BY (SIGNATURE)	SEAL INTACT?	DATE / TIME
③ Tom Nicotera	(YES) NO N/A	9-15-98 20:00	④	YES NO N/A	
RELINQUISHED BY (SIGNATURE)	SEAL INTACT?	DATE / TIME	RECEIVED BY (SIGNATURE)	SEAL INTACT?	DATE / TIME
⑤	YES NO N/A		⑥	YES NO N/A	

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: AIRBILL # 807868582248

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera + Don Westerhoff

RECEIVED FOR LABORATORY BY (SIGNATURE): [signature]
DATE: 9/16/98 TIME: 8:50 am

No. 2118

Brown & Root Environmental

REPORT TO ADDRESS: 7018 AC Skinner Pkwy Ste 250
Jacksonville FL 32256

TELEPHONE: 904-281-0400 FAX: 904-281-0070

SITE MANAGER: Tom Nicotra
PROJECT NAME: NAS Cecil Field
BRE PROJECT NO.: 7792 CODE:
P.O. NO.:

SHIPPED TO: Gaithersburg
G/Environmental Services MD.
(LABORATORY NAME, CITY)

CHAIN OF CUSTODY RECORD

LABORATORY ANALYSIS

SAMPLED BY (PRINT): Tom Nicotra + Don Westerhoff
SAMPLER SIGNATURE: Tom Nicotra + [illegible]

☐ STANDARD TAT ☐ RUSH
☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☒ 7 DAYS
RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	PARAMETERS / PRES. TYPE: Cl-Sol-Hg	NUMBER OF CONTAINERS	COMMENTS
	9-15-98	12:00	CEF-16-435-01		X	GW	1	1	Samples put on ice to 4°C
	9-15-98	13:00	CEF-16-44I-01		X	GW	1	1	
	9-15-98	15:00	CEF-16-105-01		X	GW	1	1	
	9-15-98	18:00	CEF-16-090-01		X	GW	1	1	
TOTAL NUMBER OF CONTAINERS							4	4	

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotra	SEAL INTACT? YES NO N/A	DATE: 9-1-98 TIME: 17:00
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotra	SEAL INTACT? YES NO N/A	DATE: 9-15-98 TIME: 20:00	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: Airbill # 807868582248

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotra + Don Westerhoff

RECEIVED FOR LABORATORY BY (SIGNATURE): C Lyon
DATE: 9/16/98 TIME: 9:50A

No. 2116

Terra Tech Labs, Inc. CIU-051 (13)

Brown & Root Environmental

REPORT TO ADDRESS: 7018 AC Skinner Pkwy Ste 350, Tallahassee FL 32256

TELEPHONE: 904-281-[illegible] FAX: 904-281-0[illegible]

SITE MANAGER: Tom Nicotera

PROJECT NAME: [illegible] Coal Site

BRE PROJECT NO.: 7022 CODE:

P.O. NO.:

SHIPPED TO: GA Environmental Services, Gaithersburg MD.

(LABORATORY NAME, CITY)

PAGE 1 OF 2

CHAIN OF CUSTODY RECORD

SAMPLED BY (PRINT): Tom Nicotera (TN)

SAMPLER SIGNATURE: Tom Nicotera

LABORATORY ANALYSIS

☐ STANDARD TAT ☐ RUSH

☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☐ 7 DAYS

RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP	SAMPLE TYPE GRAB	MATRIX	TCL	GASES	SVOC	DOC	METALS	ALKALINITY	TSS	COD	NH3 SULFATE	NUMBER OF CONTAINERS
			PRES. TYPE				HCl	HCl			HNO3	HNO3			HNO3	
	9-14-98	15:30	CEF-16-415-01				3	3	1	1	1	1	1	1	1	13
TOTAL NUMBER OF CONTAINERS							3	3	1	1	1	1	1	1	1	13

COMMENTS: Samples put on Ice to 4°C.

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 9-1-98 TIME: 1200
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 9-14-98 TIME: 20:00	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: AirBill # 805921689860

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☐ MANUFACTURER

METHOD OF SHIPMENT: Fed-X

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera & Don Westerhoff

RECEIVED FOR LABORATORY BY (SIGNATURE): C Lyons

DATE: 9-15-98 TIME: 9:00 AM

No. 3165

Tetra Tech NUS, Inc.

CIR

Brown & Root Environmental

REPORT TO ADDRESS: 7018 N. Kennedy Hwy Ste
Tallahassee FL 32256

TELEPHONE: 904 281-9400 FAX: 904-281-9080

SITE MANAGER: Tom Nicotera
PROJECT NAME: US Coal Field
BRE PROJECT NO.: 2292 CODE:
P.O. NO.:

SHIPPED TO: Chesterbrook Cal Environmental Services MD.
(LABORATORY NAME, CITY)

PAGE 2 OF 2

CHAIN OF CUSTODY RECORD

SAMPLED BY (PRINT): Tom Nicotera (TN)
SAMPLER SIGNATURE: Tom Nicotera

LABORATORY ANALYSIS

☐ STANDARD TAT ☐ RUSH
☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☒ 7 DAYS
RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	PARAMETERS: Alkalinity	NUMBER OF CONTAINERS	COMMENTS
	9-14-98	15:30	CEF-16-415-01		✓	GW	1	1	Samples put on Ice to 4°C.
TOTAL NUMBER OF CONTAINERS							1	1	

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 9-1-98 TIME: 1200
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 9-14-98 TIME: 20 00	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: 805 921 689 800

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X Airbill

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera + Ron Westerhoff

RECEIVED FOR LABORATORY BY (SIGNATURE): C. Lyon
DATE: 9/15/98 TIME: 9:00 am

No. 2115

GP ENVIRONMENTAL SERVICES
METALS CASE NARRATIVE

CLIENT: NUS_SOUTHDIV
Description: NAS CECIL FIELD CTO-051
GP Work Order:98-09-102
DATE: September 30, 1998

The following data package comprises one water sample which was received at GP Environmental Services on September 15, 1998. The sample was analyzed for iron, and manganese by SW846 6010B.

The sample ID was modified to accommodate the computer software used to generate the data package. The following changes was made:

CLIENT ID	MODIFIED ID	LAB ID
CFF-16-415-01	415-01	9809102-01I

A matrix spike, duplicate, and serial dilution were performed on the sample. All were within the control limits.

All QA/QC criteria were met.

RA 9/30/98
PW 9-30-98

ENVIROFORMS/INORGANIC CLP

COVER PAGE - INORGANIC ANALYSES DATA PACKAGE

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: NUS102

SOW No.: 3/90

Sample No.	Lab Sample ID.
415-01	9809102-01
415-01D	9809102-01
415-01S	9809102-01

Were ICP interelement corrections applied? Yes/No YES

Were ICP background corrections applied? Yes/No YES

If yes, were raw data generated before application of background corrections? Yes/No NO

Comments:

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package and in the computer-readable data submitted on floppy diskette has been authorized by the Laboratory Manager or the Manager's designee, as verified by the following signature.

Signature: Patricia Vicki Name: Patricia Vicki

Date: 9.30.98 Title: Metals Manager

COVER PAGE - IN

GP ENVIRONMENTAL SERVICES
METALS CASE NARRATIVE

CLIENT: NUS_SOUTHDIV
Description: NAS CECIL FIELD CTO-051
GP Work Order:98-09-110
DATE: September 30, 1998

The following data package comprises four water samples which were received at GP Environmental Services on September 16, 1998. The samples were analyzed for iron, and manganese by SW846 6010B.

The sample IDs were modified to accommodate the computer software used to generate the data package. The following changes were made:

CLIENT ID	MODIFIED ID	LAB ID
CFF-16-43S-01	43S-01	9809110-01I
CFF-16-44I-01	44I-01	9809110-02I
CFF-16-10S-01	10S-01	9809110-03I
CFF-16-09D-01	09D-01	9809110-04I

A matrix spike, duplicate, and serial dilution were performed on batch sample 9809021-01 for all required analytes. The matrix spike could not be recovered for iron. The spike addition was insignificant.

All QA/QC criteria were met.

RA 9/30/98
PW 9-30-98

GPL LABORATORIES, LLLP

WET CHEMISTRY CASE NARRATIVE

CLIENT: Tetratech NUS
GP Work Order: 9809110
DATE: October 9, 1998

The following data package is composed of four water samples received by GPL Laboratories on September 15, 1998. The samples were analyzed for Sulfide, Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), Total Organic Carbon (TOC), Total Alkalinity, Carbonate Alkalinity, Bicarbonate Alkalinity, and Bromide, Chloride, Nitrite, Nitrate, Orthophosphate, and Sulfate by Ion Chromatography (IC).

The QC for the Orthophosphate and Bromide samples in the original run; the samples were reanalyzed with acceptable QC but the original results are being reported due to holding times.

A duplicate and matrix spike analysis was performed on sample CEF-16-09D-01 for TOC. A duplicate analysis was performed on sample CEF-16-09D-01. A duplicate and matrix spike analysis was performed on sample CEF-16-441-01. All other QA/QC criteria were met.

Signature: Chris Beaty Date: 10-9-98

Reviewed by: [illegible] Date: 10-9-98

ENVIROFORMS/INORGANIC CLP

3
BLANKS

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: NUS102

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron	20.0	U	21.3	B	20.0	U	20.0	U	21.3	B	P
Lead											
Magnesium											
Manganese	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	P
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											
Boron											
Tin											

FORM III - IN

ENVIROFORMS/INORGANIC CLP

3
BLANKS

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: NUS102

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron			20.0	U	20.0	U	20.0	U			P
Lead											
Magnesium											
Manganese			1.0	U	1.0	U	1.0	U			P
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											
Boron											
Tin											

FORM III - IN

ENVIROFORMS/INORGANIC CLP

3
BLANKS

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: NUS102

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron			20.0	U	38.9	B					P
Lead											
Magnesium											
Manganese			1.0	U	1.0	U					P
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											
Boron											
Tin											

FORM III - IN

Tetra Tech NUS **INTERNAL CORRESPONDENCE**

PITT-10-8-226

TO:	**M. SPERANZA**	**DATE:**	**NOVEMBER 6, 1998**
FROM:	**GRETCHEN PHIPPS**	**COPIES:**	**DV FILE**

SUBJECT: **INORGANIC DATA VALIDATION-IRON, MANGANESE AND MISCELLANEOUS**
CTO 051 - CECIL FIELD
SDG'S – 9809117, 9809129, AND 9809149

SAMPLES: 12/Aqueous/

CEF-16-11DD-01	CEF-16-21S-01	CEF-16-23D-01
CEF-16-45I-01	CEF-16-DPI-01	CEF-16-22I-01
CEF-16-42I-01	CEF-16-27I-01	CEF-16-DP2-01
CEF-16-32S-01	CEF-16-35S-01	CEF-16-38S-01

Overview

The sample set for CTO 051, NAS Cecil Field, SDG 98091117, 9809129 and SDG 9809149, consists twelve (12) aqueous environmental samples. Two (2) field duplicate pairs (CEF-16-45I-01/ CEF-16-DPI-01 and CEF-16-27I-01 / CEF-16-DP2-01) were included within this SDG.

All samples were analyzed for iron, manganese, o-phosphate, dissolved sulfide, alkalinity, bicarbonate alkalinity, biological oxygen demand (BOD), bromide, chemical oxygen demand (COD), chloride, nitrate, nitrite, sulfate, total organic carbon (TOC) and carbonate alkalinity. The samples were collected by Tetra Tech NUS on September 16, 17 and 22, 1998 and analyzed by GP Environmental Services.

Iron and manganese analyses were conducted using SW-846 method 6010B. BOD analyses were conducted using EPA method 405.1. COD analyses were conducted using EPA method 410.1. Chloride, Bromide, Nitrate, Nitrite, 0-Phosphate and Sulfate analyses were conducted using EPA method 300. Dissolved sulfide analyses were conducted using ePA method 376.1. Alkalinity analyses were conducted using EPA method 310.1.

The data was evaluated based on the following parameters:

* • Data Completeness
* • Holding Times
• Calibration Verifications
• Laboratory Blank Analyses

* - All quality control criteria were met for this parameter.

The attached Tables 1 and 2 summarizes the validation recommendations which were based on the following information:

Calibration Verifications

Continuing Calibration Verifications (CCV's) Percent Recoveries (%R's) for chloride analyses affecting were outside the 90-110% quality control limit. The positive result reported for chloride analyses were qualified as estimated, "J".

CCV %R for nitrate analyses affecting SDG's 9809117 and 9809149 was <90% quality control limit. The nondetected results reported for nitrate analyses in the affected samples were qualified as estimated, "UJ".

CCV's %R's for o-phosphate analyses were <90% quality control limit. The positive and nondetected results reported for o-phosphate analyses were qualified as estimated, "J" and "UJ", respectively.

CCV %R for bromide analyses affecting SDG 9809149 was <90% quality control limit. The positive results reported for bromide analyses in the affected samples were qualified as estimated, "J".

CCV %R for nitrite analyses affecting SDG 9809149 was <90% quality control limit. The nondetected results reported for nitrite analyses in the affected samples were qualified as estimated, "UJ".

CCV %R for sulfate analyses affecting SDG 9809149 was <90% quality control limit. The positive results reported for sulfate analyses in the affected samples were qualified as estimated, "J".

CCV %R for TOC analyses affecting SDG 9809117 was <90% quality control limit. The positive results reported for TOC analyses in the affected samples were qualified as estimated, "J".

Laboratory Blank Analyses

Affected samples: All

Analyte	Maximum Concentration	Action Level(aqueous)
Iron[1]	29.8µg/L	149µg/L
Manganese*[2]	11.6µg/L	58µg/L

(1) Affected SDG's: 9809117 and 9809129
(2) Affected SDG: 9809149
* Maximum concentration present in preparation blank.

An action level of 5X the maximum concentration has been used to evaluate the sample data for blank contamination. Positive results < the action level for magnesium in the affected samples were qualified ,"U", as a result of blank contamination. No action was taken for iron since the results for iron were greater than the action level.

Executive Summary

Laboratory Performance: Several CCV's for several analyses were outside the 90-110% quality control limit. Iron and magnesium were present in the laboratory method / preparation blanks.

Other Factors Affecting Data Quality: None.

The Data for these analyses were reviewed with reference to the "National Functional Guidelines for Inorganic Review", February 1994 and the NFESC document entitles "Navy Installation Restoration Laboratory Quality Assurance Guide." (NFESC 2/96).

The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC Guidelines and the Quality Assurance Project Plan (QAPP)."

Gretchen A. Phipps

Tetra Tech NUS
Gretchen A. Phipps

Tetra Tech NUS
Joseph A. Samchuck
Quality Control Officer

Attachments:

1. Appendix A - Qualified Analytical Data
2. Appendix B - Results as reported by the Laboratory
3. Appendix C - Support Documentation

Cecil Field
SDG 9809117
SDG 9809129
SDG 9809149

Table 1 - RECOMMENDATION SUMMARY

Iron		
Manganese	A[1]	
O-phosphate		J[1]
Dissolved sulfide		
Alkalinity		
Bicarbonate alkalinity		
BOD		
Bromide		J[1]
COD		
Chloride		J[1]
Nitrate		J[1]
Nitrite		J[1]
Sulfate		J[1]
TOC		J[1]
Carbonate alkalinity		

If the field is left blank, the qualifier is A - Accept data.

A[1] - Accept data, but qualify results less than the blank action level as nondetected, "U", as a result of laboratory blank contamination.

J[1] Accept data, but qualify positive and nondetected results as estimated, "J" and "UJ", respectively, as the result of CCV %R.

APPENDIX A
Qualified Analytical Results

Qualifier Codes:

a	=	Lab Blank Contamination
b	=	Field Blank Contamination
c	=	Calibration (i.e., % RSDs, %Ds, ICVs, CCVs, RPDs, RRFs, etc.) Noncompliance
d	=	MS/MSD Noncompliance
e	=	LCS/LCSD Noncompliance
f	=	Lab Duplicate Imprecision
g	=	Field Duplicate Imprecision
h	=	Holding Time Exceedance
i	=	ICP Serial Dilution Noncompliance
j	=	GFAA PDS - GFAA MSA's r < 0.995
k	=	ICP Interference - include ICSAB % R's
l	=	Instrument Calibration Range Exceedance
m	=	Sample Preservation
n	=	Internal Standard Noncompliance
o	=	Poor Instrument Performance (i.e., base-time drifting)
p	=	Uncertainty near detection limit (< 2 x IDL for inorganics and < CRQL for organics)
q	=	Other problems (can encompass a number of issues)
r	=	Surrogates Recovery Noncompliance
s	=	Pesticide/PCB Resolution
t	=	% Breakdown Noncompliance for DDT and Endrin.
u	=	Pest/PCD % between columns for positive results.
v	=	Non-linear calibrations, tuning r < 0.995 (correlation coefficient)

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809149

SAMPLE NUMBER:	CEF-16-27I-01	CEF-16-DP2-01	CEF-16-32S-01	CEF-16-35S-01
SAMPLE DATE:	09/22/98	09/22/98	09/22/98	09/22/98
LABORATORY ID:	9809149 - 04	9809149 - 05	9809149 - 01	9809149 - 03
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	UG/L	UG/L	UG/L	UG/L
FIELD DUPLICATE OF:		CEF-16-27I-01		

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
IRON	1740			1790			149			303		
MANGANESE	4.2	U	A	43.8	U	A	7.7	U	A	3.1	U	A

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809149

SAMPLE NUMBER:	CEF-16-38S-01											
SAMPLE DATE:	09/22/98			/ /			/ /			/ /		
LABORATORY ID:	9809149 - 02											
QC_TYPE:	NORMAL											
% SOLIDS:	0.0 %			100.0 %			100.0 %			100.0 %		
UNITS:	UG/L											
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
IRON	215											
MANGANESE	8.4	U	A									

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809129

SAMPLE NUMBER:	CEF-16-22I-01			CEF-16-42I-01							
SAMPLE DATE:	09/17/98			09/17/98			/ /			/ /	
LABORATORY ID:	9809129 - 02			9809129 - 01							
QC_TYPE:	NORMAL			NORMAL							
% SOLIDS:	0.0 %			0.0 %			100.0 %			100.0 %	
UNITS:	UG/L			UG/L							
FIELD DUPLICATE OF:											
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
IRON	597			921								
MANGANESE	1.8			29.2								

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809117

SAMPLE NUMBER:	CEF-16-11DD-01	CEF-16-21S-01	CEF-16-23D-01	CEF-16-45I-01
SAMPLE DATE:	09/16/98	09/16/98	09/16/98	09/16/98
LABORATORY ID:	9809117 - 02	9809117 - 03	9809117 - 04	9809117 - 01
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	UG/L	UG/L	UG/L	UG/L
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
IRON	365			238			495			34700		
MANGANESE	40.6			1.5			49.4			126		

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809117

SAMPLE NUMBER:	CEF-16-DP1-01			
SAMPLE DATE:	09/16/98	/ /	/ /	/ /
LABORATORY ID:	9809117 - 05			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	UG/L			
FIELD DUPLICATE OF:	CEF-16-45I-01			

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
IRON	34300											
MANGANESE	124											

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809129

SAMPLE NUMBER:	CEF-16-22I-01	CEF-16-42I-01		
SAMPLE DATE:	09/17/98	09/17/98	/ /	/ /
LABORATORY ID:	9809129 - 02	9809129 - 01		
QC_TYPE:	NORMAL	NORMAL		
% SOLIDS:	0.0 %	0.0 %	100.0 %	100.0 %
UNITS:	MG/L	MG/L		
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
ALKALINITY	1.0	U		4.2								
BICARBONATE ALKALINITY	1.0	U		1.0	U							
BIOLOGICAL OXYGEN DEMAND	2.0	U		2.0	U							
BROMIDE	0.10	U		0.10	U							
CARBONATE ALKALINITY	1.0	U		1.0	U							
CHEMICAL OXYGEN DEMAND	10.3			7.75								
CHLORIDE	3.62	J	C	2.14	J	C						
DISSOLVED SULFIDE	19.0			2.0	U							
NITRATE	0.10	U		0.10	U							
NITRITE	0.10	U		0.10	U							
ORTHOPHOSPHATE	0.10	UJ	C	0.10	UJ	C						
SULFATE	51.5			3.89								
TOTAL ORGANIC CARBON	4.33			2.57								

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809117

SAMPLE NUMBER:	CEF-16-11DD-01	CEF-16-21S-01	CEF-16-23D-01	CEF-16-45I-01
SAMPLE DATE:	09/16/98	09/16/98	09/16/98	09/16/98
LABORATORY ID:	9809117 - 02	9809117 - 03	9809117 - 04	9809117 - 01
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	MG/L	MG/L	MG/L	MG/L
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
ALKALINITY	260			7.9			243			1.0	U	
BICARBONATE ALKALINITY	260			7.9			243			1.0	U	
BIOLOGICAL OXYGEN DEMAND	2.0	U		2.0	U		2.0	U		2.0	U	
BROMIDE	0.10	U		0.10	U		0.10	U		1.0	U	
CARBONATE ALKALINITY	1.0	U		1.0	U		1.0	U		1.0	U	
CHEMICAL OXYGEN DEMAND	5.0	U		28.6			5.2			83.1		
CHLORIDE	9.46	J	C	2.81	J	C	3.15	J	C	1.45	J	C
DISSOLVED SULFIDE	2.0	U		2.0	U		2.0	U		2.0	U	
NITRATE	0.10	UJ	C	0.10	UJ	C	0.10	UJ	C	0.10	UJ	C
NITRITE	0.10	U		0.10	U		0.10	U		0.10	U	
ORTHOPHOSPHATE	0.10	UJ	C	0.10	UJ	C	0.10	UJ	C	0.10	UJ	C
SULFATE	105			0.471			18.1			1.0	U	
TOTAL ORGANIC CARBON	1.95	J	C	16.6	J	C	2.41	J	C	16.1	J	C

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809117

SAMPLE NUMBER:	CEF-16-DP1-01			
SAMPLE DATE:	09/16/98	/ /	/ /	/ /
LABORATORY ID:	9809117 - 05			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	MG/L			
FIELD DUPLICATE OF:	CEF-16-45I-01			

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
ALKALINITY	1.0	U										
BICARBONATE ALKALINITY	1.0	U										
BIOLOGICAL OXYGEN DEMAND	5.64											
BROMIDE	1.0	U										
CARBONATE ALKALINITY	1.0	U										
CHEMICAL OXYGEN DEMAND	83.3											
CHLORIDE	111	J	C									
DISSOLVED SULFIDE	2.0											
NITRATE	0.10	U										
NITRITE	0.10	UJ	C									
ORTHOPHOSPHATE	0.10	UJ	C									
SULFATE	1.13											
TOTAL ORGANIC CARBON	19.8	J	C									

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809149

SAMPLE NUMBER:	CEF-16-27I-01			CEF-16-DP2-01			CEF-16-32S-01			CEF-16-35S-01		
SAMPLE DATE:	09/22/98			09/22/98			09/22/98			09/22/98		
LABORATORY ID:	9809149 - 04			9809149 - 05			9809149 - 01			9809149 - 03		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	MG/L			MG/L			MG/L			MG/L		
FIELD DUPLICATE OF:				CEF-16-27I-01								
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
ALKALINITY	5.25			2.1			12.6			5.25		
BICARBONATE ALKALINITY	1.0	U		1.0	U		1.0	U		1.0	U	
BIOLOGICAL OXYGEN DEMAND	2.0	U		2.0	U		8.28			2.0	U	
BROMIDE	0.106	J	C	0.106	J	C	0.109	J	C	0.124	J	C
CARBONATE ALKALINITY	1.0	U		1.0	U		1.0	U		1.0	U	
CHEMICAL OXYGEN DEMAND	20.2			17.7			20.2			30.4		
CHLORIDE	2.76	J	C	3.23	J	C	5.34	J	C	11.1	J	C
DISSOLVED SULFIDE	2.0	U		2.0	U		2.0	U		2.0	U	
NITRATE	0.10	UJ	C	0.10	UJ	C	0.10	UJ	C	0.10	UJ	C
NITRITE	0.10	UJ	C	0.10	UJ	C	0.10	UJ	C	0.10	UJ	C
ORTHOPHOSPHATE	0.10	UJ	C	0.10	UJ	C	0.10	UJ	C	0.10	UJ	C
SULFATE	2.5	J	C	2.59	J	C	3.22	J	C	3.43	J	C
TOTAL ORGANIC CARBON	2.88			2.48			3.04			7.46		

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809149

SAMPLE NUMBER:	CEF-16-38S-01										
SAMPLE DATE:	09/22/98			/ /			/ /			/ /	
LABORATORY ID:	9809149 - 02										
QC_TYPE:	NORMAL										
% SOLIDS:	0.0 %			100.0 %			100.0 %			100.0 %	
UNITS:	MG/L										
FIELD DUPLICATE OF:											
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
MISCELLANEOUS PARAMETERS												
ALKALINITY	14.7											
BICARBONATE ALKALINITY	1.0	U										
BIOLOGICAL OXYGEN DEMAND	2.0	U										
BROMIDE	0.182	J	C									
CARBONATE ALKALINITY	1.0	U										
CHEMICAL OXYGEN DEMAND	35.4											
CHLORIDE	7.70	J	C									
DISSOLVED SULFIDE	2.0	U										
NITRATE	0.339	J	C									
NITRITE	0.10	UJ	C									
ORTHOPHOSPHATE	0.10	UJ	C									
SULFATE	9.92	J	C									
TOTAL ORGANIC CARBON	24.2											

APPENDIX B
Results as reported by the Laboratory

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

1DD-01

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Matrix (soil/water): WATER Lab Sample ID: 9809117-02

Level (low/med): LOW Date Received: 09/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	365			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	40.6			P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

FORM I - IN

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

21S-01

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Matrix (soil/water): WATER Lab Sample ID: 9809117-03

Level (low/med): LOW Date Received: 09/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	238			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	1.5	B		P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				

Color Before: YELLOW Clarity Before: CLOUDY Texture:

Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

FORM I - IN

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

23D-01

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Matrix (soil/water): WATER Lab Sample ID: 9809117-04

Level (low/med): LOW Date Received: 09/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	495			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	49.4			P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

FORM I - IN

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

45I-01

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Matrix (soil/water): WATER Lab Sample ID: 9809117-01

Level (low/med): LOW Date Received: 09/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	34700			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	126			P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

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ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

DP1-01

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Matrix (soil/water): WATER Lab Sample ID: 9809117-05

Level (low/med): LOW Date Received: 09/17/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	34300			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	124			P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

FORM I - IN

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF22I

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NAS SAS No.: CT0051 SDG No.: NUS151

Matrix (soil/water): WATER Lab Sample ID: 9809129-02

Level (low/med): LOW Date Received: 09/18/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg in dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	597			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	1.8 ~~5.0~~	~~U~~		P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7439.98.7	Molybdenum				
7440.24.6	Strontium				

GP 10-28
* Refer to Raw data in Appendix C.

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

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SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

CEF42I

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NAS SAS No.: CTO051 SDG No.: NUS151

Matrix (soil/water): WATER Lab Sample ID: 9809129-01

Level (low/med): LOW Date Received: 09/18/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg in dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	921			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	29.2			P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7439.98.7	Molybdenum				
7440.24.6	Strontium				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: YELLOW Clarity After: CLEAR Artifacts:

Comments:

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF27I

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NASSD SAS No.: CTO051 SDG No.: NUS154

Matrix (soil/water):WATER Lab Sample ID: 9809149-04

Level (low/med): LOW Date Received: 09/23/98

% Solids: 0.0

Concentration Units(ug/L or mg/kg in dry weight):UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	1740			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	4.2 ~~5.0~~	~~U~~	*	P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				
7439-98-7	Molybdenum				

GP 10-28
* See raw data in Appendix C

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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SAMPLE NO.

1

INORGANIC ANALYSIS DATA SHEET

CEFDP2

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NASSD SAS No.: CTO051 SDG No.: NUS154

Matrix (soil/water): WATER Lab Sample ID: 9809149-05

Level (low/med): LOW Date Received: 09/23/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg in dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	1790			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	43.8		*	P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				
7439-98-7	Molybdenum				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

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ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF32S

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NASSD SAS No.: CTO051 SDG No.: NUS154

Matrix (soil/water): WATER Lab Sample ID: 9809149-01

Level (low/med): LOW Date Received: 09/23/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg in dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	149			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	7.7	B	*	P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				
7439-98-7	Molybdenum				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

FORM I - IN

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF35S

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NASSD SAS No.: CTO051 SDG No.: NUS154

Matrix (soil/water): WATER Lab Sample ID: 9809149-03

Level (low/med): LOW Date Received: 09/23/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg in dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	303			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	3.1 ~~5.0~~	~~U~~	~~*~~	P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				
7439-98-7	Molybdenum				

GP 10-28 & see raw data in Appendix C

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

FORM I - IN

ENVIROFORMS/INORGANIC CLP

1

INORGANIC ANALYSIS DATA SHEET

SAMPLE NO.

CEF38S

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NASSD SAS No.: CTO051 SDG No.: NUS154

Matrix (soil/water): WATER Lab Sample ID: 9809149-02

Level (low/med): LOW Date Received: 09/23/98

% Solids: 0.0

Concentration Units (ug/L or mg/kg in dry weight): UG/L

CAS No.	Analyte	Concentration	C	Q	M
7429-90-5	Aluminum				
7440-36-0	Antimony				
7440-38-2	Arsenic				
7440-39-3	Barium				
7440-41-7	Beryllium				
7440-43-9	Cadmium				
7440-70-2	Calcium				
7440-47-3	Chromium				
7440-48-4	Cobalt				
7440-50-8	Copper				
7439-89-6	Iron	215			P
7439-92-1	Lead				
7439-95-4	Magnesium				
7439-96-5	Manganese	8.4	B	*	P
7439-97-6	Mercury				
7440-02-2	Nickel				
7440-09-7	Potassium				
7782-49-2	Selenium				
7440-22-4	Silver				
7440-23-5	Sodium				
7440-28-0	Thallium				
7440-62-2	Vanadium				
7440-66-6	Zinc				
	Cyanide				
7740-42-8	Boron				
7740-42-0	Tin				
7439-98-7	Molybdenum				

Color Before: COLORLESS Clarity Before: CLEAR Texture:

Color After: COLORLESS Clarity After: CLEAR Artifacts:

Comments:

FORM I - IN

RUN SUMMARY SHEET
Sulfide

DATA FILE: S2_91898
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/18/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	ICB	0		0.000	0.000	2.00	mg/L			
2	PREP BLANK	PB	0		0.000	0.000	2.00	mg/L			
3	9808266-01	W1	0		0.000	0.000	2.00	mg/L			
4	9808266-01D	W1D	0		0.000	0.000	2.00	mg/L		DIV BY	
5	9808266-02	W2	0		0.000	0.000	2.00	mg/L			
6	9809031-01	AD-6833	0		0.000	0.000	2.00	mg/L			
7	9809102-01	CEF-16-41S-01	0		0.000	0.000	2.00	mg/L			
8	9809110-01	CEF-16-43S-01	0		0.000	0.000	2.00	mg/L			
9	9809110-02	CEF-16-44I-01	0		0.000	0.000	2.00	mg/L			
10	9809110-03	CEF-16-10S-01	0		0.000	0.000	2.00	mg/L			
11	9809110-04	CEF-16-09D-01	0		0.000	0.000	2.00	mg/L			
12	9809117-01	CEF-16-45I-01	0		0.000	0.000	2.00	mg/L			
13	BLANK	CCB	0		0.000	0.000	2.00	mg/L			
14	9809117-02	CEF-16-11DD-01	0		0.000	0.000	2.00	mg/L			
15	9809117-03	CEF-16-21S-01	0		0.000	0.000	2.00	mg/L			
16	9809117-04	CEF-16-23D-01	0		0.000	0.000	2.00	mg/L			
17	9809117-05	CEF-16-DP1-01	0		0.000	0.000	2.00	mg/L			
18	9809082-02	E03-SD03-01-121	0		0.000	0.000	34.7	mg/Kg			
19	9809082-03	E03-SD03-01-122	0		0.000	0.000	14.1	mg/Kg			
20	9809082-04	E03-SD03-01-123	0		0.000	0.000	13.1	mg/Kg			
21	9809082-05	E03-SD03-01-124	3		3.00	21.3	14.2	mg/Kg			
22	9809082-06	E03-SD03-00-125	0		0.000	0.000	2.00	mg/L			
23	BLANK	CCB	0		0.000	0.000	2.00	mg/L			
24	9809082-07	E03-SD03-00-126	0		0.000	0.000	2.00	mg/L			
25	9809082-08	E03-SD00-01-127	0		0.000	0.000	27.1	mg/Kg			
26	9809082-08D	E03-SD00-01-127	0		0.000	0.000	27.2	mg/Kg		DIV BY	
27	BLANK	CB	0		0.000	0.000	2.00	mg/L			

JH 9-21-98
Analyst / Date

9-21-98
Lab Supervisor / Date

5004

RUN SUMMARY SHEET
Sulfide

DATA FILE: S2_92498
INSTRUMENT FILE:
INSTRUMENT: WET_LAB
ANALYZED: 09/24/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	ICB	0		0.000	0.000	2.00	mg/L			
2	9809129-01	CEF-16-42I-01	0		0.000	0.000	2.00	mg/L			
3	9809129-01D	CEF-16-42I-01D	0		0.000	0.000	2.00	mg/L		DIV BY	
4	9809129-02	CEF-16-22I-01	19		19.0	19.0	2.00	mg/L			
5	BLANK	CB	0		0.000	0.000	2.00	mg/L			

Chris Bean DCB 9-30-98
Analyst Date

Tracy E Wardell 10-15-98
Lab Supervisor Date

5004

RUN SUMMARY SHEET
Sulfide

DATA FILE: S2_92998
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/29/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	ICB	0		0.000	0.000	2.00	mg/L			
2	9809149-01	CEF-16-32S-01	0		0.000	0.000	2.00	mg/L			
3	9809149-02	CEF-16-38S-01	0		0.000	0.000	2.00	mg/L			
4	9809149-03	CEF-16-35S-01	0		0.000	0.000	2.00	mg/L			
5	9809149-04	CEF-16-27I-01	0		0.000	0.000	2.00	mg/L			
6	9809149-05	CEF-16-DP2-01	0		0.000	0.000	2.00	mg/L			
7	9809149-05D	CEF-16-DP2-01D	0		0.000	0.000	2.00	mg/L		DIV BY	
8	BLANK	CB	0		0.000	0.000	2.00	mg/L			

JH
Analyst / Date

Chris Beaty 9-30-98
Lab Supervisor / Date

5010

RUN SUMMARY SHEET
Alkalinity

TA FILE: ALK91898
STRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/18/1998

g	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0127	WC0127	220.8		221	221	1.00	mg/L	94.0		
2	BLANK	ICB	0		0.000	0.000	1.00	mg/L			
3	9809082-02	E03-SD03-01-121	8.3		8.30	74.4	8.97	mg/Kg			
4	9809082-03	E03-SD03-01-122	4.2		4.20	15.8	3.75	mg/Kg			
5	9809082-03D	E03-SD03-01-122	4.2		4.20	15.8	3.75	mg/Kg		0.000	
6	9809082-04	E03-SD03-01-123	4.2		4.20	14.8	3.51	mg/Kg			
7	9809082-05	E03-SD03-01-124	4.2		4.20	15.5	3.69	mg/Kg			
8	9809082-06	E03-SD03-00-125	2.1		2.10	2.10	1.00	mg/L			
9	9809082-07	E03-SD03-00-126	0		0.000	0.000	1.00	mg/L			
0	9809082-08	E03-SD00-01-127	4.2		4.20	28.7	6.83	mg/Kg			
1	PREP BLANK	PREP BLANK	0		0.000	0.000	2.00	mg/Kg			
2	9809102-01	CEF-16-415-01	14.6		14.6	14.6	1.00	mg/L			
3	WC0127	WC0127	222.9		223	223	1.00	mg/L	94.9		
4	BLANK	BLANK	0		0.000	0.000	1.00	mg/L			
5	9809110-01	CEF-16-43S-01	34.4		34.4	34.4	1.00	mg/L			
6	9809110-02	CEF-16-44I-01	8.33		8.33	8.33	1.00	mg/L			
7	9809110-03	CEF-16-10S-01	302		302	302	1.00	mg/L			
8	9809110-04	CEF-16-09D-01	36.5		36.5	36.5	1.00	mg/L			
9	9809117-01	CEF-16-45I-01	0		0.000	0.000	1.00	mg/L			
0	9809117-02	CEF-16-11DD-01	260.4		260	260	1.00	mg/L			
1	9809117-03	CEF-16-21S-01	7.9		7.90	7.90	1.00	mg/L			
2	9809117-04	CEF-16-23D-01	242.7		243	243	1.00	mg/L			
3	9809117-05	CEF-16-DP1-01	0		0.000	0.000	1.00	mg/L			
4	9809117-04D	CEF-16-23D-01D	244.8		245	245	1.00	mg/L		0.862	
5	WC0127	WC0127	222.9		223	223	1.00	mg/L	94.9		
6	BLANK	BLANK	0		0.000	0.000	1.00	mg/L			
7	9809113-02	E19-GW03-19-113	49		49.0	49.0	1.00	mg/L			
8	9809113-05	E19-GW03-38-111	56.2		56.2	56.2	1.00	mg/L			
9	9809113-05D	E19-GW03-38-111	54.2		54.2	54.2	1.00	mg/L		3.62	
0	9809113-07	E19-GW99-18-115	40.6		40.6	40.6	1.00	mg/L			
1	9809113-09	E19-GW99-14-117	52.1		52.1	52.1	1.00	mg/L			
2	WC0127	WC0127	237		237	237	1.00	mg/L	101		
3	BLANK	BLANK	0		0.000	0.000	1.00	mg/L			
4	9809096-02	E19-GW01-19-098	4.2		4.20	4.20	1.00	mg/L			
5	9809096-02D	E19-GW01-19-098	4.2		4.20	4.20	1.00	mg/L		0.000	
6	9809096-04	E19-GW02-23-100	4.2		4.20	4.20	1.00	mg/L			
7	9809096-06	E19-GW02-23-102	2.1		2.10	2.10	1.00	mg/L			
8	9809096-08	E19-GW02-23-104	4.2		4.20	4.20	1.00	mg/L			

LM
Analyst / Date

Chris Bean 10-9-98
Lab Supervisor / Date

5024

RUN SUMMARY SHEET
Alkalinity

TA FILE: ALK91898
STRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/18/1998

g	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
9	9809096-10	E19-GW99-13-106	2.1		2.10	2.10	1.00	mg/L			
0	9809096-12	E19-GW99-13-108	5.2		5.20	5.20	1.00	mg/L			
1	9809098-02	E38-GW04-39-041	62.5		62.5	62.5	1.00	mg/L			
2	9809098-04	E38-GW04-31-043	45.8		45.8	45.8	1.00	mg/L			
3	WC0127	WC0127	237		237	237	1.00	mg/L	101		
4	BLANK	BLANK	0		0.000	0.000	1.00	mg/L			

LM
Analyst / Date

Chris Beaty 10-9-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Alkalinity

DATA FILE: ALK00298
INSTRUMENT FILE:
INSTRUMENT: WET_LAB
ANALYZED: 10/02/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0218	ICV	224		224	224	1.00	mg/L	95.3		
2	BLANK	ICB	0		0.000	0.000	1.00	mg/L			
3	9809129-01	CEF-16-42I-01	4.20		4.20	4.20	1.00	mg/L			
4	9809129-02	CEF-16-22I-01	0		0.000	0.000	1.00	mg/L			
5	9809129-02D	CEF-16-22I-01D	0		0.000	0.000	1.00	mg/L		DIV BY	
6	9809146-01	PW-11	17.83		17.8	17.8	1.00	mg/L			
7	9809146-03	PW-12	0		0.000	0.000	1.00	mg/L			
8	9809149-01	CEF-16-32S-01	12.59		12.6	12.6	1.00	mg/L			
9	9809149-02	CEF-16-38S-01	14.69		14.7	14.7	1.00	mg/L			
10	9809149-03	CEF-16-35S-01	5.25		5.25	5.25	1.00	mg/L			
11	9809149-04	CEF-16-27I-01	5.25		5.25	5.25	1.00	mg/L			
12	9809149-05	CEF-16-DP2-01	2.10		2.10	2.10	1.00	mg/L			
13	WC0218	CV	226		226	226	1.00	mg/L	96.2		
14	BLANK	CB	0		0.000	0.000	1.00	mg/L			

SN
Analyst / Date

Chris Beaty 10-14-98
Lab Supervisor / Date

5014

RUN SUMMARY SHEET
Bicarbonate Alkalinity

TA FILE: ALK91898
STRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/18/1998

g	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
2	BLANK	ICB			0.000	0.000	1.00	mg/L			
3	9809082-02	E03-SD03-01-121			0.000	0.000	8.97	mg/Kg			
4	9809082-03	E03-SD03-01-122			0.000	0.000	3.75	mg/Kg			
5	9809082-03D	E03-SD03-01-122			0.000	0.000	3.75	mg/Kg		DIV BY	
6	9809082-04	E03-SD03-01-123			0.000	0.000	3.51	mg/Kg			
7	9809082-05	E03-SD03-01-124			0.000	0.000	3.69	mg/Kg			
8	9809082-06	E03-SD03-00-125			0.000	0.000	1.00	mg/L			
9	9809082-07	E03-SD03-00-126			0.000	0.000	1.00	mg/L			
0	9809082-08	E03-SD00-01-127			0.000	0.000	6.83	mg/Kg			
1	PREP BLANK	PREP BLANK			0.000	0.000	2.00	mg/Kg			
2	9809102-01	CEF-16-415-01	14.6		14.6	14.6	1.00	mg/L			
3	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
4	BLANK	BLANK			0.000	0.000	1.00	mg/L			
5	9809110-01	CEF-16-43S-01	34.6		34.6	34.6	1.00	mg/L			
6	9809110-02	CEF-16-44I-01	8.33		8.33	8.33	1.00	mg/L			
7	9809110-03	CEF-16-10S-01	302.0		302	302	1.00	mg/L			
8	9809110-04	CEF-16-09D-01	36.5		36.5	36.5	1.00	mg/L			
9	9809117-01	CEF-16-45I-01	0		0.000	0.000	1.00	mg/L			
0	9809117-02	CEF-16-11DD-01	260.4		260	260	1.00	mg/L			
1	9809117-03	CEF-16-21S-01	7.9		7.90	7.90	1.00	mg/L			
2	9809117-04	CEF-16-23D-01	242.7		243	243	1.00	mg/L			
3	9809117-05	CEF-16-DP1-01	0		0.000	0.000	1.00	mg/L			
4	9809117-04D	CEF-16-23D-01D	244.8		245	245	1.00	mg/L		0.862	
5	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
6	BLANK	BLANK			0.000	0.000	1.00	mg/L			
7	9809113-02	E19-GW03-19-113	49		49.0	49.0	1.00	mg/L			
8	9809113-05	E19-GW03-38-111	56.2		56.2	56.2	1.00	mg/L			
9	9809113-05D	E19-GW03-38-111	54.2		54.2	54.2	1.00	mg/L		3.62	
0	9809113-07	E19-GW99-18-115	40.6		40.6	40.6	1.00	mg/L			
1	9809113-09	E19-GW99-14-117	52.1		52.1	52.1	1.00	mg/L			
2	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
3	BLANK	BLANK			0.000	0.000	1.00	mg/L			
4	9809096-02	E19-GW01-19-098	4.2		4.20	4.20	1.00	mg/L			
5	9809096-02D	E19-GW01-19-098	4.2		4.20	4.20	1.00	mg/L		0.000	
6	9809096-04	E19-GW02-23-100	4.2		4.20	4.20	1.00	mg/L			
7	9809096-06	E19-GW02-23-102	2.1		2.10	2.10	1.00	mg/L			
8	9809096-08	E19-GW02-23-104	4.2		4.20	4.20	1.00	mg/L			

LM
Analyst / Date

Chris Beaty 10-9-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Bicarbonate Alkalinity

ATA FILE: ALK91898
NSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/18/1998

eq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
39	9809096-10	E19-GW99-13-106	2.1		2.10	2.10	1.00	mg/L			
40	9809096-12	E19-GW99-13-108	5.2		5.20	5.20	1.00	mg/L			
41	9809098-02	E38-GW04-39-041	62.5		62.5	62.5	1.00	mg/L			
42	9809098-04	E38-GW04-31-043	45.8		45.8	45.8	1.00	mg/L			
43	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
44	BLANK	BLANK			0.000	0.000	1.00	mg/L			

LM
Analyst / Date

Chris Beazley 10-9-98
Lab Supervisor Date

RUN SUMMARY SHEET
Bicarbonate Alkalinity

DATA FILE: ALK00298
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 10/02/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0218	ICV			0.000	0.000	1.00	mg/L	Div. by 0		
2	BLANK	ICB			0.000	0.000	1.00	mg/L			
3	9809129-01	CEF-16-42I-01	0		0.000	0.000	1.00	mg/L			
4	9809129-02	CEF-16-22I-01	0		0.000	0.000	1.00	mg/L			
5	9809129-02D	CEF-16-22I-01D	0		0.000	0.000	1.00	mg/L		DIV BY	
6	9809146-01	PW-11			0.000	0.000	1.00	mg/L			
7	9809146-03	PW-12			0.000	0.000	1.00	mg/L			
8	9809149-01	CEF-16-32S-01	0		0.000	0.000	1.00	mg/L			
9	9809149-02	CEF-16-38S-01	0		0.000	0.000	1.00	mg/L			
10	9809149-03	CEF-16-35S-01	0		0.000	0.000	1.00	mg/L			
11	9809149-04	CEF-16-27I-01	0		0.000	0.000	1.00	mg/L			
12	9809149-05	CEF-16-DP2-01	0		0.000	0.000	1.00	mg/L			
13	WC0218	CV			0.000	0.000	1.00	mg/L	Div. by 0		
14	BLANK	CB			0.000	0.000	1.00	mg/L			

SN
Analyst / Date

Chris Beaty 10-14-98
Lab Supervisor / Date

5015

RUN SUMMARY SHEET
Biological Oxygen Demand

ATA FILE: BOD92398
NSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/23/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	UNSEEDED BLAN	UBLK	1.20	0	0.600	0.600	2.00	mg/L			141
2	SEEDED BLANK	SBLK	0.90	0.20	0.550	0.550	2.00	mg/L			90.0
3	WC0231	G/GA	161	26.4	93.7	93.7	2.00	mg/L	46.8		102
4	ERA 8067	LCS	30.7	189	110	110	2.00	mg/L	133		102
5	9809117-01	CEF-16-45I-01	0		0.000	0.000	2.00	mg/L			
6	9809117-02	CEF-16-11DD-01	0		0.000	0.000	2.00	mg/L			
7	9809117-03	CEF-16-21S-01	0		0.000	0.000	2.00	mg/L			
8	9809117-04	CEF-16-23D-01	0		0.000	0.000	2.00	mg/L			
9	9809117-05	CEF-16-DP1-01	5.64		5.64	5.64	2.00	mg/L			
10	9809117-05D	CEF-16-DP1-01D	5.41		5.41	5.41	2.00	mg/L		4.16	
11	9809129-01	CEF-16-42I-01	0		0.000	0.000	2.00	mg/L			
12	9809129-02	CEF-16-22I-01	0		0.000	0.000	2.00	mg/L			

VBF 10/16/98
Analyst / Date

Chris Bennett 10-16-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Biological Oxygen Demand

DATA FILE: BOD93098
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/30/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	UNSEEDED BLAN	UBLK	0.60	0.50	0.550	0.550	2.00	mg/L			12.9
2	SEEDED BLANK	SBLK	0.70	0.20	0.450	0.450	2.00	mg/L			78.6
3	WC0231	G/GA	119	119	119	119	2.00	mg/L	59.5		0.00
4	ERA 8067	LCS	54.2	49.4	51.8	51.8	2.00	mg/L	62.5		6.55
5	9809149-01	CEF-16-32S-01	8.28		8.28	8.28	2.00	mg/L			
6	9809149-02	CEF-16-38S-01	0		0.000	0.000	2.00	mg/L			
7	9809149-03	CEF-16-35S-01	0		0.000	0.000	2.00	mg/L			
8	9809149-03D	CEF-16-35S-01D	0		0.000	0.000	2.00	mg/L		DIV BY	
9	9809149-04	CEF-16-27I-01	0		0.000	0.000	2.00	mg/L			
10	9809149-05	CEF-16-DP2-01	0		0.000	0.000	2.00	mg/L			

VBF
Analyst / Date

Chris Bean 10-16-98
Lab Supervisor / Date

5004

RUN SUMMARY SHEET
BROMIDE BY IC METHOD 300

DATA FILE: NUS91898
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/18/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	975		0.103	0.103	0.100	mg/L			
2	0.1 PPM	S1	1847		0.158	0.158	0.100	mg/L			
3	0.5 PPM	S2	6575		0.460	0.460	0.100	mg/L			
4	1.0 PPM	S3	13476		0.900	0.900	0.100	mg/L			
5	3.0 PPM	S4	44963		2.91	2.91	0.100	mg/L			
6	5.0 PPM	S5	78842		5.07	5.07	0.100	mg/L			
7	9809117-01	CEF-16-45I-01	0		0.041	0.041	0.100	mg/L			
8	For NO3 only										
9	For Cl andl SO4 analysis only										
10	For NO2 only										
11	For PO4 only										
12	BLANK	ICB	0		0.041	0.041	0.100	mg/L			
13	9809117-01	CEF-16-45I-01	0		0.041	0.406	1.00	mg/L			
14	9809117-02	CEF-16-11DD-01	0		0.041	0.041	0.100	mg/L			
15	9809117-03	CEF-16-21S-01	520		0.074	0.074	0.100	mg/L			
16	9809117-04	CEF-16-23D-01	190		0.053	0.053	0.100	mg/L			
17	9809117-05	CEF-16-DP1-01	622		0.080	0.803	1.00	mg/L			
18	9809117-01	CEF-16-45I-01	0		0.041	0.041	0.100	mg/L			
19	9809117-02	CEF-16-11DD-01	176		0.052	0.518	1.00	mg/L			
20	9809117-03	CEF-16-21S-01	0		0.041	0.406	1.00	mg/L			
21	9809117-04	CEF-16-23D-01	0		0.041	0.406	1.00	mg/L			
22	9809117-05	CEF-16-DP1-01	396		0.066	0.066	0.100	mg/L			
23	For NO3 analysis only										
24	For Cl and SO4 analysis only										
25	For NO2 only										
26	For PO4 only										
27	CCB1	CCB1	0		0.041	0.041	0.100	mg/L			
28	9809117-05S	CEF-16-DP1-01S	35956		2.33	4.67	0.200	mg/L	93.4		
29	9809117-05D	CEF-16-DP1-01D	358		0.063	0.063	0.100	mg/L			~~171~~ NA
30	9809129-01	CEF-16-42I-01	0		0.041	0.041	0.100	mg/L			
31	9809129-01	CEF-16-42I-01	0		0.041	0.406	1.00	mg/L			
32	9809129-02	CEF-16-22I-01	386		0.065	0.065	0.100	mg/L			
33	9809129-02	CEF-16-22I-01	0		0.041	0.406	1.00	mg/L			
34	For NO3 analysis only										
35	For Cl and SO4 analysis only										
36	For NO2										
37	For PO4										
38	CCB2	CCB2	0		0.041	0.041	0.100	mg/L			

Tracy E Wardell 10-16-98
Analyst / Date

Chris Bu 10-19-98
Lab Supervisor / Date

5042

RUN SUMMARY SHEET
BROMIDE BY IC METHOD 300

DATA FILE: NUS92498
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/24/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	0		0.067	0.067	0.100	mg/L			
2	0.1 PPM	S1	1194		0.142	0.142	0.100	mg/L			
3	0.5 PPM	S2	6575		0.483	0.483	0.100	mg/L			
4	1.0 PPM	S3	13559		0.924	0.924	0.100	mg/L			
5	3.0 PPM	S4	45289		2.93	2.93	0.100	mg/L			
6	5.0 PPM	S5	78861		5.05	5.05	0.100	mg/L			
7	ERA981#805	ICV	7906		0.567	1.13	0.200	mg/L	81.0		
8	For nitrite only										
9	BLANK	ICB	0		0.067	0.067	0.100	mg/L			
10	9809149-01	CEF-16-32S-01	673		0.109	0.109	0.100	mg/L			
11	9809149-01D	CEF-16-32S-01D	619		0.106	0.106	0.100	mg/L		3.17	
12	9809149-01S	CEF-16-32S-01S	34288		2.24	4.47	0.200	mg/L	87.2		
13	9809149-02	CEF-16-38S-01	1817		0.182	0.182	0.100	mg/L			
14	9809149-03	CEF-16-35S-01	911		0.124	0.124	0.100	mg/L			
15	9809149-04	CEF-16-27I-01	627		0.106	0.106	0.100	mg/L			
16	9809149-05	CEF-16-DP2-01	618		0.106	0.106	0.100	mg/L			
17	CCV1 x 2	CCV1 x 2	8136		0.581	1.16	0.200	mg/L	83.0		
18	For nitrite only										
19	CCV1 x 10	CCV1 x 10	1429		0.157	1.57	1.00	mg/L	112		
20	CCB1	CCB1	0		0.067	0.067	0.100	mg/L			
21	9809149-01	CEF-16-32S-01	0		0.067	0.667	1.00	mg/L			
22	9809149-01D	CEF-16-32S-01D	0		0.067	0.667	1.00	mg/L		0.000	
23	9809149-01S	CEF-16-32S-01S	32612		2.13	42.6	2.00	mg/L	85.2		
24	9809149-02	CEF-16-38S-01	176		0.078	0.779	1.00	mg/L			
25	9809149-03	CEF-16-35S-01	0		0.067	0.667	1.00	mg/L			
26	9809149-04	CEF-16-27I-01	0		0.067	0.667	1.00	mg/L			
27	9809149-05	CEF-16-DP2-01	0		0.067	0.667	1.00	mg/L			
28	CCV2 x 2	CCV2 x 2	8671		0.615	1.23	0.200	mg/L	87.9		
29	CCV2 x 10	CCV2 x 10	1499		0.162	1.62	1.00	mg/L	115		
30	For nitrite only										
31	CCB2	CCB2	0		0.067	0.067	0.100	mg/L			

VF 10/22/98
Analyst / Date

Tracy R Wardell 10-5-98
Lab Supervisor / Date

5033

RUN SUMMARY SHEET
Carbonate Alkalinity

ATA FILE: ALK91898
NSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/18/1998

eq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
2	BLANK	ICB			0.000	0.000	1.00	mg/L			
3	9809082-02	E03-SD03-01-121			0.000	0.000	8.97	mg/Kg			
4	9809082-03	E03-SD03-01-122			0.000	0.000	3.75	mg/Kg			
5	9809082-03D	E03-SD03-01-122			0.000	0.000	3.75	mg/Kg		DIV BY	
6	9809082-04	E03-SD03-01-123			0.000	0.000	3.51	mg/Kg			
7	9809082-05	E03-SD03-01-124			0.000	0.000	3.69	mg/Kg			
8	9809082-06	E03-SD03-00-125			0.000	0.000	1.00	mg/L			
9	9809082-07	E03-SD03-00-126			0.000	0.000	1.00	mg/L			
10	9809082-08	E03-SD00-01-127			0.000	0.000	6.83	mg/Kg			
11	PREP BLANK	PREP BLANK			0.000	0.000	2.00	mg/Kg			
12	9809102-01	CEF-16-415-01	0		0.000	0.000	1.00	mg/L			
13	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
14	BLANK	BLANK			0.000	0.000	1.00	mg/L			
15	9809110-01	CEF-16-43S-01	0		0.000	0.000	1.00	mg/L			
16	9809110-02	CEF-16-44I-01	0		0.000	0.000	1.00	mg/L			
17	9809110-03	CEF-16-10S-01	0		0.000	0.000	1.00	mg/L			
18	9809110-04	CEF-16-09D-01	0		0.000	0.000	1.00	mg/L			
19	9809117-01	CEF-16-45I-01	0		0.000	0.000	1.00	mg/L			
20	9809117-02	CEF-16-11DD-01	0		0.000	0.000	1.00	mg/L			
21	9809117-03	CEF-16-21S-01	0		0.000	0.000	1.00	mg/L			
22	9809117-04	CEF-16-23D-01	0		0.000	0.000	1.00	mg/L			
23	9809117-05	CEF-16-DP1-01	0		0.000	0.000	1.00	mg/L			
24	9809117-04D	CEF-16-23D-01D	0		0.000	0.000	1.00	mg/L		DIV BY	
25	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
26	BLANK	BLANK			0.000	0.000	1.00	mg/L			
27	9809113-02	E19-GW03-19-113	0		0.000	0.000	1.00	mg/L			
28	9809113-05	E19-GW03-38-111	0		0.000	0.000	1.00	mg/L			
29	9809113-05D	E19-GW03-38-111	0		0.000	0.000	1.00	mg/L		DIV BY	
30	9809113-07	E19-GW99-18-115	0		0.000	0.000	1.00	mg/L			
31	9809113-09	E19-GW99-14-117	0		0.000	0.000	1.00	mg/L			
32	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
33	BLANK	BLANK			0.000	0.000	1.00	mg/L			
34	9809096-02	E19-GW01-19-098	0		0.000	0.000	1.00	mg/L			
35	9809096-02D	E19-GW01-19-098	0		0.000	0.000	1.00	mg/L		DIV BY	
36	9809096-04	E19-GW02-23-100	0		0.000	0.000	1.00	mg/L			
37	9809096-06	E19-GW02-23-102	0		0.000	0.000	1.00	mg/L			
38	9809096-08	E19-GW02-23-104	0		0.000	0.000	1.00	mg/L			

LM
Analyst / Date

Chris Bo 10-9-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Carbonate Alkalinity

TA FILE: ALK91898
STRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 09/18/1998

a	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
9	9809096-10	E19-GW99-13-106	0		0.000	0.000	1.00	mg/L			
0	9809096-12	E19-GW99-13-108	0		0.000	0.000	1.00	mg/L			
1	9809098-02	E38-GW04-39-041	0		0.000	0.000	1.00	mg/L			
2	9809098-04	E38-GW04-31-043	0		0.000	0.000	1.00	mg/L			
3	WC0127	WC0127			0.000	0.000	1.00	mg/L	Div. by 0		
4	BLANK	BLANK			0.000	0.000	1.00	mg/L			

LM
Analyst / Date

Chris Bee 10-9-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Carbonate Alkalinity

DATA FILE: ALK00298
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 10/02/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0218	ICV			0.000	0.000	1.00	mg/L	Div. by 0		
2	BLANK	ICB			0.000	0.000	1.00	mg/L			
3	9809129-01	CEF-16-42I-01	0		0.000	0.000	1.00	mg/L			
4	9809129-02	CEF-16-22I-01	0		0.000	0.000	1.00	mg/L			
5	9809129-02D	CEF-16-22I-01D	0		0.000	0.000	1.00	mg/L		DIV BY	
6	9809146-01	PW-11	0		0.000	0.000	1.00	mg/L			
7	9809146-03	PW-12	0		0.000	0.000	1.00	mg/L			
8	9809149-01	CEF-16-32S-01	0		0.000	0.000	1.00	mg/L			
9	9809149-02	CEF-16-38S-01	0		0.000	0.000	1.00	mg/L			
10	9809149-03	CEF-16-35S-01	0		0.000	0.000	1.00	mg/L			
11	9809149-04	CEF-16-27I-01	0		0.000	0.000	1.00	mg/L			
12	9809149-05	CEF-16-DP2-01	0		0.000	0.000	1.00	mg/L			
13	WC0218	CV			0.000	0.000	1.00	mg/L	Div. by 0		
14	BLANK	CB			0.000	0.000	1.00	mg/L			

SN
Analyst / Date

Chris Beaty 10-14-98
Lab Supervisor / Date

5016

RUN SUMMARY SHEET
Chemical Oxygen Demand

ATA FILE: COD00298
NSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 10/02/1998

eq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0149	WC0149	64.9		64.9	130	10.0	mg/L	94.1		
2	BLANK	BLANK	0		0.000	0.000	5.00	mg/L			
3	9809119-01	YR-8-4	67.5		67.5	67.5	5.00	mg/L			
4	9809102-01	CEF-16-415-01	36.4		36.4	36.4	5.00	mg/L			
5	9809102-01D	CEF-16-415-01D	39.0		39.0	39.0	5.00	mg/L		6.90	
6	9809102-01S	CEF-16-415-01S	93.5		93.5	93.5	5.00	mg/L	114		
7	9809110-01	CEF-16-43S-01	155.8		156	156	5.00	mg/L			
8	9809110-02	CEF-16-44I-01	36.4		36.4	36.4	5.00	mg/L			
9	9809110-03	CEF-16-10S-01	57.1		57.1	57.1	5.00	mg/L			
10	9809110-04	CEF-16-09D-01	0		0.000	0.000	5.00	mg/L			
11	9809117-01	CEF-16-45I-01	83.1		83.1	83.1	5.00	mg/L			
12	9809117-02	CEF-16-11DD-01	0		0.000	0.000	5.00	mg/L			
13	9809117-03	CEF-16-21S-01	28.6		28.6	28.6	5.00	mg/L			
14	9809117-04	CEF-16-23D-01	5.2		5.20	5.20	5.00	mg/L			
15	9809117-05	CEF-16-DP1-01	83.3		83.3	83.3	5.00	mg/L			
16	WC0149	WC0149	67.53		67.5	135	10.0	mg/L	97.9		
17	BLANK	BLANK	0		0.000	0.000	5.00	mg/L			

SN
Analyst / Date

Chris Beaty 10-6-98
Lab Supervisor / Date

5009

RUN SUMMARY SHEET
Chemical Oxygen Demand

ATA FILE: CO000398
NSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 10/03/1998

eq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	PREP BLANK	PREP BLANK	0		0.000	0.000	5.00	mg/L			
2	ERA 8067	ERA 8067	67.2		67.2	134	10.0	mg/L	Div. by 0		
3	NA-OVER RANGE										
4	9809126-02	BB002P	237.7		238	951	20.0	mg/kg			
5	9809126-03	BB002	258.4		258	1030	20.0	mg/kg			
6	NA-OVER RANGE										
7	NA-OVER RANGE										
8	9809126-07	BB001E	5.17		5.17	5.17	5.00	mg/kg			
9	9809126-07D	BB001ED	5.17		5.17	5.17	5.00	mg/kg		0.000	
10	9809126-07S	BB001ES	51.7		51.7	51.7	5.00	mg/kg	93.1		
11	9809126-09	BB001F	0		0.000	0.000	100	mg/kg			
12	NA-OVER RANGE										
13	NA-OVER RANGE										
14	NA-OVER RANGE										
15	9810018-01	YR-4	98.2		98.2	98.2	5.00	mg/L			
16	9810018-02	DE-4	77.5		77.5	77.5	5.00	mg/L			
17	9809129-01	CEF-16-42I-01	7.75		7.75	7.75	5.00	mg/L			
18	9809129-02	CEF-16-22I-01	10.3		10.3	10.3	5.00	mg/L			
19	NA-OVER RANGE										
20	NA-OVER RANGE										
21	NA-OVER RANGE										
22	NA-OVER RANGE										
23	NA-OVER RANGE										
24	PREP BLANK	PREP BLANK	0		0.000	0.000	5.00	mg/L			
25	ERA 8067	ERA 8067	62.6		62.6	125	10.0	mg/L	90.7		
26	NA-OVER RANGE										
27	9809120-03	AE001E	15.5		15.5	15.5	5.00	mg/kg			
28	9809120-03D	AE001ED	15.5		15.5	15.5	5.00	mg/kg		0.000	
29	9809120-03S	AE001ES	62.0		62.0	62.0	5.00	mg/kg			
30	9809120-04	AE001F	0		0.000	0.000	5.00	mg/kg			
31	NA-OVER RANGE										
32	NA-OVER RANGE										
33	9809120-10	BA001	121.4		121	4860	200	mg/kg			
34	9809120-11	BA001E	0		0.000	0.000	5.00	mg/kg			
35	9809120-12	BA001F	0		0.000	0.000	5.00	mg/kg			
36	NA-OVER RANGE										
37	NA-OVER RANGE										
38	NA-OVER RANGE										
39	9809156-04	CA001F	0		0.000	0.000	5.00	mg/kg			
40	NA-OVER RANGE										
41	NA-OVER RANGE										
42	NA-OVER RANGE										
43	NA-OVER RANGE										
44	NA-OVER RANGE										
45	NA-OVER RANGE										
46	PREP BLANK	PREP BLANK	0		0.000	0.000	5.00	mg/L			

SN
Analyst / Date

Chris Bo[illegible] 10-13-98
Lab Supervisor / Date

5009

RUN SUMMARY SHEET
Chemical Oxygen Demand

ATA FILE: COD00398
NSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 10/03/1998

eq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
47	ERA 8067	ERA 8067	69.7		69.7	139	10.0	mg/L	101		
48	NA-OVER RANGE										
49	9809166-09	BB004	33.6		33.6	2690	400	mg/kg			

SN
Analyst / Date

Chris Beam 10-13-98
Lab Supervisor / Date

5010

RUN SUMMARY SHEET
Chemical Oxygen Demand

DATA FILE: COD02098
INSTRUMENT FILE: INSTRUMENT: WET_LAB ANALYZED: 10/20/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	ICB	0		0.000	0.000	5.00	mg/L			
2	WC0149	ICV	70.89		70.9	142	10.0	mg/L	103		
3	9809120-01	AE001	217.72		218	218000	5000	mg/kg			
4	9809120-15	BA002	167.09		167	1670	50.0	mg/kg			
5	USED SAMPLE RESULT WITH THE LOWER DILUTION										
6	9809120-13	BA001W	167.089		167	1670	50.0	mg/kg			
7	USED SAMPLE RESULT WITH THE LOWER DILUTION										
8	9809120-16	BA002P	136.71		137	1370	50.0	mg/kg			
9	USED SAMPLE RESULT WITH THE LOWER DILUTION										
10	9809146-01	PW-11	15.2		15.2	15.2	5.00	mg/L			
11	9809146-03	PW-12	15.2		15.2	15.2	5.00	mg/L			
12	9809149-01	CEF-16-32S-01	20.2		20.2	20.2	5.00	mg/L			
13	9809149-01D	CEF-16-32S-01D	20.2		20.2	20.2	5.00	mg/L		0.000	
14	9809149-01S	CEF-16-32S-01S	75.9		75.9	75.9	5.00	mg/L	111		
15	9809149-02	CEF-16-38S-01	35.4		35.4	35.4	5.00	mg/L			
16	9809149-03	CEF-16-35S-01	30.4		30.4	30.4	5.00	mg/L			
17	9809149-04	CEF-16-271-01	20.2		20.2	20.2	5.00	mg/L			
18	9809149-05	CEF-16-DP2-01	17.7		17.7	17.7	5.00	mg/L			
19	9810072-01	JRMIC-01	20.2		20.2	20.2	5.00	mg/L			
20	9810072-02	JRMIC-02	35.4		35.4	35.4	5.00	mg/L			
21	9810072-03	JRMIC-03	20.2		20.2	20.2	5.00	mg/L			
22	BLANK	CB	0		0.000	0.000	5.00	mg/L			
23	WC0149	CV	65.82		65.8	132	10.0	mg/L	95.4		
24	9809120-02	AE001P	40.51		40.5	405000	50000	mg/kg			
25	9809120-05	AE001W	63.29		63.3	633000	50000	mg/kg			
26	9809120-07	AE002	25.32		25.3	253000	50000	mg/kg			
27	USED SAMPLE RESULT WITH THE LOWER DILUTION										
28	USED SAMPLE RESULT WITH THE LOWER DILUTION										
29	USED SAMPLE RESULT WITH THE LOWER DILUTION										
30	9809120-16S	BA002PS	50.63		50.6	506000	50000	mg/kg	101		

A. Salch AS 10-20-98
Analyst / Date

Gracy E Wardell 10-20-98
Lab Supervisor / Date

5014

RUN SUMMARY SHEET
CHLORIDE BY IC METHOD 300

DATA FILE: NUS91898
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/18/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	3979		-0.017	-0.017	0.100	mg/L			
2	0.1 PPM	S1	122608		0.297	0.297	0.100	mg/L			
3	0.5 PPM	S2	173544		0.433	0.433	0.100	mg/L			
4	1.0 PPM	S3	354496		0.913	0.913	0.100	mg/L			
5	3.0 PPM	S4	1110108		2.92	2.92	0.100	mg/L			
6	5.0 PPM	S5	1917233		5.06	5.06	0.100	mg/L			
7	9809117-01	CEF-16-45I-01	31351224		83.1	83.1	0.100	mg/L			
8	WC0217 x5	WC0217 x5	14350844		38.0	190	0.500	mg/L	102		
9	WC0217 x100	WC0217 x100	612545		1.60	160	10.0	mg/L	85.9		
10	For NO2 analysis only										
11	For PO4 analysis only										
12	BLANK	ICB	0		-0.028	-0.028	0.100	mg/L			
13	9809117-01	CEF-16-45I-01	65178		0.145	1.45	1.00	mg/L			
14	9809117-02	CEF-16-11DD-01	35253245		93.5	93.5	0.100	mg/L			
15	9809117-03	CEF-16-21S-01	3987728		10.5	10.5	0.100	mg/L			
16	9809117-04	CEF-16-23D-01	1196980		3.15	3.15	0.100	mg/L			
17	9809117-05	CEF-16-DP1-01	4191403		11.1	111	1.00	mg/L			
18	9809117-01	CEF-16-45I-01	35001314		92.8	92.8	0.100	mg/L			
19	9809117-02	CEF-16-11DD-01	367125		0.946	9.46	1.00	mg/L			
20	9809117-03	CEF-16-21S-01	116459		0.281	2.81	1.00	mg/L			
21	9809117-04	CEF-16-23D-01	387182		0.999	9.99	1.00	mg/L			
22	9809117-05	CEF-16-DP1-01	3540642		9.36	9.36	0.100	mg/L			
23	CCV1 x5	CCV1 x5	14510515		38.5	192	0.500	mg/L	103		
24	CCV1 x100	CCV1 x100	627189		1.64	164	10.0	mg/L	88.0		
25	For NO2 analysis only										
26	For PO4 analysis only										
27	CCB1	CCB1	69208		0.156	0.156	0.100	mg/L			
28	9809117-05S	CEF-16-DP1-01S	2598181		6.86	13.7	0.200	mg/L	87.3		
29	9809117-05D	CEF-16-DP1-01D	3543444		9.37	9.37	0.100	mg/L		0.079	
30	9809129-01	CEF-16-42I-01	1237096		3.25	3.25	0.100	mg/L			
31	9809129-01	CEF-16-42I-01	91136		0.214	2.14	1.00	mg/L			
32	9809129-02	CEF-16-22I-01	2001179		5.28	5.28	0.100	mg/L			
33	9809129-02	CEF-16-22I-01	146962		0.362	3.62	1.00	mg/L			
34	CCV2 x5	CCV2 x5	14031083		37.2	186	0.500	mg/L	100		
35	CCV2 x100	CCV2 x100	664060		1.73	173	10.0	mg/L	93.2		
36	For NO2 analysis only										
37	For PO4 analysis only										
38	CCB2	CCB2	53521		0.114	0.114	0.100	mg/L			

Tracy E Wardell 10-16-98
Analyst / Date

Chris Beaz 10-19-98
Lab Supervisor / Date

RUN SUMMARY SHEET
CHLORIDE BY IC METHOD 300

DATA FILE: NUS92498
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/24/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	295		-0.120	-0.120	0.100	mg/L			
2	0.1 PPM	S1	4295		0.024	0.024	0.100	mg/L			
3	0.5 PPM	S2	17970		0.516	0.516	0.100	mg/L			
4	1.0 PPM	S3	35162		1.13	1.13	0.100	mg/L			
5	3.0 PPM	S4	94172		3.26	3.26	0.100	mg/L			
6	5.0 PPM	S5	136627		4.79	4.79	0.100	mg/L			
7	ERA981#805	ICV	162754		5.73	11.5	0.200	mg/L	93.1		
8	For nitrite only										
9	BLANK	ICB	0		-0.131	-0.131	0.100	mg/L			
10	9809149-01	CEF-16-32S-01	211217		7.47	7.47	0.100	mg/L			
11	9809149-01D	CEF-16-32S-01D	207023		7.32	7.32	0.100	mg/L		2.04	
12	9809149-01S	CEF-16-32S-01S	172469		6.08	12.2	0.200	mg/L	93.7		
13	9809149-02	CEF-16-38S-01	257481		9.14	9.14	0.100	mg/L			
14	9809149-03	CEF-16-35S-01	330354		11.8	11.8	0.100	mg/L			
15	9809149-04	CEF-16-27I-01	183901		6.49	6.49	0.100	mg/L			
16	9809149-05	CEF-16-DP2-01	166818		5.87	5.87	0.100	mg/L			
17	CCV1 x 2	CCV1 x 2	179064		6.32	12.6	0.200	mg/L	103		
18	For nitrite only										
19	CCV1 x 10	CCV1 x 10	32096		1.02	10.2	1.00	mg/L	83.3		
20	CCB1	CCB1	384		-0.117	-0.117	0.100	mg/L			
21	9809149-01	CEF-16-32S-01	18465		0.534	5.34	1.00	mg/L			
22	9809149-01D	CEF-16-32S-01D	20388		0.603	6.03	1.00	mg/L		12.2	
23	9809149-01S	CEF-16-32S-01S	73435		2.51	50.3	2.00	mg/L	89.8		
24	9809149-02	CEF-16-38S-01	25025		0.770	7.70	1.00	mg/L			
25	9809149-03	CEF-16-35S-01	34566		1.11	11.1	1.00	mg/L			
26	9809149-04	CEF-16-27I-01	11317		0.276	2.76	1.00	mg/L			
27	9809149-05	CEF-16-DP2-01	12600		0.323	3.23	1.00	mg/L			
28	CCV2 x 2	CCV2 x 2	208154		7.36	14.7	0.200	mg/L	120		
29	CCV2 x 10	CCV2 x 10	34871		1.12	11.2	1.00	mg/L	91.4		
30	For nitrite only										
31	CCB2	CCB2	432		-0.116	-0.116	0.100	mg/L			

Analyst / Date 10/22/98

Lab Supervisor / Date 10-22-

5034

RUN SUMMARY SHEET
NITRATE BY IC

DATA FILE: NUS91898
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/18/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	0		-0.003	-0.003	0.100	mg/L			
2	0.1 PPM	S1	5627		0.125	0.125	0.100	mg/L			
3	0.5 PPM	S2	23403		0.532	0.532	0.100	mg/L			
4	1.0 PPM	S3	42785		0.975	0.975	0.100	mg/L			
5	3.0 PPM	S4	128254		2.93	2.93	0.100	mg/L			
6	5.0 PPM	S5	220697		5.04	5.04	0.100	mg/L			
7	9809117-01	CEF-16-45I-01	5151		0.115	0.115	0.100	mg/L			
8	WC0217 x5	WC0217 x5	64080		1.46	7.31	0.500	mg/L	88.1		
9	WC0217 x100	WC0217 x100	4046		0.089	8.93	10.0	mg/L	108		
10	For NO2 analysis only										
11	For PO4 analysis only										
12	BLANK	ICB	0		-0.003	-0.003	0.100	mg/L			
13	9809117-01	CEF-16-45I-01	0		-0.003	-0.032	1.00	mg/L			
14	9809117-02	CEF-16-11DD-01	2537		0.055	0.055	0.100	mg/L			
15	9809117-03	CEF-16-21S-01	241		0.002	0.002	0.100	mg/L			
16	9809117-04	CEF-16-23D-01	0		-0.003	-0.003	0.100	mg/L			
17	9809117-05	CEF-16-DP1-01	0		-0.003	-0.032	1.00	mg/L			
18	9809117-01	CEF-16-45I-01	4315		0.095	0.095	0.100	mg/L			
19	9809117-02	CEF-16-11DD-01	0		-0.003	-0.032	1.00	mg/L			
20	9809117-03	CEF-16-21S-01	0		-0.003	-0.032	1.00	mg/L			
21	9809117-04	CEF-16-23D-01	0		-0.003	-0.032	1.00	mg/L			
22	9809117-05	CEF-16-DP1-01	334		0.004	0.004	0.100	mg/L			
23	CCV1 x5	CCV1 x5	70079		1.60	7.99	0.500	mg/L	96.3		
24	CCV1 x100	CCV1 x100	4176		0.092	9.23	10.0	mg/L	111		
25	For NO2 analysis only										
26	For PO4 analysis only										
27	CCB1	CCB1	97		-0.001	-0.001	0.100	mg/L			
28	9809117-05S	CEF-16-DP1-01S	114131		2.61	5.21	0.200	mg/L	104		
29	9809117-05D	CEF-16-DP1-01D	149		0.000	0.000	0.100	mg/L			~~203~~ NA
30	9809129-01	CEF-16-42I-01	0		-0.003	-0.003	0.100	mg/L			
31	9809129-01	CEF-16-42I-01	0		-0.003	-0.032	1.00	mg/L			
32	9809129-02	CEF-16-22I-01	0		-0.003	-0.003	0.100	mg/L			
33	9809129-02	CEF-16-22I-01	103		-0.001	-0.008	1.00	mg/L			
34	CCV2 x5	CCV2 x5	67568		1.54	7.71	0.500	mg/L	92.9		
35	CCV2 x100	CCV2 x100	4324		0.096	9.56	10.0	mg/L	115		
36	For NO2 analysis only										
37	For PO4 analysis only										
38	CCB2	CCB2	0		-0.003	-0.003	0.100	mg/L			

Tracy E Wardell TW 10-16-98
Analyst / Date

Chris Bennett 10-19-98
Lab Supervisor / Date

RUN SUMMARY SHEET
NITRATE BY IC

DATA FILE: NUS92498
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/24/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	0		-0.006	-0.006	0.100	mg/L			
2	0.1 PPM	S1	5344		0.116	0.116	0.100	mg/L			
3	0.5 PPM	S2	23403		0.529	0.529	0.100	mg/L			
4	1.0 PPM	S3	43517		0.988	0.988	0.100	mg/L			
5	3.0 PPM	S4	128858		2.94	2.94	0.100	mg/L			
6	5.0 PPM	S5	220767		5.04	5.04	0.100	mg/L			
7	ERA981#805	ICV	61523		1.40	2.80	0.200	mg/L	80.0		
8	For nitrite only										
9	BLANK	ICB	0		-0.006	-0.006	0.100	mg/L			
10	9809149-01	CEF-16-32S-01	1139		0.020	0.020	0.100	mg/L			
11	9809149-01D	CEF-16-32S-01D	1044		0.018	0.018	0.100	mg/L		11.3	
12	9809149-01S	CEF-16-32S-01S	100548		2.29	4.58	0.200	mg/L	91.6		
13	9809149-02	CEF-16-38S-01	15115		0.339	0.339	0.100	mg/L			
14	9809149-03	CEF-16-35S-01	685		0.010	0.010	0.100	mg/L			
15	9809149-04	CEF-16-27I-01	0		-0.006	-0.006	0.100	mg/L			
16	9809149-05	CEF-16-DP2-01	0		-0.006	-0.006	0.100	mg/L			
17	CCV1 x 2	CCV1 x 2	67094		1.53	3.05	0.200	mg/L	87.2		
18	For nitrite only										
19	CCV1 x 10	CCV1 x 10	14618		0.328	3.28	1.00	mg/L	93.7		
20	CCB1	CCB1	108		-0.003	-0.003	0.100	mg/L			
21	9809149-01	CEF-16-32S-01	151		-0.002	-0.023	1.00	mg/L			
22	9809149-01D	CEF-16-32S-01D	161		-0.002	-0.020	1.00	mg/L		10.6	
23	9809149-01S	CEF-16-32S-01S	104294		2.38	47.5	2.00	mg/L	95.0		
24	9809149-02	CEF-16-38S-01	1380		0.026	0.258	1.00	mg/L			
25	9809149-03	CEF-16-35S-01	0		-0.006	-0.057	1.00	mg/L			
26	9809149-04	CEF-16-27I-01	0		-0.006	-0.057	1.00	mg/L			
27	9809149-05	CEF-16-DP2-01	0		-0.006	-0.057	1.00	mg/L			
28	CCV2 x 2	CCV2 x 2	70887		1.61	3.23	0.200	mg/L	92.2		
29	CCV2 x 10	CCV2 x 10	15313		0.344	3.44	1.00	mg/L	98.3		
30	For nitrite only										
31	CCB2	CCB2	0		-0.006	-0.006	0.100	mg/L			

Vhn Lvnn 10/22/98
Analyst / Date

Tracy E Wardell 10-22-98
Lab Supervisor / Date

RUN SUMMARY SHEET
NITRITE BY IC

DATA FILE: NUS91898
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/18/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	0		-0.017	-0.017	0.100	mg/L			
2	0.1 PPM	S1	9562		0.102	0.102	0.100	mg/L			
3	0.5 PPM	S2	39004		0.466	0.466	0.100	mg/L			
4	1.0 PPM	S3	80786		0.983	0.983	0.100	mg/L			
5	3.0 PPM	S4	257338		3.17	3.17	0.100	mg/L			
6	5.0 PPM	S5	396941		4.90	4.90	0.100	mg/L			
7	9809117-01	CEF-16-45I-01	0		-0.017	-0.017	0.100	mg/L			
8	For Cl and SO4 analysis only										
9	For NO3 analysis only										
10	WC0207	WC0207	253899		3.13	6.25	0.200	mg/L	90.6		
11	For PO4 analysis only										
12	BLANK	ICB	0		-0.017	-0.017	0.100	mg/L			
13	9809117-01	CEF-16-45I-01	0		-0.017	-0.169	1.00	mg/L			
14	9809117-02	CEF-16-11DD-01	0		-0.017	-0.017	0.100	mg/L			
15	9809117-03	CEF-16-21S-01	0		-0.017	-0.017	0.100	mg/L			
16	9809117-04	CEF-16-23D-01	0		-0.017	-0.017	0.100	mg/L			
17	9809117-05	CEF-16-DP1-01	0		-0.017	-0.169	1.00	mg/L			
18	9809117-01	CEF-16-45I-01	0		-0.017	-0.017	0.100	mg/L			
19	9809117-02	CEF-16-11DD-01	0		-0.017	-0.169	1.00	mg/L			
20	9809117-03	CEF-16-21S-01	0		-0.017	-0.169	1.00	mg/L			
21	9809117-04	CEF-16-23D-01	0		-0.017	-0.169	1.00	mg/L			
22	9809117-05	CEF-16-DP1-01	0		-0.017	-0.017	0.100	mg/L			
23	For Cl and SO4 analysis only										
24	For NO3 analysis only										
25	CCV1 NO2	CCV1 NO2	272713		3.36	6.72	0.200	mg/L	97.4		
26	For PO4 analysis only										
27	CCB1	CCB1	0		-0.017	-0.017	0.100	mg/L			
28	9809117-05S	CEF-16-DP1-01S	223971		2.76	5.51	0.200	mg/L	*110		
29	9809117-05D	CEF-16-DP1-01D	0		-0.017	-0.017	0.100	mg/L			NA
30	9809129-01	CEF-16-42I-01	0		-0.017	-0.017	0.100	mg/L			
31	9809129-01	CEF-16-42I-01	0		-0.017	-0.169	1.00	mg/L			
32	9809129-02	CEF-16-22I-01	0		-0.017	-0.017	0.100	mg/L			
33	9809129-02	CEF-16-22I-01	0		-0.017	-0.169	1.00	mg/L			
34	For Cl and SO4 analysis only										
35	For NO3 analysis only										
36	CCV2 NO2	CCV2 NO2	289476		3.57	7.13	0.200	mg/L	103		
37	For PO4 analysis only										
38	CCB2	CCB2	0		-0.017	-0.017	0.100	mg/L			

Tracy E Warden 10-16-98
Analyst / Date

Chris B 10-19-98
Lab Supervisor / Date

RUN SUMMARY SHEET
NITRITE BY IC

DATA FILE: NUS92498
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/24/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	0		-0.008	-0.008	0.100	mg/L			
2	0.1 PPM	S1	7319		0.082	0.082	0.100	mg/L			
3	0.5 PPM	S2	38867		0.472	0.472	0.100	mg/L			
4	1.0 PPM	S3	80856		0.991	0.991	0.100	mg/L			
5	3.0 PPM	S4	256885		3.17	3.17	0.100	mg/L			
6	5.0 PPM	S5	396976		4.90	4.90	0.100	mg/L			
7	For other anions										
8	WC0207	WC0207	245960		3.03	6.06	0.200	mg/L	87.9		
9	BLANK	ICB	0		-0.008	-0.008	0.100	mg/L			
10	9809149-01	CEF-16-32S-01	0		-0.008	-0.008	0.100	mg/L			
11	9809149-01D	CEF-16-32S-01D	0		-0.008	-0.008	0.100	mg/L		0.000	
12	9809149-01S	CEF-16-32S-01S	221875		2.73	5.47	0.200	mg/L	109		
13	9809149-02	CEF-16-38S-01	0		-0.008	-0.008	0.100	mg/L			
14	9809149-03	CEF-16-35S-01	0		-0.008	-0.008	0.100	mg/L			
15	9809149-04	CEF-16-27I-01	0		-0.008	-0.008	0.100	mg/L			
16	9809149-05	CEF-16-DP2-01	0		-0.008	-0.008	0.100	mg/L			
17	For other anions										
18	CCV1 NO2	CCV1 NO2	255448		3.15	6.30	0.200	mg/L	91.3		
19	For other anions										
20	CCB1	CCB1	0		-0.008	-0.008	0.100	mg/L			
21	9809149-01	CEF-16-32S-01	0		-0.008	-0.084	1.00	mg/L			
22	9809149-01D	CEF-16-32S-01D	0		-0.008	-0.084	1.00	mg/L		0.000	
23	9809149-01S	CEF-16-32S-01S	189907		2.34	46.8	2.00	mg/L	93.5		
24	9809149-02	CEF-16-38S-01	0		-0.008	-0.084	1.00	mg/L			
25	9809149-03	CEF-16-35S-01	0		-0.008	-0.084	1.00	mg/L			
26	9809149-04	CEF-16-27I-01	0		-0.008	-0.084	1.00	mg/L			
27	9809149-05	CEF-16-DP2-01	0		-0.008	-0.084	1.00	mg/L			
28	For other anions										
29	For other anions										
30	CCV2 NO2	CCV2 NO2	277225		3.42	6.84	0.200	mg/L	99.1		
31	CCB2	CCB2	0		-0.008	-0.008	0.100	mg/L			

VF 10/24/98
Analyst / Date

Tracy E Wardell 10-29-98
Lab Supervisor / Date

5036

RUN SUMMARY SHEET
O-Phosphate (as phosphorus)

DATA FILE: NUS91898
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/18/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	0		-0.076	-0.076	0.100	mg/L			
2	0.1 PPM	S1	847		0.039	0.039	0.100	mg/L			
3	0.5 PPM	S2	4456		0.527	0.527	0.100	mg/L			
4	1.0 PPM	S3	8528		1.08	1.08	0.100	mg/L			
5	3.0 PPM	S4	23790		3.15	3.15	0.100	mg/L			
6	5.0 PPM	S5	36615		4.88	4.88	0.100	mg/L			
7	9809117-01	CEF-16-45I-01	0		-0.076	-0.076	0.100	mg/L			
8	For Cl and SO4 analysis only										
9	For NO3 analysis only										
10	For NO2 analysis only										
11	PO4 QC	PO4 QC	6808		0.846	4.23	0.500	mg/L	106		
12	BLANK	ICB	0		-0.076	-0.076	0.100	mg/L			
13	9809117-01	CEF-16-45I-01	0		-0.076	-0.762	1.00	mg/L			
14	9809117-02	CEF-16-11DD-01	130		-0.059	-0.059	0.100	mg/L			
15	9809117-03	CEF-16-21S-01	0		-0.076	-0.076	0.100	mg/L			
16	9809117-04	CEF-16-23D-01	84		-0.065	-0.065	0.100	mg/L			
17	9809117-05	CEF-16-DP1-01	0		-0.076	-0.762	1.00	mg/L			
18	9809117-01	CEF-16-45I-01	0		-0.076	-0.076	0.100	mg/L			
19	9809117-02	CEF-16-11DD-01	101		-0.063	-0.625	1.00	mg/L			
20	9809117-03	CEF-16-21S-01	0		-0.076	-0.762	1.00	mg/L			
21	9809117-04	CEF-16-23D-01	0		-0.076	-0.762	1.00	mg/L			
22	9809117-05	CEF-16-DP1-01	0		-0.076	-0.076	0.100	mg/L			
23	For Cl and SO4 analysis only										
24	For NO3 analysis only										
25	For NO2 analysis only										
26	CCV1 PO4	CCV1 PO4	5629		0.686	3.43	0.500	mg/L	85.8		
27	CCB1	CCB1	0		-0.076	-0.076	0.100	mg/L			
28	9809117-05S	CEF-16-DP1-01S	13929		1.81	3.62	0.200	mg/L	72.4		
29	9809117-05D	CEF-16-DP1-01D	0		-0.076	-0.076	0.100	mg/L			~~165~~ NA
30	9809129-01	CEF-16-42I-01	116		-0.060	-0.060	0.100	mg/L			
31	9809129-01	CEF-16-42I-01	0		-0.076	-0.762	1.00	mg/L			
32	9809129-02	CEF-16-22I-01	0		-0.076	-0.076	0.100	mg/L			
33	9809129-02	CEF-16-22I-01	0		-0.076	-0.762	1.00	mg/L			
34	For Cl and SO4 analysis only										
35	For NO3 analysis only										
36	For NO2 analysis only										
37	CCV2 PO4	CCV2 PO4	5533		0.673	3.37	0.500	mg/L	84.2		
38	CCB2	CCB2	0		-0.076	-0.076	0.100	mg/L			

Tracy R. Ward CTW 10-16-98
Analyst / Date

Chris Bean 10-19-98
Lab Supervisor / Date

RUN SUMMARY SHEET
O-Phosphate (as phosphorus)

DATA FILE: NUS92498
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/24/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	0		0.032	0.032	0.100	mg/L			
2	0.1 PPM	S1	18922		0.109	0.109	0.100	mg/L			
3	0.5 PPM	S2	113503		0.493	0.493	0.100	mg/L			
4	1.0 PPM	S3	231077		0.971	0.971	0.100	mg/L			
5	3.0 PPM	S4	723943		2.97	2.97	0.100	mg/L			
6	5.0 PPM	S5	1227134		5.02	5.02	0.100	mg/L			
7	ERA981#805	ICV	93437		0.411	0.823	0.200	mg/L	68.6		
8	For nitrite only										
9	BLANK	ICB	0		0.032	0.032	0.100	mg/L			
10	9809149-01	CEF-16-32S-01	0		0.032	0.032	0.100	mg/L			
11	9809149-01D	CEF-16-32S-01D	0		0.032	0.032	0.100	mg/L		0.000	
12	9809149-01S	CEF-16-32S-01S	402420		1.67	3.34	0.200	mg/L	66.7		
13	9809149-02	CEF-16-38S-01	0		0.032	0.032	0.100	mg/L			
14	9809149-03	CEF-16-35S-01	0		0.032	0.032	0.100	mg/L			
15	9809149-04	CEF-16-27I-01	0		0.032	0.032	0.100	mg/L			
16	9809149-05	CEF-16-DP2-01	0		0.032	0.032	0.100	mg/L			
17	CCV1 x 2	CCV1 x 2	85475		0.379	0.758	0.200	mg/L	63.2		
18	For nitrite only										
19	CCV1 x 10	CCV1 x 10	15156		0.093	0.932	1.00	mg/L	77.7		
20	CCB1	CCB1	0		0.032	0.032	0.100	mg/L			
21	9809149-01	CEF-16-32S-01	0		0.032	0.316	1.00	mg/L			
22	9809149-01D	CEF-16-32S-01D	0		0.032	0.316	1.00	mg/L		0.000	
23	9809149-01S	CEF-16-32S-01S	447956		1.85	37.1	2.00	mg/L	74.1		
24	9809149-02	CEF-16-38S-01	0		0.032	0.316	1.00	mg/L			
25	9809149-03	CEF-16-35S-01	0		0.032	0.316	1.00	mg/L			
26	9809149-04	CEF-16-27I-01	0		0.032	0.316	1.00	mg/L			
27	9809149-05	CEF-16-DP2-01	0		0.032	0.316	1.00	mg/L			
28	CCV2 x 2	CCV2 x 2	101640		0.445	0.890	0.200	mg/L	74.1		
29	CCV2 x 10	CCV2 x 10	14365		0.090	0.900	1.00	mg/L	75.0		
30	For nitrite only										
31	CCB2	CCB2	0		0.032	0.032	0.100	mg/L			

VF 10/22/98
Analyst / Date

Tracy E Wardell 10-22-98
Lab Supervisor / Date

5037

RUN SUMMARY SHEET
SULFATE BY IC METHOD 300

DATA FILE: NUS91898
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/18/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	0		0.032	0.032	0.100	mg/L			
2	0.1 PPM	S1	34663		0.174	0.174	0.100	mg/L			
3	0.5 PPM	S2	124758		0.544	0.544	0.100	mg/L			
4	1.0 PPM	S3	199023		0.848	0.848	0.100	mg/L			
5	3.0 PPM	S4	713964		2.96	2.96	0.100	mg/L			
6	5.0 PPM	S5	1220339		5.04	5.04	0.100	mg/L			
7	9809117-01	CEF-16-45I-01	23021071		94.5	94.5	0.100	mg/L			
8	WC0217 x5	WC0217 x5	13686023		56.2	281	0.500	mg/L	112		
9	WC0217 x100	WC0217 x100	596208		2.48	248	10.0	mg/L	98.8		
10	For NO2 analysis only										
11	For PO4 analysis only										
12	BLANK	ICB	0		0.032	0.032	0.100	mg/L			
13	9809117-01	CEF-16-45I-01	902		0.035	0.353	1.00	mg/L			
14	9809117-02	CEF-16-11DD-01	25573393		105	105	0.100	mg/L			
15	9809117-03	CEF-16-21S-01	107156		0.471	0.471	0.100	mg/L			
16	9809117-04	CEF-16-23D-01	4397789		18.1	18.1	0.100	mg/L			
17	9809117-05	CEF-16-DP1-01	19725		0.113	1.13	1.00	mg/L			
18	9809117-01	CEF-16-45I-01	24825224		102	102	0.100	mg/L			
19	9809117-02	CEF-16-11DD-01	12623		0.083	0.834	1.00	mg/L			
20	9809117-03	CEF-16-21S-01	440186		1.84	18.4	1.00	mg/L			
21	9809117-04	CEF-16-23D-01	7120		0.061	0.608	1.00	mg/L			
22	9809117-05	CEF-16-DP1-01	2107882		8.68	8.68	0.100	mg/L			
23	CCV1 x5	CCV1 x5	13905538		57.1	286	0.500	mg/L	114		
24	CCV1 x100	CCV1 x100	606289		2.52	252	10.0	mg/L	100		
25	For NO2 analysis only										
26	For PO4 analysis only										
27	CCB1	CCB1	0		0.032	0.032	0.100	mg/L			
28	9809117-05S	CEF-16-DP1-01S	1637919		6.75	13.5	0.200	mg/L	96.5		
29	9809117-05D	CEF-16-DP1-01D	2072378		8.54	8.54	0.100	mg/L		1.69	
30	9809129-01	CEF-16-42I-01	940052		3.89	3.89	0.100	mg/L			
31	9809129-01	CEF-16-42I-01	95419		0.423	4.23	1.00	mg/L			
32	9809129-02	CEF-16-22I-01	12549833		51.5	51.5	0.100	mg/L			
33	9809129-02	CEF-16-22I-01	127446		0.555	5.55	1.00	mg/L			
34	CCV2 x5	CCV2 x5	13547453		55.6	278	0.500	mg/L	111		
35	CCV2 x100	CCV2 x100	595320		2.48	248	10.0	mg/L	98.6		
36	For NO2 analysis only										
37	For PO4 analysis only										
38	CCB2	CCB2	0		0.032	0.032	0.100	mg/L			

Tracy E Wardell TW 10-16-98
Analyst / Date

Chris Berg 10-19-98
Lab Supervisor / Date

RUN SUMMARY SHEET
SULFATE BY IC METHOD 300

DATA FILE: NUS92498
INSTRUMENT FILE: INSTRUMENT: DIONEX ANALYZED: 09/24/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	BLANK	S0	0		-0.014	-0.014	0.100	mg/L			
2	0.1 PPM	S1	34663		0.125	0.125	0.100	mg/L			
3	0.5 PPM	S2	124758		0.488	0.488	0.100	mg/L			
4	1.0 PPM	S3	252849		1.00	1.00	0.100	mg/L			
5	3.0 PPM	S4	748326		3.00	3.00	0.100	mg/L			
6	5.0 PPM	S5	1247248		5.00	5.00	0.100	mg/L			
7	ERA981#805	ICV	2792474		11.2	22.4	0.200	mg/L	86.0		
8	For nitrite only										
9	BLANK	ICB	0		-0.014	-0.014	0.100	mg/L			
10	9809149-01	CEF-16-32S-01	805233		3.22	3.22	0.100	mg/L			
11	9809149-01D	CEF-16-32S-01D	813710		3.26	3.26	0.100	mg/L		1.05	
12	9809149-01S	CEF-16-32S-01S	940115		3.77	7.53	0.200	mg/L	86.2		
13	9809149-02	CEF-16-38S-01	2469798		9.92	9.92	0.100	mg/L			
14	9809149-03	CEF-16-35S-01	856939		3.43	3.43	0.100	mg/L			
15	9809149-04	CEF-16-27I-01	624101		2.50	2.50	0.100	mg/L			
16	9809149-05	CEF-16-DP2-01	647592		2.59	2.59	0.100	mg/L			
17	CCV1 x 2	CCV1 x 2	2860903		11.5	23.0	0.200	mg/L	88.1		
18	For nitrite only										
19	CCV1 x 10	CCV1 x 10	543262		2.17	21.7	1.00	mg/L	83.2		
20	CCB1	CCB1	1713		-0.007	-0.007	0.100	mg/L			
21	9809149-01	CEF-16-32S-01	81142		0.312	3.12	1.00	mg/L			
22	9809149-01D	CEF-16-32S-01D	77603		0.298	2.98	1.00	mg/L		4.66	
23	9809149-01S	CEF-16-32S-01S	585404		2.34	46.8	2.00	mg/L	87.4		
24	9809149-02	CEF-16-38S-01	235550		0.933	9.33	1.00	mg/L			
25	9809149-03	CEF-16-35S-01	90979		0.352	3.52	1.00	mg/L			
26	9809149-04	CEF-16-27I-01	67819		0.259	2.59	1.00	mg/L			
27	9809149-05	CEF-16-DP2-01	368593		1.47	14.7	1.00	mg/L			
28	CCV2 x 2	CCV2 x 2	2941684		11.8	23.6	0.200	mg/L	90.6		
29	Run stopped prior to sulfate peak										
30	For nitrite only										
31	CCB2	CCB2	0		-0.014	-0.014	0.100	mg/L			

[signature] VF 10/22/98
Analyst / Date

Tracy E Wardell 10/22/98
Lab Supervisor / Date

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RUN SUMMARY SHEET
Total Organic Carbon

DATA FILE: TOC93098
INSTRUMENT FILE: INSTRUMENT: DOHRMAN ANALYZED: 09/30/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0149	ICV	48.17		48.2	48.2	1.00	mg/L	89.4		
2	BLANK	ICB	0		0.000	0.000	1.00	mg/L			
3	9809119-01	YR-8-4	8.11		8.11	8.11	1.00	mg/L			
4	9809063-01	TF2-4	2.92		2.92	2.92	1.00	mg/L			
5	9809063-03	TF2-4D	2.64		2.64	2.64	1.00	mg/L			
6	9809063-05	TF2-5	3.26		3.26	3.26	1.00	mg/L			
7	9809069-01	TF1-4	7.51		7.51	7.51	1.00	mg/L			
8	9809069-03	TF1-4D	10.30		10.3	10.3	1.00	mg/L			
9	9809069-05	TF1-5	5.68		5.68	5.68	1.00	mg/L			
10	9809108-01	TF1-4	8.96		8.96	8.96	1.00	mg/L			
11	9809108-03	TF1-4D	9.06		9.06	9.06	1.00	mg/L			
12	9809108-05	TF1-5	7.68		7.68	7.68	1.00	mg/L			
13	WC0149	CCV	45.82		45.8	45.8	1.00	mg/L	85.0		
14	BLANK	CCB	0		0.000	0.000	1.00	mg/L			
15	9809102-01	CEF-16-415-01	12.50		12.5	12.5	1.00	mg/L			
16	9809110-01	CEF-16-43S-01	61.28		61.3	61.3	1.00	mg/L			
17	9809110-02	CEF-16-44I-01	8.28		8.28	8.28	1.00	mg/L			
18	9809110-03	CEF-16-10S-01	57.37		57.4	57.4	1.00	mg/L			
19	9809110-04	CEF-16-09D-01	2.78		2.78	2.78	1.00	mg/L			
20	9809110-04D	CEF-16-09D-01D	2.93		2.93	2.93	1.00	mg/L		5.25	
21	9809110-04S	CEF-16-09D-01S	21.40		21.4	21.4	1.00	mg/L	93.1		
22	9809117-01	CEF-16-45I-01	16.06		16.1	16.1	1.00	mg/L			
23	9809117-02	CEF-16-11DD-01	1.95		1.95	1.95	1.00	mg/L			
24	9809117-03	CEF-16-21S-01	16.61		16.6	16.6	1.00	mg/L			
25	WC0149	CV	49.76		49.8	49.8	1.00	mg/L	92.3		
26	BLANK	CB	0		0.000	0.000	1.00	mg/L			

Chris Beaufay DCB 10/1/98
Analyst / Date

Tracy E Wardell 10-6-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Total Organic Carbon

DATA FILE: TOC01398
INSTRUMENT FILE: INSTRUMENT: DOHRMAN ANALYZED: 10/13/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0149	ICV	53.74		53.7	53.7	1.00	mg/L	99.7		
2	BLANK	ICB	0		0.000	0.000	1.00	mg/L			
3	9809117-04	CEF-16-23D-01	2.41		2.41	2.41	1.00	mg/L			
4	9809117-05	CEF-16-DP1-01	19.82		19.8	19.8	1.00	mg/L			
5	9809117-05D	CEF-16-DP1-01D	19.75		19.8	19.8	1.00	mg/L		0.354	
6	9809117-05S	CEF-16-DP1-01S	29.90		29.9	29.9	1.00	mg/L	101		
7	WC0149	CV	53.84		53.8	53.8	1.00	mg/L	99.9		
8	BLANK	CB	0		0.000	0.000	1.00	mg/L			

Chris Bean DCB 10-14-98
Analyst / Date

Tracy E Wardell 10-14-98
Lab Supervisor / Date

RUN SUMMARY SHEET
Total Organic Carbon

DATA FILE: TOC01498
INSTRUMENT FILE: INSTRUMENT: DOHRMAN ANALYZED: 10/14/1998

Seq	Lab ID	Client ID	Rep1	Rep2	Raw Conc.	Result	MDL	Units	%Recovery	%RPD	%RSD
1	WC0149	ICV	54.33		54.3	54.3	1.00	mg/L	101		
2	BLANK	ICB	0		0.000	0.000	1.00	mg/L			
3	9809129-01	CEF-16-42I-01	2.57		2.57	2.57	1.00	mg/L			
4	9809129-02	CEF-16-22I-01	4.33		4.33	4.33	1.00	mg/L			
5	9809140-01	W1	0		0.000	0.000	1.00	mg/L			
6	9809140-01D	W1D	0		0.000	0.000	1.00	mg/L		DIV BY	
7	9809140-01S	W1S	9.87		9.87	9.87	1.00	mg/L	98.7		
8	9809140-02	W2	0		0.000	0.000	1.00	mg/L			
9	9809149-01	CEF-16-32S-01	3.04		3.04	3.04	1.00	mg/L			
10	9809149-02	CEF-16-38S-01	24.16		24.2	24.2	1.00	mg/L			
11	9809149-03	CEF-16-35S-01	7.46		7.46	7.46	1.00	mg/L			
12	9809149-04	CEF-16-27I-01	2.88		2.88	2.88	1.00	mg/L			
13	WC0149	CCV	53.67		53.7	53.7	1.00	mg/L	99.6		
14	BLANK	CCB	0		0.000	0.000	1.00	mg/L			
15	9809149-05	CEF-16-DP2-01	2.48		2.48	2.48	1.00	mg/L			
16	9809082-06	E03-SD03-00-125	0		0.000	0.000	1.00	mg/L			
17	9809082-07	E03-SD03-00-126	0		0.000	0.000	1.00	mg/L			
18	9810018-01	YR-4	7.80		7.80	7.80	1.00	mg/L			
19	9810018-02	DE-4	4.59		4.59	4.59	1.00	mg/L			
20	9810069-01	S57RB100998	0		0.000	0.000	1.00	mg/L			
21	9810069-02	S57FB100998-1	0		0.000	0.000	1.00	mg/L			
22	9810069-03	S57FB100998-2	7.09		7.09	7.09	1.00	mg/L			
23	9810074-01	E13-GWFS-89A-33	1.086		1.09	1.09	1.00	mg/L			
24	9810074-02	E13-GWFS-91A-33	0		0.000	0.000	1.00	mg/L			
25	WC0149	CCV	52.16		52.2	52.2	1.00	mg/L	96.8		
26	BLANK	CCB	0		0.000	0.000	1.00	mg/L			
27	9810074-03	E13-GWFS-90B-33	0		0.000	0.000	1.00	mg/L			
28	9810074-04	E13-GWFS-89B-33	0		0.000	0.000	1.00	mg/L			
29	9810074-05	E13-GWFS-22-335	0.916		0.916	0.916	1.00	mg/L			
30	9810074-06	E13-GWFS-91B-33	0		0.000	0.000	1.00	mg/L			
31	9810074-06D	E13-GWFS-91B-33	0		0.000	0.000	1.00	mg/L		DIV BY	
32	9810074-06S	E13-GWFS-91B-33	8.30		8.30	8.30	1.00	mg/L	83.0		
33	9810081-01	E13-GWFS-89C-33	0		0.000	0.000	1.00	mg/L			
34	9810081-02	E13-GWFS-90A-33	0		0.000	0.000	1.00	mg/L			
35	9810081-03	E13-GWFS-21-340	2.716		2.72	2.72	1.00	mg/L			
36	9810081-04	E13-GWFS-21-341	1.70		1.70	1.70	1.00	mg/L			
37	WC0149	CV	48.65		48.6	48.6	1.00	mg/L	90.3		
38	BLANK	CB	0		0.000	0.000	1.00	mg/L			

Chris Bean ADCB 10-14-98
Analyst / Date

Tracy E Wardell 10-15-98
Lab Supervisor / Date

5021

APPENDIX C
Support Documentation

Brown & Root Environmental

REPORT TO ADDRESS: 7018 Ac Skinner Pkwy Ste 350 Jacksonville FL 32256

TELEPHONE: 904-281-0400 FAX: 904-281-0070

SITE MANAGER: Tom Nicotera

PROJECT NAME: NAS Cecil Field

BRE PROJECT NO.: 7772 CODE:

P.O. NO.:

SHIPPED TO: GP Environmental Services Gaithersburg MD.

(LABORATORY NAME, CITY)

PAGE 1 OF 2

CHAIN OF CUSTODY RECORD

LABORATORY ANALYSIS

SAMPLED BY (PRINT): Tom Nicotera + Don Westerhoff

SAMPLER SIGNATURE: Tom Nicotera + Don Westerhoff

☐ STANDARD TAT ☐ RUSH

☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☒ 7 DAYS

RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	VOC	GASES	SVOC	DOC	METALS	Alkalinity	Lead	Cad	NO3 Sulfate	NUMBER OF CONTAINERS
			PRES. TYPE				HCl	HCl		HNO3	HNO3				H2SO4	
	9-16-98	10:40	CEF-16-45I-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-16-98	12:30	CEF-16-110D-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-16-98	15:15	CEF-16-215-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-16-98	18:30	CEF-16-23D-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-16-98	—	CEF-16-dP1-01		X	GW	3	3	1	1	1	1	1	1	1	13
TOTAL NUMBER OF CONTAINERS							15	15	5	5	5	5	5	5	5	65

COMMENTS: Samples put on Ice to 4°C.

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 9-1-98 TIME: 1700
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 9-16-98 TIME: 20:00	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: Airbill # 264766862

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X Airbill #

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera + Don Westerhoff

RECEIVED FOR LABORATORY BY (SIGNATURE): [illegible]

DATE: 9-17-98 TIME: 10:06 am

No. 2117

Brown & Root Environmental

REPORT TO ADDRESS: 7018 A Southside Blvd. Ste 252, Jacksonville, FL 32256

TELEPHONE: 904-731-4400 FAX: 904-731-4404

SITE MANAGER: Tom Nicotera

PROJECT NAME: NAS Cecil Field

BRE PROJECT NO.: 2292 CODE:

P.O. NO.:

SHIPPED TO: GP Environmental Services, Gaithersburg, MD

(LABORATORY NAME, CITY)

PAGE 2 OF 2

CHAIN OF CUSTODY RECORD

LABORATORY ANALYSIS

SAMPLED BY (PRINT): Tom Nicotera & Don Wester

SAMPLER SIGNATURE: Tom Nicotera & Don Wester

☐ STANDARD TAT ☐ RUSH

☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☒ 7 DAYS

RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	PARAMETERS / PRES. TYPE: Cl	NUMBER OF CONTAINERS	COMMENTS
	9-16-98	10:40	CEF-16-45I-01		X	GW	1	1	Samples put on
	9-16-98	12:30	CEF-16-110D-01		X	GW	1	1	Ice to 4°C
	9-16-98	15:15	CEF-16-215-01		X	GW	1	1	
	9-16-98	18:30	CEF-16-230-01		X	GW	1	1	
	9-16-98	—	CEF-16-dP1-01		X	GW	1	1	
			TOTAL NUMBER OF CONTAINERS				5	5	

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 9-17-98 TIME: 12:00
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 9-16-98 TIME: 20:00	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: 264766862

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X Airbill

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera & Don Wester

RECEIVED FOR LABORATORY BY (SIGNATURE): [illegible]

DATE: 9-17-98 TIME: 10:00

No. 2119

Brown & Root Environmental

REPORT TO ADDRESS: 7018 AC Skinner Pkwy Ste 200, Jacksonville FL 32256

TELEPHONE: 904-281-0400 FAX: 904-281-0020

SITE MANAGER: Tom Nicotera

PROJECT NAME: NAS Cecil Field

BRE PROJECT NO.: 7792 CODE:

P.O. NO.:

SHIPPED TO: GAI Environmental Services, Gaithersburg, MD.

(LABORATORY NAME, CITY)

PAGE 1 OF 2

CHAIN OF CUSTODY RECORD

SAMPLED BY (PRINT): Tom Nicotera + Don Westerhoff

SAMPLER SIGNATURE: Tom Nicotera + [signature]

LABORATORY ANALYSIS

☒ STANDARD TAT ☐ RUSH

☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☐ 7 DAYS

RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	VOC (PRES. HCl)	GASES (HCl)	SVOC (1)	DOC (H2SO4)	METALS (HNO3)	Alkalinity/Hardness (1)	BOD	COD	dis. sulfide (NaOH)	NUMBER OF CONTAINERS	COMMENTS
	9-17-98	1030	CEF-16-42I-01		X	GW	3	3	1	1	1	1	1	1	1	13	
	9-17-98	1145	CEF-16-22I-01		X	GW	3	3	1	1	1	1	1	1	1	13	Samples put on ice to 4°C.
TOTAL NUMBER OF CONTAINERS							6	6	2	2	2	2	2	2	2	26	

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotera	SEAL INTACT? (YES) NO N/A	DATE: 9-18-98 TIME: 1700
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotera	SEAL INTACT? (YES) NO N/A	DATE: 9-17-98 TIME: 2000	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: 8070413782 0

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X AirBill #

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera + Don Westerhoff

RECEIVED FOR LABORATORY BY (SIGNATURE): [signature]

DATE: 9/18/98 TIME: 3:15 pm

No. 2169

Brown & Root Environmental

REPORT TO ADDRESS: 7018 AC Skinner Pkwy. Jacksonville Fl. 32256

TELEPHONE: 904-281-0400 FAX: 904-281-0070

SITE MANAGER: Tom Nicotera

PROJECT NAME: NAS Cecil Field

BRE PROJECT NO.: 7792 CODE:

P.O. NO.:

SHIPPED TO: GP Environmental Services MD (LABORATORY NAME, CITY)

CHAIN OF CUSTODY RECORD

SAMPLED BY (PRINT): Tom Nicotera + Ron Westerhoff

SAMPLER SIGNATURE: Tom Nicotera + [illegible]

LABORATORY ANALYSIS

☒ STANDARD TAT ☐ RUSH

☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☐ 7 DAYS

RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	PARAMETERS: Metals	NUMBER OF CONTAINERS	COMMENTS
	9-17-98	10:30	CEF-16-42I-01		X	GW	1	1	Samples put on
	9-17-98	11:45	CEF-16-22I-01		X	GW	1	1	Ice to 4°C.
			TOTAL NUMBER OF CONTAINERS				2	2	

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotera	SEAL INTACT? (YES) NO N/A	DATE: 9-17-98 TIME: 1700
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotera	SEAL INTACT? (YES) NO N/A	DATE: 9-17-98 TIME: 2000	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: 8970413 7820

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X Airbill #

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera + Ron Westerhoff

RECEIVED FOR LABORATORY BY (SIGNATURE): [illegible]

DATE: 9/18/98 TIME: 3:15 pm

No. 2168

Jacksonville NAS Inc

Brown & Root Environmental STC 22

REPORT TO ADDRESS: 7018 AC Skinner Pkwy
Jacksonville, Fl. 32256

TELEPHONE: 904-281-0400 FAX: 904-281-0020

SITE MANAGER: Tom Nicotera
PROJECT NAME: NAS Cecil Field
BRE PROJECT NO.: 2792 CODE:
P.O. NO.:

SHIPPED TO: GP Environmental Services Gaithersburg MD.
(LABORATORY NAME, CITY)

PAGE 1 OF 2

CHAIN OF CUSTODY RECORD

SAMPLED BY (PRINT): Tom Nicotera & Jason McCann
SAMPLER SIGNATURE: Tom Nicotera & Jason McCann

LABORATORY ANALYSIS

☒ STANDARD TAT ☐ RUSH
☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☐ 7 DAYS
RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	VOC (HCl)	Gases (HCl)	SVOC (1)	DOC (H2SO4)	Metals (HNO3)	Alkalinity	Bod	Cod	dis. sulfide (NaOH Zn)	NUMBER OF CONTAINERS
	9-22-98	12:00	CEF-16-325-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-22-98	13:00	CEF-16-385-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-22-98	15:00	CEF-16-355-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-22-98	18:00	CEF-16-27I-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-22-98	—	CEF-16-dP2-01		X	GW	3	3	1	1	1	1	1	1	1	13
TOTAL NUMBER OF CONTAINERS							15	15	5	5	5	5	5	5	5	65

COMMENTS: Samples put on ice to 4°C.

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 9-1-98 TIME: 17:00
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 9-22-98 TIME: 20:00	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: 807041137831

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X AirBill #

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera + Jason McCann

RECEIVED FOR LABORATORY BY (SIGNATURE): [illegible]
DATE: 9/23/98 TIME: 9:05 A

No. 2190

Brown & Root Environmental

REPORT TO ADDRESS: 2018 AC Skinner Pkwy 25c
Jacksonville, Fl. 32256
TELEPHONE: 904-281-0400 FAX: 904-281-0020

SITE MANAGER: Tom Mictera
PROJECT NAME: NAS Cecil Field
BRE PROJECT NO.: 7792 CODE:
P.O. NO.:

SHIPPED TO: GF Environmental Services, Gaithersburg MD
(LABORATORY NAME, CITY)

PAGE 2 OF 2

CHAIN OF CUSTODY RECORD / LABORATORY ANALYSIS

SAMPLED BY (PRINT): Tom Mictera & Jason McCann
SAMPLER SIGNATURE: Tom Mictera & Jason M. McCann

☒ STANDARD TAT ☐ RUSH
☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☐ 7 DAYS
RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	PARAMETERS / PRES. TYPE: VOC Sulfide	NUMBER OF CONTAINERS	COMMENTS
	9-22-98	1200	CEF-16-325-01		X	GW	1	1	Samples put on ice to 4°C.
	9-22-98	1300	CEF-16-385-01		X	GW	1	1	
	9-22-98	1500	CEF-16-355-01		X	GW	1	1	
	9-22-98	1800	CEF-16-27I-01		X	GW	1	1	
	9-22-98	—	CEF-16-dP2-01		X	GW	1	1	
TOTAL NUMBER OF CONTAINERS							5	5	

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Mictera	SEAL INTACT? YES NO N/A	DATE: 9-1-98 TIME: 12:00
RELINQUISHED BY (SIGNATURE) ③ Tom Mictera	SEAL INTACT? YES NO N/A	DATE: 9-22-98 TIME: 20:00	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: 807041137831

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X AirBill

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Mictera & Jason McCann

RECEIVED FOR LABORATORY BY (SIGNATURE): C. Gross
DATE: 9/28/98 TIME: 9:05 A

No. 2106

GPL LABORATORIES, LLLP
METALS CASE NARRATIVE

CLIENT: NUS_SOUTHDIV
Description: NAS CECIL FIELD CTO-051
GP Work Order:98-09-117
DATE: September 30, 1998

The following data package comprises five water samples which were received at GPL Laboratories on September 17, 1998. The samples were analyzed for iron, and manganese by SW846 6010B.

The sample IDs were modified to accommodate the computer software used to generate the data package. The following changes were made:

CLIENT ID	MODIFIED ID	LAB ID
CFF-16-45I-01	45I-01	9809117-01I
CFF-16-11DD-01	1DD-01	9809117-02I
CFF-16-21S-01	21S-01	9809117-03I
CFF-16-23D-01	23D-01	9809117-04I
CFF-16-DP1-01	DP1-01	9809117-05I

A matrix spike, duplicate, and serial dilution were performed on sample CFF-16-45I-01 for all required analytes. The matrix spike could not be recovered for iron. The spike addition was insignificant.

All QA/QC criteria were met.

RA 9/30/98
9-30-98

GPL LABORATORIES, LLLP

WET CHEMISTRY CASE NARRATIVE

CLIENT: Tetratech NUS
GP Work Order: 9809117
DATE: October 19, 1998

The following data package is comprised of five water samples received at GPL Laboratories on September 17, 1998. The samples were analyzed for chloride, sulfate, bromide, nitrate, nitrite, orthophosphate, total organic carbon (TOC), chemical oxygen demand (COD), biological oxygen demand (BOD), sulfide, and alkalinity.

Sample CEF-16-23D-01 was analyzed in duplicate for alkalinity. A duplicate and matrix spike was analyzed on sample CEF-16-DP1-01 for TOC, chloride, bromide, nitrate, nitrite, orthophosphate, sulfate. A duplicate was analyzed for BOD on sample CEF-16-DP1-01. A Bromide ICV/CCV was unavailable when the samples were initially analyzed. The samples were re-analyzed with acceptable ICV/CCV results on a later date. The original results have been reported. All QA/QC criteria were met.

Tracy E Wardell 10-19-98

Chris Beazley 10-19-98

GPL LABORATORIES, LLLP
METALS CASE NARRATIVE

CLIENT: NUS_TETRATECH_SOUTH DIVISION
Description: NAS CECIL FIELD_CTO-051
GP Work Order: 98-09-129
DATE: October 7, 1998

The following data package comprises two water samples which were received at GPL Laboratories on September 18, 1998. The samples were analyzed for iron and manganese by SW846 methodologies.

The sample ID was modified to accommodate the computer software used to generate the data package. The following changes was made:

CLIENT ID	MODIFIED ID	LAB ID
CEF-16-42I-01	CEF42I	9809129-01I
CEF-16-22I-01	CEF22I	9809129-02I

A matrix spike, duplicate, and serial dilution were performed on sample CEF-16-42I-01. All QA/QC criteria were met.

Calibration standards were verified against independent check samples purchased from a commercial vendor of environmental standards.

All QA/QC criteria were met.

JM 10-7-98
JM 10-9-98

GPL LABORATORIES, LLLP

WET CHEMISTRY CASE NARRATIVE

CLIENT: Tetratech NUS
GP Work Order: 9809129
DATE: October 19, 1998

The following data package is comprised of two water samples received at GPL Laboratories on September 18, 1998. The samples were analyzed for chloride, sulfate, bromide, nitrate, nitrite, orthophosphate, total organic carbon (TOC), chemical oxygen demand (COD), biological oxygen demand (BOD), sulfide, and alkalinity.

Sample CEF-16-22I-01 was analyzed in duplicate for alkalinity. Sample CEF-42I-01 was analyzed in duplicate for sulfide. A Bromide ICV/CCV was unavailable when the samples were initially analyzed. The samples were re-analyzed with acceptable ICV/CCV results on a later date. The original results have been reported. All QA/QC criteria were met.

Tracy E Wardell 10-19-98
Chris Beaty 10-19-98

GPL LABORATORIES, LLLP

WET CHEMISTRY CASE NARRATIVE

CLIENT: Tetratech NUS
GP Work Order: 9809149
DATE: October 22, 1998

The following data package is comprised of five water samples received at GPL Laboratories on September 23, 1998. The samples were analyzed for chloride, sulfate, bromide, nitrate, nitrite, orthophosphate, total organic carbon (TOC), chemical oxygen demand (COD), biological oxygen demand (BOD), sulfide, and alkalinity.

Sample CEF-16-35S-01 was analyzed in duplicate for BOD. Sample CEF-16-DP2-01 was analyzed in duplicate for sulfide. A matrix spike and duplicate were analyzed on sample CEF-16-32S-01 for COD and the anions by IC. The orthophosphate ICV and CCVs were low (~78%) when the samples were initially analyzed. Analysis was continued with failing calibration verifications to obtain results within the 48 hour holding time. The samples were re-analyzed with acceptable ICV/CCV results on a later date. Orthophosphate was not detected in either analysis. The original results have been reported. The glucose/glutamic acid and LCS results were low for BOD. The sample could not be reanalyzed due to limited volume and holding times. All other QA/QC criteria were met.

Stacy E Wardell 10-22-98

Chris Beaghley 10-22-98

GPL LABORATORIES, LLLP
METALS CASE NARRATIVE

CLIENT: NUS_TETRATECH_SOUTH DIVISION
Description: NAS CECIL FIELD_CTO-051
GP Work Order: 98-09-149
DATE: October 13, 1998

The following data package comprises five water samples which were received at GPL Laboratories on September 23, 1998. The samples were analyzed for iron and manganese by SW846 methodologies.

The sample IDs were modified to accommodate the computer software used to generate the data package. The following changes was made:

CLIENT ID	MODIFIED ID	LAB ID
CEF-16-32S-01	CEF32S	9809149-01I
CEF-16-38S-01	CEF38S	9809149-02I
CEF-16-35S-01	CEF35S	9809149-03I
CEF-16-27I-01	CEF27I	9809149-04I
CEF-16-DP2-01	CEFDP2	9809149-05I

A matrix spike, duplicate, and serial dilution were performed on sample CEF-16-DP2-01. The duplicate was outside of the control limits for manganese; all associated data has been flagged with an "*".

Calibration standards were verified against independent check samples purchased from a commercial vendor of environmental standards.

All QA/QC criteria were met with the exception of those mentioned above.

JM 10-13-98
RW 10-15-98

Analysis Report Fri 09-25-98 05:30:05 PM page 1

Method: TRACE12 Sample Name: S 9809129-02I Operator:
Run Time: 09/25/98 17:24:33
Comment:
Mode: CONC Corr. Factor: 1

CEF-16-21S-01
GP 10-28

Elem	SB	AS	PB	SE	AG	TL	BA
Avge	-.056	-2.38	-.221	.283	-.076	-4.53	6.23
#1	-.300	-.926	.137	1.21	-.015	-4.31	6.28
#2	.189	-3.83	-.579	-.643	-.136	-4.75	6.18
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	10500.	21000.	52500.	10500.	1050.	10500.	101000.
Low	-6.00	-10.0	-3.00	-5.00	-10.0	-10.0	-200.

Elem	BE	CD	CO	CR	CU	MN	NI
Avge	-.022	-.047	-.497	.202	1.07	1.75	-.899
#1	-.039	-.058	-.642	.565	1.03	1.79	-.856
#2	-.005	-.037	-.353	-.161	1.12	1.70	-.941
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	1050.	10500.	10500.	10500.	25100.	10500.	10500.
Low	-5.00	-5.00	-50.0	-10.0	-25.0	-15.0	-40.0

Elem	V	ZN	B	MO	SI	SR	TI
Avge	1.19	3.75	16.7	-.462	1750.	4.21	.165
#1	1.19	4.00	17.1	-.341	1750.	4.23	.124
#2	1.19	3.51	16.3	-.584	1750.	4.19	.206
Errors	LC Pass	LC Pass	LC Pass	NOCHECK	NOCHECK	NOCHECK	LC Pass
High	10500.	21000.	10500.				101000.
Low	-50.0	-20.0	-50.0				-40.0

Elem	SN	NA	K	AL	FE	CA	MG
Avge	-3.22	3120.	236.	336.	597.	435.	510.
#1	-2.05	3160.	236.	337.	595.	434.	507.
#2	-4.39	3080.	237.	335.	599.	435.	512.
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	10500.	525000.	52500.	525000.	525000.	525000.	525000.
Low	-40.0	-100.	-50.0	-100.	-100.	-100.	-100.

Elem	2203/1	2203/2	1960/1	1960/2
Avge	1.43	-1.04	3.10	-1.12
#1	-.832	.620	2.52	.553
#2	3.69	-2.71	3.68	-2.80
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High				
Low				

Analysis Report Thu 10-08-98 12:45:10 PM page 1

Method: TRACE12 Sample Name: S 9809149-04I Operator: DDH
Run Time: 10/08/98 12:39:38
Comment: CEF-16-271-01 GP 10-28
Mode: CONC Corr. Factor: 1

Elem	SB	AS	PB	SE	AG	TL	BA
Avge	-1.28	3.07	2.47	.354	.467	-2.79	6.28
#1	-1.49	1.86	2.69	-.325	.343	-3.97	6.36
#2	-1.08	4.28	2.25	1.03	.592	-1.61	6.20
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	10500.	21000.	52500.	10500.	1050.	10500.	101000.
Low	-6.00	-10.0	-3.00	-5.00	-10.0	-10.0	-200.

Elem	BE	CD	CO	CR	CU	MN	NI
Avge	-.071	.173	-.090	.385	1.81	4.21	-1.30
#1	-.073	.085	-.138	.322	1.33	4.21	-.587
#2	-.069	.262	-.041	.448	2.30	4.21	-2.02
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	1050.	10500.	10500.	10500.	25100.	10500.	10500.
Low	-5.00	-5.00	-50.0	-10.0	-25.0	-15.0	-40.0

Elem	V	ZN	B	MO	SI	SR	TI
Avge	.298	81.5	20.0	-.316	3300.	4.98	.717
#1	.458	81.4	20.1	-.202	3310.	5.00	.639
#2	.137	81.7	19.8	-.429	3300.	4.97	.796
Errors	LC Pass	LC Pass	LC Pass	NOCHECK	NOCHECK	NOCHECK	LC Pass
High	10500.	21000.	10500.				101000.
Low	-50.0	-20.0	-50.0				-40.0

Elem	SN	NA	K	AL	FE	CA	MG
Avge	-2.98	4270.	208.	127.	1740.	363.	461.
#1	-2.92	4350.	208.	131.	1740.	360.	461.
#2	-3.04	4180.	209.	123.	1750.	365.	460.
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	10500.	525000.	52500.	525000.	525000.	525000.	525000.
Low	-40.0	-100.	-50.0	-100.	-100.	-100.	-100.

Elem	2203/1	2203/2	1960/1	1960/2
Avge	3.84	1.79	-3.76	2.41
#1	4.04	2.02	-5.29	2.15
#2	3.64	1.56	-2.23	2.66
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High				
Low				

Analysis Report Thu 10-08-98 12:39:33 PM page 1

Method: TRACE12 Sample Name: S 9809149-03I Operator: DDH
Run Time: 10/08/98 12:34:01
Comment: CEF-16-355-01 GP 10-28
Mode: CONC Corr. Factor: 1

Elem	SB	AS	PB	SE	AG	TL	BA
Avge	.238	-.989	2.80	2.60	.263	-.241	6.54
#1	.675	-2.43	2.20	3.11	.183	1.96	6.54
#2	-.199	.448	3.40	2.09	.344	-2.44	6.54
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	10500.	21000.	52500.	10500.	1050.	10500.	101000.
Low	-6.00	-10.0	-3.00	-5.00	-10.0	-10.0	-200.

Elem	BE	CD	CO	CR	CU	MN	NI
Avge	.013	.255	-.399	.866	1.26	3.10	-.377
#1	.000	.288	-.255	.756	1.53	3.07	-.993
#2	.027	.223	-.542	.975	.997	3.12	.238
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	1050.	10500.	10500.	10500.	25100.	10500.	10500.
Low	-5.00	-5.00	-50.0	-10.0	-25.0	-15.0	-40.0

Elem	V	ZN	B	MO	SI	SR	TI
Avge	1.47	6.65	36.9	.044	1950.	4.51	.786
#1	1.10	6.65	36.9	-.052	1950.	4.50	.744
#2	1.85	6.66	36.9	.139	1960.	4.52	.828
Errors	LC Pass	LC Pass	LC Pass	NOCHECK	NOCHECK	NOCHECK	LC Pass
High	10500.	21000.	10500.				101000.
Low	-50.0	-20.0	-50.0				-40.0

Elem	SN	NA	K	AL	FE	CA	MG
Avge	.398	10800.	183.	416.	303.	427.	439.
#1	2.94	10800.	186.	416.	301.	428.	439.
#2	-2.14	10800.	180.	416.	304.	426.	439.
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	10500.	525000.	52500.	525000.	525000.	525000.	525000.
Low	-40.0	-100.	-50.0	-100.	-100.	-100.	-100.

Elem	2203/1	2203/2	1960/1	1960/2
Avge	5.09	1.66	-.286	4.04
#1	5.17	.715	.850	4.24
#2	5.00	2.60	-1.42	3.84
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High				
Low				

ENVIROFORMS/INORGANIC CLP

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Initial Calibration Source: #3192

Continuing Calibration Source: #3192

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron	10000.0	9890.00	98.9	10000.0	9900.00	99.0	9780.00	97.8	P
Lead									
Magnesium									
Manganese	500.0	502.00	100.4	500.0	503.00	100.6	497.00	99.4	P
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									
Boron									
Tin									

(1) Control Limits : Mercury 80-120; Other Metals 90-110; Cyanide 85-115

FORM II (PART 1) - IN

ENVIROFORMS/INORGANIC CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Initial Calibration Source:

Continuing Calibration Source: #3192

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron				10000.0	9660.00	96.6	9830.00	98.3	P
Lead									
Magnesium									
Manganese				500.0	492.00	98.4	498.00	99.6	P
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									
Boron									
Tin									

(1) Control Limits : Mercury 80-120; Other Metals 90-110; Cyanide 85-115

FORM II (PART 1) - IN

ENVIROFORMS/INORGANIC CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Initial Calibration Source:

Continuing Calibration Source: #3192

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron				10000.0	9990.00	99.9			P
Lead									
Magnesium									
Manganese				500.0	503.00	100.6			P
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									
Boron									
Tin									

(1) Control Limits : Mercury 80-120; Other Metals 90-110; Cyanide 85-115

FORM II (PART 1) - IN

ENVIROFORMS/INORGANIC CLP

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Initial Calibration Source: #3192

Continuing Calibration Source: #3192

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron	10000.0	9720.00	97.2	10000.0	9700.00	97.0	9630.00	96.3	P
Lead									
Magnesium									
Manganese	500.0	506.00	101.2	500.0	503.00	100.6	502.00	100.4	P
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									
Boron									
Tin									

(1) Control Limits : Mercury 80-120; Other Metals 90-110; Cyanide 85-115

FORM II (PART 1) - IN

ENVIROFORMS/INORGANIC CLP

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Initial Calibration Source:

Continuing Calibration Source: #3192

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron				10000.0	9670.00	96.7	9720.00	97.2	P
Lead									
Magnesium									
Manganese				500.0	503.00	100.6	503.00	100.6	P
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									
Boron									
Tin									

(1) Control Limits : Mercury 80-120; Other Metals 90-110; Cyanide 85-115

FORM II (PART 1) - IN

ENVIROFORMS/INORGANIC CLP

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Initial Calibration Source:

Continuing Calibration Source: #3192

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron				10000.0	10200.00	102.0			P
Lead									
Magnesium									
Manganese				500.0	523.00	104.6			P
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									
Boron									
Tin									

(1) Control Limits : Mercury 80-120; Other Metals 90-110; Cyanide 85-115

ENVIROFORMS/INORGANIC CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

AA CRDL Standard Source:

ICP CRDL Standard Source: #3049

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Found Found	%R
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron				200.0	189.00	94.5	208.00	104.0
Lead								
Magnesium								
Manganese				30.0	30.50	101.7	31.30	104.3
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								
Boron								
Tin								

FORM II (PART 2) - IN

ENVIROFORMS/INORGANIC CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

AA CRDL Standard Source:

ICP CRDL Standard Source: #3049

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Found Found	%R
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron				200.0	202.00	101.0	190.00	95.0
Lead								
Magnesium								
Manganese				30.0	30.60	102.0	30.80	102.7
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								
Boron								
Tin								

3
BLANKS

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron	20.0	U	27.7	B	20.0	U	20.0	U	20.0	U	P
Lead											
Magnesium											
Manganese	1.0	U	1.0	U	1.0	U	1.0	U	1.0	U	P
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											
Boron											
Tin											

3
BLANKS

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron			20.0	U	29.8	B					P
Lead											
Magnesium											
Manganese			1.0	U	1.0	U					P
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											
Boron											
Tin											

3
BLANKS

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron			20.4	B	20.0	U	20.0	U			P
Lead											
Magnesium											
Manganese			1.0	U	1.0	U	1.0	U			P
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											
Boron											
Tin											

3
BLANKS

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron			20.0	U	20.0	U					P
Lead											
Magnesium											
Manganese			1.0	U	1.0	U					P
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											
Boron											
Tin											

10

INSTRUMENT DETECTION LIMITS (QUARTERLY)

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

ICP ID Number: TRACE Date: 07/24/98

Flame AA ID Number:

Furnace AA ID Number:

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	IDL (ug/L)	M
Aluminum	308.22		200.0	30.0	P
Antimony	206.84		60.0	2.0	P
Arsenic	189.04		10.0	3.0	P
Barium	493.41		200.0	6.0	P
Beryllium	313.04		5.0	1.0	P
Cadmium	226.50		5.0	1.0	P
Calcium	317.93		5000.0	40.0	P
Chromium	267.72		10.0	1.0	P
Cobalt	228.62		50.0	1.0	P
Copper	324.75		25.0	1.0	P
Iron	271.44		100.0	20.0	P
Lead	220.35		3.0	2.0	P
Magnesium	279.08		5000.0	20.0	P
Manganese	257.61		15.0	1.0	P
Mercury			0.2		
Nickel	231.60		40.0	1.0	P
Potassium	766.49		5000.0	20.0	P
Selenium	196.02		5.0	2.0	P
Silver	328.07		10.0	1.0	P
Sodium	330.23		5000.0	100.0	P
Thallium	190.86		10.0	3.0	P
Vanadium	292.40		50.0	1.0	P
Zinc	206.20		20.0	6.0	P
Cyanide			5.0		
Boron	249.68		0.0	2.0	P
Tin	189.99		0.0	3.0	P

Comments:

13

Preparation Log

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GP Case No.: SAS No.: SDG No.: TET117

Method: P

Sample No.	Preparation Date	Weight (gram)	Volume (ml)
1DD-01	09/24/98		100
21S-01	09/24/98		100
23D-01	09/24/98		100
45I-01	09/24/98		100
45I-01D	09/24/98		100
45I-01S	09/24/98		100
DP1-01	09/24/98		100
LCS456	09/24/98		100
PBW456	09/24/98		100

FORM XIII - IN

14

Analysis Run Log

Lab Name: GP ENVIRONMENTAL
Lab Code: GP Case No.:
Instrument ID Number: TRACE
Start Date: 09/24/98

Contract:
SAS No.: SDG No.: TET117
Method: P
End Date: 09/24/98

Sample No.	D/F	Time	% R	Analytes																								
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
S0	1.00	1155												X			X										
S1	1.00	1200												X			X										
S2	1.00	1205																									
S3	1.00	1211												X													
AGSTD	1.00	1216												X			X										
ICV	1.00	1221												X			X										
ICB	1.00	1226												X			X										
CRII	1.00	1232												X			X										
PQLLCK	1.00	1237												X			X										
ICSAI	1.00	1242												X			X										
ICSABI	1.00	1248												X			X										
CCV1	1.00	1257												X			X										
CCB1	1.00	1302												X			X										
ZZZZZZ	5.00	1307																									
ZZZZZZ	10.00	1313																									
ZZZZZZ	10.00	1319																									
ZZZZZZ	10.00	1324																									
ZZZZZZ	10.00	1330																									
ZZZZZZ	10.00	1336																									
ZZZZZZ	1.00	1341																									
ZZZZZZ	1.00	1347																									
ZZZZZZ	1.00	1352																									
ZZZZZZ	1.00	1358																									
CCV2	1.00	1404												X			X										
CCB2	1.00	1409												X			X										
ZZZZZZ	1.00	1415																									
ZZZZZZ	1.00	1421																									
ZZZZZZ	1.00	1426																									
ZZZZZZ	1.00	1432																									
PBW456	1.00	1438												X			X										
LCS456	1.00	1443												X			X										
ZZZZZZ	1.00	1449																									

FORM XIV - IN

ENVIROFORMS/INORGANIC CLP

14

Analysis Run Log

Lab Name: GP ENVIRONMENTAL
Lab Code: GP Case No.:
Instrument ID Number: TRACE
Start Date: 09/24/98

Contract:
SAS No.: SDG No.: TET117
Method: P
End Date: 09/24/98

Sample No.	D/F	Time	% R	Analytes																							
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
ZZZZZZ	1.00	1454																									
ZZZZZZ	1.00	1500																									
ZZZZZZ	1.00	1506																									
CCV3	1.00	1511												X			X										
CCB3	1.00	1517												X			X										
ZZZZZZ	1.00	1523																									
ZZZZZZ	1.00	1528																									
ZZZZZZ	1.00	1534																									
ZZZZZZ	1.00	1539																									
ZZZZZZ	1.00	1549																									
ZZZZZZ	2.00	1554																									
ZZZZZZ	2.00	1600																									
ZZZZZZ	2.00	1605																									
CCV4	1.00	1611												X			X										
CCB4	1.00	1617												X			X										
ZZZZZZ	2.00	1627																									
ZZZZZZ	2.00	1633																									
ZZZZZZ	2.00	1638																									
ZZZZZZ	2.00	1644																									
ZZZZZZ	2.00	1649																									
ZZZZZZ	2.00	1655																									
CRIF	1.00	1701												X			X										
ICSAF	1.00	1706												X			X										
ICSABF	1.00	1712												X			X										
CCV5	1.00	1718												X			X										
CCB5	1.00	1723												X			X										

FORM XIV - IN

ENVIROFORMS/INORGANIC CLP

14

Analysis Run Log

Lab Name: GP ENVIRONMENTAL
Lab Code: GP Case No.:
Instrument ID Number: TRACE
Start Date: 09/25/98

Contract:
SAS No.: SDG No.: TET117
Method: P
End Date: 09/25/98

Sample No.	D/F	Time	% R	Analytes																								
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
S0	1.00	1219												X			X										
S1	1.00	1224												X			X										
S2	1.00	1230																									
S3	1.00	1235												X													
AGSTD	1.00	1240												X			X										
ICV2	1.00	1245												X			X										
ICB2	1.00	1251												X			X										
CRII2	1.00	1256												X			X										
WCHECK	1.00	1301												X			X										
ICSAI2	1.00	1306												X			X										
ICSABI2	1.00	1312												X			X										
CCV21	1.00	1321												X			X										
CCB21	1.00	1326												X			X										
ZZZZZZ	5.00	1332																									
ZZZZZZ	5.00	1337																									
ZZZZZZ	5.00	1343																									
ZZZZZZ	5.00	1348																									
ZZZZZZ	5.00	1354																									
ZZZZZZ	5.00	1400																									
ZZZZZZ	5.00	1405																									
ZZZZZZ	5.00	1411																									
ZZZZZZ	5.00	1417																									
ZZZZZZ	5.00	1422																									
CCV22	1.00	1428												X			X										
CCB22	1.00	1433												X			X										
ZZZZZZ	5.00	1439																									
ZZZZZZ	5.00	1445																									
ZZZZZZ	5.00	1450																									
ZZZZZZ	5.00	1456																									
ZZZZZZ	1.00	1502																									
ZZZZZZ	1.00	1507																									
ZZZZZZ	1.00	1513																									

FORM XIV - IN

14

Analysis Run Log

Lab Name: GP ENVIRONMENTAL
Lab Code: GP Case No.:
Instrument ID Number: TRACE
Start Date: 09/25/98

Contract:
SAS No.: SDG No.: TET117
Method: P
End Date: 09/25/98

Sample No.	D/F	Time	% R	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
				Analytes																							
ZZZZZZ	1.00	1519																									
ZZZZZZ	1.00	1524																									
ZZZZZZ	1.00	1530																									
CCV23	1.00	1535												X			X										
CCB23	1.00	1541												X			X										
ZZZZZZ	1.00	1548																									
45I-01	1.00	1554												X			X										
45I-01D	1.00	1600												X			X										
45I-01S	1.00	1605												X			X										
45I-01A	1.00	1611												X			X										
45I-01L	5.00	1616												X			X										
1DD-01	1.00	1622												X			X										
21S-01	1.00	1628												X			X										
23D-01	1.00	1633												X			X										
DP1-01	1.00	1639												X			X										
CCV24	1.00	1645												X			X										
CCB24	1.00	1650												X			X										
ZZZZZZ	1.00	1656																									
ZZZZZZ	1.00	1702																									
ZZZZZZ	1.00	1707																									
ZZZZZZ	1.00	1713																									
ZZZZZZ	1.00	1718																									
ZZZZZZ	1.00	1724																									
CRIF2	1.00	1730												X			X										
ICSAF2	1.00	1735												X			X										
ICSABF2	1.00	1741												X			X										
CCV25	1.00	1747												X			X										
CCB25	1.00	1752												X			X										

13
Preparation Log

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NAS SAS No.: CTO051 SDG No.: NUS151

Method: P

Sample No.	Preparation Date	Weight (g)	Volume (ml)
CEF22I	09/24/98		100
CEF42I	09/24/98		100
CEF42ID	09/24/98		100
CEF42IS	09/24/98		100
LCS456	09/24/98		100
PBW456	09/24/98		100

FORM XIII - IN

ENVIROFORMS/INORGANIC CLP

14

Analysis Run Log

Lab Name: GP ENVIRONMENTAL
Lab Code: GP Case No.: NAS
Instrument ID Number: TRACE
Start Date: 09/24/98

Contract: CECILFIELD
SAS No.: CTO051 SDG No.: NUS151
Method: P
End Date: 09/24/98

Sample No.	D/F	Time	% R	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
				Analytes																							
S0	1.00	1155												X			X										
S1	1.00	1200												X			X										
S2	1.00	1205												X			X										
S3	1.00	1211												X			X										
AGSTD	1.00	1216												X			X										
ICV	1.00	1221												X			X										
ICB	1.00	1226												X			X										
CRII	1.00	1232												X			X										
PQLLCK	1.00	1237												X			X										
ICSAI	1.00	1242												X			X										
ICSABI	1.00	1248												X			X										
CCV1	1.00	1257												X			X										
CCB1	1.00	1302												X			X										
ZZZZZZ	5.00	1307																									
ZZZZZZ	10.00	1313																									
ZZZZZZ	10.00	1319																									
ZZZZZZ	10.00	1324																									
ZZZZZZ	10.00	1330																									
ZZZZZZ	10.00	1336																									
ZZZZZZ	1.00	1341																									
ZZZZZZ	1.00	1347																									
ZZZZZZ	1.00	1352																									
ZZZZZZ	1.00	1358																									
CCV2	1.00	1404												X			X										
CCB2	1.00	1409												X			X										
ZZZZZZ	1.00	1415																									
ZZZZZZ	1.00	1421																									
ZZZZZZ	1.00	1426																									
ZZZZZZ	1.00	1432																									
PBW456	1.00	1438												X			X										
LCS456	1.00	1443												X			X										
ZZZZZZ	1.00	1449																									

FORM XIV - IN

ENVIROFORMS/INORGANIC CLP

14

Analysis Run Log

Lab Name: GP ENVIRONMENTAL
Lab Code: GP Case No.: NAS
Instrument ID Number: TRACE
Start Date: 09/24/98

Contract: CECILFIELD
SAS No.: CTO051 SDG No.: NUS151
Method: P
End Date: 09/24/98

Sample No.	D/F	Time	% R	Analytes																								
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
ZZZZZZ	1.00	1454																									
ZZZZZZ	1.00	1500																									
ZZZZZZ	1.00	1506																									
CCV3	1.00	1511												X			X										
CCB3	1.00	1517												X			X										
ZZZZZZ	1.00	1523																									
ZZZZZZ	1.00	1528																									
ZZZZZZ	1.00	1534																									
ZZZZZZ	1.00	1539																									
ZZZZZZ	1.00	1549																									
ZZZZZZ	2.00	1554																									
ZZZZZZ	2.00	1600																									
ZZZZZZ	2.00	1605																									
CCV4	1.00	1611												X			X										
CCB4	1.00	1617												X			X										
ZZZZZZ	2.00	1627																									
ZZZZZZ	2.00	1633																									
ZZZZZZ	2.00	1638																									
ZZZZZZ	2.00	1644																									
ZZZZZZ	2.00	1649																									
ZZZZZZ	2.00	1655																									
CRIF	1.00	1701												X			X										
ICSAF	1.00	1706												X			X										
ICSABF	1.00	1712												X			X										
CCV5	1.00	1718												X			X										
CCB5	1.00	1723												X			X										

FORM XIV - IN

ENVIROFORMS/INORGANIC CLP

14

Analysis Run Log

Lab Name: GP ENVIRONMENTAL
Lab Code: GP Case No.: NAS
Instrument ID Number: TRACE
Start Date: 09/25/98

Contract: CECILFIELD
SAS No.: CTO051 SDG No.: NUS151
Method: P
End Date: 09/25/98

Sample No.	D/F	Time	% R	Analytes																							
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
S0	1.00	1219												X			X										
S1	1.00	1224												X			X										
S2	1.00	1230												X			X										
S3	1.00	1235												X			X										
AGSTD	1.00	1240												X			X										
ICV2	1.00	1245												X			X										
ICB2	1.00	1251												X			X										
CRII2	1.00	1256												X			X										
PQLLCK	1.00	1301												X			X										
ICSAI2	1.00	1306												X			X										
ICSABI2	1.00	1312												X			X										
CCV21	1.00	1321												X			X										
CCB21	1.00	1326												X			X										
ZZZZZZ	5.00	1332																									
ZZZZZZ	5.00	1337																									
ZZZZZZ	5.00	1343																									
ZZZZZZ	5.00	1348																									
ZZZZZZ	5.00	1354																									
ZZZZZZ	5.00	1400																									
ZZZZZZ	5.00	1405																									
ZZZZZZ	5.00	1411																									
ZZZZZZ	5.00	1417																									
ZZZZZZ	5.00	1422																									
CCV22	1.00	1428												X			X										
CCB22	1.00	1433												X			X										
ZZZZZZ	5.00	1439																									
ZZZZZZ	5.00	1445																									
ZZZZZZ	5.00	1450																									
ZZZZZZ	5.00	1456																									
ZZZZZZ	1.00	1502																									
ZZZZZZ	1.00	1507																									
ZZZZZZ	1.00	1513																									

FORM XIV - IN

ENVIROFORMS/INORGANIC CLP

14

Analysis Run Log

Lab Name: GP ENVIRONMENTAL
Lab Code: GP Case No.: NAS
Instrument ID Number: TRACE
Start Date: 09/25/98

Contract: CECILFIELD
SAS No.: CTO051 SDG No.: NUS151
Method: P
End Date: 09/25/98

Sample No.	D/F	Time	% R	Analytes																								
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
ZZZZZZ	1.00	1519																									
ZZZZZZ	1.00	1524																									
ZZZZZZ	1.00	1530																									
CCV23	1.00	1535												X			X										
CCB23	1.00	1541												X			X										
ZZZZZZ	1.00	1548																									
ZZZZZZ	1.00	1554																									
ZZZZZZ	1.00	1600																									
ZZZZZZ	1.00	1605																									
ZZZZZZ	1.00	1611																									
ZZZZZZ	1.00	1616																									
ZZZZZZ	1.00	1622																									
ZZZZZZ	1.00	1628																									
ZZZZZZ	1.00	1633																									
ZZZZZZ	1.00	1639																									
CCV24	1.00	1645												X			X										
CCB24	1.00	1650												X			X										
CEF42I	1.00	1656												X			X										
CEF42ID	1.00	1702												X			X										
CEF42IS	1.00	1707												X			X										
CEF42IA	1.00	1713																									
CEF42IL	5.00	1718												X			X										
CEF22I	1.00	1724												X			X										
CRIF2	1.00	1730												X			X										
ICSAF2	1.00	1735												X			X										
ICSABF2	1.00	1741												X			X										
CCV25	1.00	1747												X			X										
CCB25	1.00	1752												X			X										

FORM XIV - IN

ENVIROFORMS/INORGANIC CLP

2A
INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NASSD SAS No.: CTO051 SDG No.: NUS154

Initial Calibration Source: #3300

Continuing Calibration Source: #3300

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron	10000.0	9850.00	98.5	10000.0	9820.00	98.2	9760.00	97.6	P
Lead									
Magnesium									
Manganese	500.0	502.00	100.4	500.0	500.00	100.0	498.00	99.6	P
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									
Boron									
Tin									
Molybdenum									

(1) Control Limits : Mercury 80-120; Other Metals 90-110; Cyanide 85-115

FORM II (PART 1) - IN

ENVIROFORMS/INORGANIC CLP

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NASSD SAS No.: CTO051 SDG No.: NUS154

Initial Calibration Source:

Continuing Calibration Source: #3300

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron				10000.0	9830.00	98.3	9760.00	97.6	P
Lead									
Magnesium									
Manganese				500.0	502.00	100.4	499.00	99.8	P
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									
Boron									
Tin									
Molybdenum									

(1) Control Limits : Mercury 80-120; Other Metals 90-110; Cyanide 85-115

FORM II (PART 1) - IN

ENVIROFORMS/INORGANIC CLP

2A

INITIAL AND CONTINUING CALIBRATION VERIFICATION

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NASSD SAS No.: CTO051 SDG No.: NUS154

Initial Calibration Source:

Continuing Calibration Source: #3300

Concentration Units: ug/L

Analyte	Initial Calibration True	Initial Calibration Found	Initial Calibration %R(1)	Continuing Calibration True	Continuing Calibration Found	Continuing Calibration %R(1)	Continuing Calibration Found	Continuing Calibration %R(1)	M
Aluminum									
Antimony									
Arsenic									
Barium									
Beryllium									
Cadmium									
Calcium									
Chromium									
Cobalt									
Copper									
Iron				10000.0	10000.00	100.0	9940.00	99.4	P
Lead									
Magnesium									
Manganese				500.0	509.00	101.8	504.00	100.8	P
Mercury									
Nickel									
Potassium									
Selenium									
Silver									
Sodium									
Thallium									
Vanadium									
Zinc									
Cyanide									
Boron									
Tin									
Molybdenum									

(1) Control Limits : Mercury 80-120; Other Metals 90-110; Cyanide 85-115

ENVIROFORMS/INORGANIC CLP

2B
CRDL STANDARD FOR AA AND ICP

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NASSD SAS No.: CTO051 SDG No.: NUS154

AA CRDL Standard Source:

ICP CRDL Standard Source: #3253

Concentration Units: ug/L

Analyte	CRDL Standard for AA			CRDL Standard for ICP				
	True	Found	%R	True	Initial Found	%R	Found Found	%R
Aluminum								
Antimony								
Arsenic								
Barium								
Beryllium								
Cadmium								
Calcium								
Chromium								
Cobalt								
Copper								
Iron				200.0	181.00	90.5	210.00	105.0
Lead								
Magnesium								
Manganese				30.0	30.50	101.7	31.50	105.0
Mercury								
Nickel								
Potassium								
Selenium								
Silver								
Sodium								
Thallium								
Vanadium								
Zinc								
Boron								
Tin								
Molybdenum								

FORM II (PART 2) - IN

ENVIROFORMS/INORGANIC CLP

3
BLANKS

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NASSD SAS No.: CTO051 SDG No.: NUS154

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron	100.0	U	100.0	U	100.0	U	100.0	U	100.0	U	P
Lead											
Magnesium											
Manganese	5.0	U	5.0	U	5.0	U	5.0	U	11.6	B	P
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											
Boron											
Tin											
Molybdenum											

FORM III - IN

3
BLANKS

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NASSD SAS No.: CTO051 SDG No.: NUS154

Preparation Blank Matrix (soil/water): WATER

Preparation Blank Concentration Units (ug/L or mg/kg): UG/L

Analyte	Initial Calib. Blank (ug/L)	C	Continuing Calibration Blank (ug/L) 1	C	2	C	3	C	Prepa-ration Blank	C	M
Aluminum											
Antimony											
Arsenic											
Barium											
Beryllium											
Cadmium											
Calcium											
Chromium											
Cobalt											
Copper											
Iron			100.0	U	100.0	U	100.0	U			P
Lead											
Magnesium											
Manganese			5.0	U	5.0	U	5.0	U			P
Mercury											
Nickel											
Potassium											
Selenium											
Silver											
Sodium											
Thallium											
Vanadium											
Zinc											
Cyanide											
Boron											
Tin											
Molybdenum											

10
PRACTICAL QUANTITATION LIMITS (ANNUALLY)

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NASSD SAS No.: CTO051 SDG No.: NUS154

ICP ID Number: TRACE Date: 01/23/98

Flame AA ID Number:

Furnace AA ID Number:

Analyte	Wave-length (nm)	Back-ground	CRDL (ug/L)	PQL (ug/L)	M
Aluminum	308.22		200.0	200.0	P
Antimony	206.84		60.0	5.0	P
Arsenic	189.04		10.0	5.0	P
Barium	493.41		200.0	10.0	P
Beryllium	313.04		5.0	3.0	P
Cadmium	226.50		5.0	3.0	P
Calcium	317.93		5000.0	1000.0	P
Chromium	267.72		10.0	5.0	P
Cobalt	228.62		50.0	5.0	P
Copper	324.75		25.0	5.0	P
Iron	271.44		100.0	100.0	P
Lead	220.35		3.0	3.0	P
Magnesium	279.08		5000.0	50.0	P
Manganese	257.61		15.0	5.0	P
Molybdenum	202.03		5.0	5.0	P
Nickel	231.60		40.0	5.0	P
Potassium	766.49		5000.0	50.0	P
Selenium	196.02		5.0	5.0	P
Silver	328.07		10.0	3.0	P
Sodium	330.23		5000.0	500.0	P
Thallium	190.86		10.0	10.0	P
Vanadium	292.40		50.0	5.0	P
Zinc	206.20		20.0	10.0	P
Boron	249.68		50.0	50.0	P
Tin	189.99		40.0	5.0	P

Comments:

ENVIROFORMS/INORGANIC CLP

13
Preparation Log

Lab Name: GP ENVIRONMENTAL Contract: CECILFIELD

Lab Code: GP Case No.: NASSD SAS No.: CTO051 SDG No.: NUS154

Method: P

Sample No.	Preparation Date	Weight (g)	Volume (ml)
CEF27I	10/05/98		100
CEF32S	10/05/98		100
CEF35S	10/05/98		100
CEF38S	10/05/98		100
CEFDP2	10/05/98		100
CEFDP2D	10/05/98		100
CEFDP2S	10/05/98		100
LCS486	10/05/98		100
PBW486	10/05/98		100

FORM XIII - IN

ENVIROFORMS/INORGANIC CLP

14

Analysis Run Log

Lab Name: GP ENVIRONMENTAL
Lab Code: GP Case No.: NASSD
Instrument ID Number: TRACE
Start Date: 10/08/98

Contract: CECILFIELD
SAS No.: CTO051 SDG No.: NUS154
Method: P
End Date: 10/08/98

Sample No.	D/F	Time	% R	Analytes																								
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
S0	1.00	1057																									
S1	1.00	1104												X			X										
S2	1.00	1109												X			X										
S3	1.00	1114																									
AGSTD	1.00	1119												X													
ICV	1.00	1125																									
ICB	1.00	1130												X			X										
CRII	1.00	1135												X			X										
PQLLCK	1.00	1141												X			X										
ICSAI	1.00	1146												X			X										
ICSABI	1.00	1151												X			X										
CCV1	1.00	1200												X			X										
CCB1	1.00	1206												X			X										
PBW486	1.00	1211												X			X										
LCS486	1.00	1217												X			X										
CEF32S	1.00	1222												X			X										
CEF38S	1.00	1228												X			X										
CEF35S	1.00	1234												X			X										
CEF27I	1.00	1239												X			X										
CEFDP2	1.00	1245												X			X										
CEFDP2D	1.00	1250												X			X										
CEFDP2S	1.00	1256												X			X										
CEFDP2A	1.00	1302																									
CCV2	1.00	1307												X			X										
CCB2	1.00	1313												X			X										
CEFDP2L	5.00	1319												X			X										
ZZZZZZ	10.00	1324																									
ZZZZZZ	10.00	1330																									
ZZZZZZ	10.00	1335																									
ZZZZZZ	10.00	1341																									
ZZZZZZ	10.00	1347																									
ZZZZZZ	10.00	1352																									

FORM XIV - IN

ENVIROFORMS/INORGANIC CLP

14

Analysis Run Log

Lab Name: GP ENVIRONMENTAL
Lab Code: GP Case No.: NASSD
Instrument ID Number: TRACE
Start Date: 10/08/98

Contract: CECILFIELD
SAS No.: CTO051 SDG No.: NUS154
Method: P
End Date: 10/08/98

Sample No.	D/F	Time	% R	Analytes																								
				AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
ZZZZZZ	10.00	1358																									
ZZZZZZ	10.00	1404																									
ZZZZZZ	10.00	1409																									
CCV3	1.00	1415												X			X										
CCB3	1.00	1420												X			X										
ZZZZZZ	10.00	1426																									
ZZZZZZ	10.00	1432																									
ZZZZZZ	10.00	1437																									
ZZZZZZ	1.00	1443																									
ZZZZZZ	1.00	1449																									
ZZZZZZ	1.00	1454																									
ZZZZZZ	1.00	1500																									
ZZZZZZ	1.00	1506																									
ZZZZZZ	1.00	1511																									
ZZZZZZ	1.00	1517																									
CCV4	1.00	1522												X			X										
CCB4	1.00	1534												X			X										
ZZZZZZ	1.00	1540																									
ZZZZZZ	1.00	1546																									
ZZZZZZ	1.00	1551																									
ZZZZZZ	1.00	1557																									
ZZZZZZ	2.00	1603																									
ZZZZZZ	2.00	1608																									
ZZZZZZ	2.00	1614																									
ZZZZZZ	2.00	1619																									
ZZZZZZ	2.00	1625																									
ZZZZZZ	2.00	1631																									
CCV5	1.00	1636												X			X										
CCB5	1.00	1642												X			X										
ZZZZZZ	2.00	1657																									
ZZZZZZ	2.00	1703																									
CRIF	1.00	1708												X			X										

FORM XIV - IN

ENVIROFORMS/INORGANIC CLP

14

Analysis Run Log

Lab Name: GP ENVIRONMENTAL
Lab Code: GP Case No.: NASSD
Instrument ID Number: TRACE
Start Date: 10/08/98

Contract: CECILFIELD
SAS No.: CTO051 SDG No.: NUS154
Method: P
End Date: 10/08/98

Sample No.	D/F	Time	% R	AL	SB	AS	BA	BE	CD	CA	CR	CO	CU	FE	PB	MG	MN	HG	NI	K	SE	AG	NA	TL	V	ZN	CN
				Analytes																							
ICSAF	1.00	1714												X			X										
ICSABF	1.00	1719												X			X										
CCV6	1.00	1725												X			X										
CCB6	1.00	1732												X			X										

FORM XIV - IN

Tetra Tech NUS

INTERNAL CORRESPONDENCE

TO: **MR. MARK SPERANZA** **DATE:** **OCTOBER 28, 1998**

FROM: **LINDA KARSONOVICH** **COPIES:** **DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – CHLORIANTED VOCS/BEHP/DISSOLVED GASES**
CTO 051, CECIL FIELD
SDGs 9809010, 9809102, 9809110, 9809117, 9809129, 9809149

SAMPLES: 20/Aqueous/

9809010	CEF-16-IW01-01 TB083198	CEF-16-IW02-01
9809102	CEF-16-41S-01	
9809110	CEF-16-09D-01 CEF-16-43S-01	CEF-16-10S-01 CEF-16-44I-01
9809117	CEF-16-11DD-01 CEF-16-23D-01 CEF-16-DP1-01	CEF-16-21S-01 CEF-16-45I-01
9809129	CEF-16-22I-01	CEF-16-42I-01
9809149	CEF-16-27I-01 CEF-16-32S-01 CEF-16-38S-01	CEF-16-DP2-01 CEF-16-35S-01

OVERVIEW

The reviewer elected to review the SDGs as one set to avoid duplication of effort as the samples were analyzed within the same time frame. This review of CTO 051 Cecil Fields consists of one (1) aqueous field quality control blank and nineteen (19) aqueous environmental samples. All samples were analyzed for chlorinated volatile organic compounds. All SDGs except 9809010 were also analyzed for bis(2-ethylhexyl)phthalate (BEHP) and dissolved gases. Two pairs of field duplicates are included in this report: CEF-16-45I-01 and CEF-16-DP1-01; and CEF-16-27I-01 and CEF-16-DP2-01.

The samples were collected by TetraTech NUS on August 31st, and September 14-17th, and 22nd, 1998 and analyzed by GP Environmental Services. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8260B, 8270C, and RSK Methods 147 and 145 analytical and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- Holding times
- Laboratory method and field quality control blank results
- Initial and continuing calibration
- Surrogate recovery

Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified Analytical results are presented in Appendix A.

TO:	**MR. MARK SPERANZA**	**DATE:**	**OCTOBER 28, 1998**
FROM:	**LINDA KARSONOVICH**	**COPIES:**	**DV FILE**

SUBJECT: **ORGANIC DATA VALIDATION – CHLORIANTED VOCS/BEHP/DISSOLVED GASES**
CTO 051, CECIL FIELD
SDGs 9809010, 9809102, 9809110, 9809117, 9809129, 9809149

SAMPLES: 20/Aqueous/

9809010	CEF-16-IW01-01 TB083198	CEF-16-IW02-01
9809102	CEF-16-41S-01	
9809110	CEF-16-09D-01 CEF-16-43S-01	CEF-16-10S-01 CEF-16-44I-01
9809117	CEF-16-11DD-01 CEF-16-23D-01 CEF-16-DP1-01	CEF-16-21S-01 CEF-16-45I-01
9809129	CEF-16-22I-01	CEF-16-42I-01
9809149	CEF-16-27I-01 CEF-16-32S-01 CEF-16-38S-01	CEF-16-DP2-01 CEF-16-35S-01

OVERVIEW

The reviewer elected to review the SDGs as one set to avoid duplication of effort as the samples were analyzed within the same time frame. This review of CTO 051 Cecil Fields consists of one (1) aqueous field quality control blank and nineteen (19) aqueous environmental samples. All samples were analyzed for chlorinated volatile organic compounds. All SDGs except 9809010 were also analyzed for bis(2-ethylhexyl)phthalate (BEHP) and dissolved gases. Two pairs of field duplicates are included in this report: CEF-16-45I-01 and CEF-16-DP1-01; and CEF-16-27I-01 and CEF-16-DP2-01.

The samples were collected by TetraTech NUS on August 31st, and September 14-17th, and 22nd, 1998 and analyzed by GP Environmental Services. All analyses were conducted in accordance with Naval Facilities Engineering Service Center (NFESC) Quality Assurance/Quality Control (QA/QC) criteria using SW-846 Methods 8260B, 8270C, and RSK Methods 147 and 145 analytical and reporting protocols. The data contained in this SDG were validated with regard to the following parameters:

- Holding times
- Laboratory method and field quality control blank results
- Initial and continuing calibration
- Surrogate recovery

Problems affecting data quality are discussed below; documentation supporting these findings is presented in Appendix C. Qualified Analytical results are presented in Appendix A.

Volatile

The laboratory analyzed all samples within in the required holding time. However, subsequent dilutions required due to exceedance of the instrument's linear calibration range were analyzed as much as 28 days after sample collection. Samples CEF-16-IW01-01, -IW02-01, -41S-01, -10S-01, and 32S-01 were affected by this noncompliance.

Initial calibration percent relative standard deviations (%RSDs) exceeded the 30% quality control limit for chloroethane, carbon tetrachloride, trichloroethene, and methylene chloride. Positive and nondetected results were qualified as estimated, J and UJ.

Continuing calibration percent differences (%Ds) exceeded the 25% quality control limit for chloromethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,3-dichloropropene, 1,1,2-trichloroethane, and tetrachloroethene. Nondetected results were qualified as estimated, UJ, in the associated samples.

Continuing calibration %Ds exceeded the 25% quality control limit for chloromethane, cis-1,3-dichloropropene, trans-1,3-dichloropropene, and 1,1,2-trichloroethane. Nondetected results were qualified as estimated, UJ, in the associated samples.

The following table summarizes the maximum concentration of volatile compounds detected in the method quality control blanks in this report.

Compound	Maximum Concentration	Action Level
Methylene chloride	1.0 µg/L	10 µg/L
Chloroform	0.6 µg/L	3.0 µg/L
Trichloroethene	0.2 µg/L	1.0 µg/L

Dilution factors and sample aliquot were taken into consideration when applying blank action levels. Positive results for methylene chloride, chloroform, and trichloroethene below the blank action level were qualified as nondetected, U.

Surrogate recovery fell below the lower quality control limit for one or more surrogates in samples TB083198 and CEF-16-IW02-01. Positive and nondetected results were qualified as estimated, J and UJ.

Surrogate recovery exceeded the upper quality control limit for one or more surrogates in samples CEF-16-IW01-01 DL, -10S-01, –09D-01, -09D-01 MS, and –09D-01 MSD. Positive results were qualified as estimated, J. Samples –09D-01, 09D-01 MS, and –09D-01 MSD did not require qualification on this basis.

Internal standard recovery fell below the lower quality control limit in samples CEF-16-09D-01 MS and MSD. No validation action was required as these were quality control samples.

Samples CEF-16-IW01-01, -IW02-01, -41S-01, and –32S-01 required 250X, 500X, 50X, and 10X dilutions, respectively, due to the presence of trichloroethene above the instrument's linear calibration range. Results from the dilutions were transposed over the original sample result for this compound only and used for validation purposes.

Sample CEF-16-10S-01 required as 50X dilution due to the presence of vinyl chloride, 1,1-dichlroethene, 1,1-dichloroethane, cis-1,2-dichloroethene, and 1,1,1-trichloroethane above the instrument's linear calibration range. Results from the dilution for these compounds only were transposed over the undiluted sample results and used for validation purposes.

Samples CEF-16-45I-01 and –DP1-01 were analyzed and reported at a 500X dilution due to the presence of target compounds at high levels. This accounts for the elevated reporting limits for these samples. The samples required a further 10,000X dilution due to the presence of trichloroethene above the instrument's linear calibration range. Results from the second dilution were transposed over the original analysis and used for validation purposes.

Semivolatile

The following table summarizes the maximum concentration of the semivolatile compound detected in the laboratory method quality control blanks in this report.

Compound	Maximum Concentration	Action Level
Bis(2-ethylhexyl)phthalate	1.0 µg/L	10 µg/L

Dilution factors and sample aliquot were taken into consideration when applying blank action levels. Positive results for bis(2-ethylhexyl)phthalate below the blank action level were qualified as nondetected, U. Only SDG 9809149 was affected by this noncompliance.

Dissolved Gases

The initial calibration %RSD exceeded 15% for methane. Positive results were qualified as estimated, J.

Continuing calibration %Ds exceeded 15% for methane. Positive results were qualified as estimated, J.

The following table summarizes the maximum concentration of the volatile compound detected in the laboratory method quality control blanks in this report.

Compound	Maximum Concentration	Action Level
Methane	2.2 µg/L	11 µg/L

Dilution factors and sample aliquot were taken into consideration when applying blank action levels. Positive results for methane below the blank action level were qualified as nondetected, U.

Several samples required dilutions for Methane ranging from 2X to 100X. Results from the dilutions were transposed over the original sample results and used for validation purposes.

Additional Comments

Numerous transcription errors were found between the Form 1s and the electronic data. Corrections to the electronic data were made by the reviewer. In some cases, results reported on the Form 1 were rounded when transferred to the electronic data. The reviewer elected to report the rounded results.

Volatile samples were analyzed for chlorinated compounds only. Semivolatile samples were analyzed for bis(2-ethylhexyl)phthalate only. All required reporting limits were achieved.

EXECUTIVE SUMMARY

Laboratory Performance Issues: Several compounds failed the %RSD and %D criteria in the volatile and dissolved gases fraction. Surrogate recovery was outside the quality control limits in the volatile fraction. Several compounds were reported in the laboratory method blanks. Holding times were exceeded for dilutions in the volatiles fraction.

Other Factors Affecting Data Quality: None.

The data for these analyses were reviewed with reference to the EPA Functional Guidelines for Organic Data Validation (2/94), and the NFESC guidelines "Navy Installation Restoration Program Laboratory Quality Assurance Guide" (February, 1996). The text of this report has been formulated to address only those problem areas affecting data quality.

"I attest that the data referenced herein were validated according to the agreed upon validation criteria as specified in the NFESC guidelines and the Quality Assurance Project Plan (QAPP)."

TetraTech NUS

Linda Karsonovich
Chemist/Data Validator

TetraTech NUS

Joseph A. Samchuck
Data Validation Quality Assurance Officer

Attachments:

1. Appendix A - Qualified Analytical Results
2. Appendix B - Results as Reported by the Laboratory
3. Appendix C - Support Documentation

CECIL FIELD

TABLE 1 - RECOMMENDATION SUMMARY

Sample No.	VOA		SVOA	D. GASES	
9809010					
CEF-16-IW01-01	A[1]	J[1, 4, 7, 8, 9]			
CEF-16-IW02-01	A[1]	J[1, 4, 6, 8, 9]			
TB083198	A[1]	J[1, 4, 6]			
9809102					
CEF-16-41S-01	A[1, 2]	J[3, 8, 9]			J[10, 11]
9809110					
CEF-16-09D-01					J[10, 11]
CEF-16-10S-01		J[7, 8, 9]			J[10]
CEF-16-43S-01	A[3]				J[10, 11]
CEF-16-44I-01					J[10, 11]
9809117					
CEF-16-11DD-01	A[1]	J[5]			J[10]
CEF-16-21S-01	A[1]	J[5, 9]		A[5]	
CEF-16-23D-01	A[1]	J[5]			J[10]
CEF-16-45I-01	A[1, 2]	J[5, 9]		A[5]	
CEF-16-DP1-01	A[1, 2]	J[5, 9]		A[5]	
9809129					
CEF-16-22I-01	A[1]	J[5]			J[10, 11]
CEF-16-42I-01	A[1]	J[5]		A[5]	
9809149					
CEF-16-27I-01	A[1]	J[2, 9]			J[10, 11]
CEF-16-DP2-01	A[1]	J[2, 9]	A[4]		J[10, 11]
CEF-16-32S-01	A[1]	J[2, 8, 9]	A[4]	A[5]	
CEF-16-35S-01	A[1]	J[2]	A[4]		J[10, 11]
CEF-16-38S-01	A[1]	J[2]	A[4]		J[10, 11]

If the field is left blank, the qualifier is A - Accept all data.

A[1] - Accept data, but qualify as nondetected, U, positive results for methylene chloride below the blank action level.

A[2] - Accept data, but qualify as nondetected, U, positive results for chloroform below the blank action level.

A[3] - Accept data, but qualify as nondetected, U, positive results for trichloroethene below the blank action level.

A[4] - Accept data, but qualify as nondetected, U, positive results for bis(2-ethylhexyl)phthalate below the blank action level.

A[5] - Accept data, but qualify as nondetected, U, positive results for methane below the blank action level.

J[1] - Accept data, but qualify nondetected results for chloroethane as estimated, UJ, due to initial calibration %RSD above the 30% quality control limit.

J[2] - Accept data, but qualify positive and nondetected results for carbon tetrachloride and trichloroethene as estimated, J and UJ, due to initial calibration %RSDs above the 30% quality control limit.

J[3] - Accept data, but qualify positive results for trichloroethene as estimated, J, due to initial calibration %RSD above the 30% quality control limit.

J[4] - Accept data, but qualify nondetected results for chloromethane, 1,1-dichloroethene, cis-1,2-dichloroethene, trans-1,3-dichloropropene, 1,1,2-trichloroethane, and tetrachloroethene as estimated, UJ, due to continuing calibration %Ds above the 25% quality control limit.

J[5] - Accept data, but qualify nondetected results for chloromethane, cis-1,3-dichloropropene, trans-1,3-dichloropropene, and 1,1,2-trichloroethane as estimated, UJ, due to continuing calibration %Ds above the 25% quality control limit.

J[6] - Accept data, but qualify positive and nondetected results as estimated, J and UJ, due to surrogate recovery below the quality control limit.

J[7] - Accept data, but qualify positive results as estimated, J, due to surrogate recovery above the quality control limit.

J[8] - Accept data, but qualify positive results as estimated, J, due to holding time noncompliance.

J[9] - Accept data, but qualify positive results below the CRQL as estimated, J, due to uncertainty near the detection limit.

J[10] - Accept data, but qualify positive results for methane as estimated, J, due to initial calibration %RSD above the 30% quality control limit.

J[11] - Accept data, but qualify positive results for methane as estimated, J, due to continuing calibration %Ds above the 15% quality control limit.

FIELD DUPLICATES

Parameter (µg/L)	Compound	CEF-16-45I-01	CEF-16-DP1-01	%D
Volatile	1,1,1-trichloroethane	1600 J	1600 J	0%
	1,1-dichloroethane	1500 J	1700 J	
	1,1-dichloroethene	810 J	1000 J	
	cis-1,2-dichloroethene	780 J	290 J	
	trichloroethene	220,000	410,000	
Semivolatile		ND	ND	
Dissolved Gases		ND	ND	

Parameter (µg/L)	Compound	CEF-16-27I-01	CEF-16-DP2-01	%D
Volatile	cis-1,2-dichloroethene	0.6 J	0.5 J	
	trichloroethene	33.3	32.8	
Semivolatile	bis(2-ethylhexyl)phthalate	11	6 U	NC
Dissolved Gases	Methane	14 J	13.7 J	

ND – Not Detected
NC – Not Calculated

APPENDIX A

QUALIFIED ANALYTICAL RESULTS

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809129

SAMPLE NUMBER:	CEF-16-22I-01	CEF-16-42I-01	/ /	/ /
SAMPLE DATE:	09/17/98	09/17/98		
LABORATORY ID:	9809129 - 02	9809129 - 01		
QC_TYPE:	NORMAL	NORMAL		
% SOLIDS:	0.0 %	0.0 %	100.0 %	100.0 %
UNITS:	UG/L	UG/L		
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
1,1,1-TRICHLOROETHANE	5	U		5	U							
1,1,2,2-TETRACHLOROETHANE	0.2	U		0.2	U							
1,1,2-TRICHLOROETHANE	5	UJ	C	5	UJ	C						
1,1-DICHLOROETHANE	5	U		5	U							
1,1-DICHLOROETHENE	5	U		5	U							
1,2-DICHLOROETHANE	3	U		3	U							
1,2-DICHLOROPROPANE	5	U		5	U							
CARBON TETRACHLORIDE	3	U		3	U							
CHLOROBENZENE	5	U		5	U							
CHLOROETHANE	5	U		5	U							
CHLOROFORM	5	U		5	U							
CHLOROMETHANE	2	UJ	C	2	UJ	C						
CIS-1,2-DICHLOROETHENE	5	U		5	U							
CIS-1,3-DICHLOROPROPENE	0.2	UJ	C	0.2	UJ	C						
METHYLENE CHLORIDE	5	U	A	5	U	A						
TETRACHLOROETHENE	3	U		3	U							
TRANS-1,2-DICHLOROETHENE	5	U		5	U							
TRANS-1,3-DICHLOROPROPENE	0.2	UJ	C	0.2	UJ	C						
TRICHLOROETHENE	6.4			4.7								
VINYL CHLORIDE	1	U		1	U							

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809129

SAMPLE NUMBER:	CEF-16-22I-01	CEF-16-42I-01		
SAMPLE DATE:	09/17/98	09/17/98	/ /	/ /
LABORATORY ID:	9809129 - 02	9809129 - 01		
QC_TYPE:	NORMAL	NORMAL		
% SOLIDS:	0.0 %	0.0 %	100.0 %	100.0 %
UNITS:	UG/L	UG/L		
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ETHANE	5.8	U		5.8	U							
ETHENE	6.2	U		6.2	U							
METHANE	14.7	J	C	2.5	U	A						

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809129

SAMPLE NUMBER:	CEF-16-22I-01	CEF-16-42I-01		
SAMPLE DATE:	09/17/98	09/17/98	/ /	/ /
LABORATORY ID:	9809129 - 02	9809129 - 01		
QC_TYPE:	NORMAL	NORMAL		
% SOLIDS:	0.0 %	0.0 %	100.0 %	100.0 %
UNITS:	UG/L	UG/L		
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
BIS(2-ETHYLHEXYL)PHTHALATE	1	J	P	3	J	P						

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809149

SAMPLE NUMBER:	CEF-16-27I-01	CEF-16-DP2-01	CEF-16-32S-01	CEF-16-35S-01
SAMPLE DATE:	09/22/98	09/22/98	09/22/98	09/22/98
LABORATORY ID:	9809149 - 04	9809149 - 05	9809149 - 01	9809149 - 03
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	UG/L	UG/L	UG/L	UG/L
FIELD DUPLICATE OF:		CEF-16-27I-01		

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
1,1,1-TRICHLOROETHANE	5	U		5	U		5	U		5	U	
1,1,2,2-TETRACHLOROETHANE	0.2	U		0.2	U		0.2	U		0.2	U	
1,1,2-TRICHLOROETHANE	5	U		5	U		5	U		5	U	
1,1-DICHLOROETHANE	5	U		5	U		5	U		5	U	
1,1-DICHLOROETHENE	5	U		5	U		0.3	J	P	5	U	
1,2-DICHLOROETHANE	3	U		3	U		3	U		3	U	
1,2-DICHLOROPROPANE	5	U		5	U		5	U		5	U	
CARBON TETRACHLORIDE	3	U		3	U		3	U		3	U	
CHLOROBENZENE	5	U		5	U		5	U		5	U	
CHLOROETHANE	5	U		5	U		5	U		5	U	
CHLOROFORM	5	U		5	U		5	U		5	U	
CHLOROMETHANE	2	U		2	U		2	U		2	U	
CIS-1,2-DICHLOROETHENE	0.6	J	P	0.5	J	P	0.9	J	P	5	U	
CIS-1,3-DICHLOROPROPENE	0.2	U		0.2	U		0.2	U		0.2	U	
METHYLENE CHLORIDE	5	U	A	5	U	A	5	U	A	5	U	A
TETRACHLOROETHENE	3	U		3	U		0.3	J	P	3	U	
TRANS-1,2-DICHLOROETHENE	5	U		5	U		5	U		5	U	
TRANS-1,3-DICHLOROPROPENE	0.2	U		0.2	U		0.2	U		0.2	U	
TRICHLOROETHENE	33.3			32.8			126	J	H	3	U	
VINYL CHLORIDE	1	U		1	U		1	U		1	U	

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809149

SAMPLE NUMBER:	CEF-16-38S-01			
SAMPLE DATE:	09/22/98	/ /	/ /	/ /
LABORATORY ID:	9809149 - 02			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	UG/L			
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
1,1,1-TRICHLOROETHANE	5	U										
1,1,2,2-TETRACHLOROETHANE	0.2	U										
1,1,2-TRICHLOROETHANE	5	U										
1,1-DICHLOROETHANE	5	U										
1,1-DICHLOROETHENE	5	U										
1,2-DICHLOROETHANE	3	U										
1,2-DICHLOROPROPANE	5	U										
CARBON TETRACHLORIDE	3	U										
CHLOROBENZENE	5	U										
CHLOROETHANE	5	U										
CHLOROFORM	5	U										
CHLOROMETHANE	2	U										
CIS-1,2-DICHLOROETHENE	5	U										
CIS-1,3-DICHLOROPROPENE	0.2	U										
METHYLENE CHLORIDE	5	U	A									
TETRACHLOROETHENE	3	U										
TRANS-1,2-DICHLOROETHENE	5	U										
TRANS-1,3-DICHLOROPROPENE	0.2	U										
TRICHLOROETHENE	3	U										
VINYL CHLORIDE	1	U										

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809149

SAMPLE NUMBER:	CEF-16-27I-01			CEF-16-DP2-01			CEF-16-32S-01			CEF-16-35S-01		
SAMPLE DATE:	09/22/98			09/22/98			09/22/98			09/22/98		
LABORATORY ID:	9809149 - 04			9809149 - 05			9809149 - 01			9809149 - 03		
QC_TYPE:	NORMAL			NORMAL			NORMAL			NORMAL		
% SOLIDS:	0.0 %			0.0 %			0.0 %			0.0 %		
UNITS:	UG/L			UG/L			UG/L			UG/L		
FIELD DUPLICATE OF:				CEF-16-27I-01								
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
BIS(2-ETHYLHEXYL)PHTHALATE	11			6	U	A	6	U	A	6	U	A

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809149

SAMPLE NUMBER:	CEF-16-38S-01			
SAMPLE DATE:	09/22/98	/ /	/ /	/ /
LABORATORY ID:	9809149 - 02			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	UG/L			
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
BIS(2-ETHYLHEXYL)PHTHALATE	6	U	A									

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809149

SAMPLE NUMBER:	CEF-16-27I-01	CEF-16-DP2-01	CEF-16-32S-01	CEF-16-35S-01
SAMPLE DATE:	09/22/98	09/22/98	09/22/98	09/22/98
LABORATORY ID:	9809149 - 04	9809149 - 05	9809149 - 01	9809149 - 03
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	UG/L	UG/L	UG/L	UG/L
FIELD DUPLICATE OF:		CEF-16-27I-01		

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ETHANE	5.8	U		5.8	U		5.8	U		5.8	U	
ETHENE	6.2	U		6.2	U		6.2	U		6.2	U	
METHANE	14	J	C	13.7	J	C	5.7	U	A	46.9	J	C

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809149

SAMPLE NUMBER:	CEF-16-38S-01			
SAMPLE DATE:	09/22/98	/ /	/ /	/ /
LABORATORY ID:	9809149 - 02			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	UG/L			
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ETHANE	5.8	U										
ETHENE	6.2	U										
METHANE	22.5	J	C									

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809117

SAMPLE NUMBER:	CEF-16-11DD-01	CEF-16-21S-01	CEF-16-23D-01	CEF-16-45I-01
SAMPLE DATE:	09/16/98	09/16/98	09/16/98	09/16/98
LABORATORY ID:	9809117 - 02	9809117 - 03	9809117 - 04	9809117 - 01
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	UG/L	UG/L	UG/L	UG/L
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
1,1,1-TRICHLOROETHANE	5	U		5	U		5	U		1600	J	P
1,1,2,2-TETRACHLOROETHANE	0.2	U		0.2	U		0.2	U		100	U	
1,1,2-TRICHLOROETHANE	5	UJ	C	5	UJ	C	5	UJ	C	2500	UJ	C
1,1-DICHLOROETHANE	5	U		5	U		5	U		1500	J	P
1,1-DICHLOROETHENE	5	U		5	U		5	U		810	J	P
1,2-DICHLOROETHANE	3	U		3	U		3	U		1500	U	
1,2-DICHLOROPROPANE	5	U		5	U		5	U		2500	U	
CARBON TETRACHLORIDE	3	U		3	U		3	U		1500	U	
CHLOROBENZENE	5	U		5	U		5	U		2500	U	
CHLOROETHANE	5	U		5	U		5	U		2500	U	
CHLOROFORM	5	U		5	U		5	U		2500	U	A
CHLOROMETHANE	2	UJ	C	2	UJ	C	2	UJ	C	1000	UJ	C
CIS-1,2-DICHLOROETHENE	5	U		5	U		5	U		780	J	P
CIS-1,3-DICHLOROPROPENE	0.2	UJ	C	0.2	UJ	C	0.2	UJ	C	100	UJ	C
METHYLENE CHLORIDE	5	U	A	5	U	A	5	U	A	2500	U	A
TETRACHLOROETHENE	3	U		3	U		3	U		1500	U	
TRANS-1,2-DICHLOROETHENE	5	U		5	U		5	U		2500	U	
TRANS-1,3-DICHLOROPROPENE	0.2	UJ	C	0.2	UJ	C	0.2	UJ	C	100	UJ	C
TRICHLOROETHENE	5			2.9	J	P	5.6			220000		
VINYL CHLORIDE	1	U		1	U		1	U		500	U	

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809117

SAMPLE NUMBER:	CEF-16-DP1-01			
SAMPLE DATE:	09/16/98	/ /	/ /	/ /
LABORATORY ID:	9809117 - 05			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	UG/L			
FIELD DUPLICATE OF:	CEF-16-45I-01			

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
1,1,1-TRICHLOROETHANE	1600	J	P									
1,1,2,2-TETRACHLOROETHANE	100	U										
1,1,2-TRICHLOROETHANE	2500	UJ	C									
1,1-DICHLOROETHANE	1700	J	P									
1,1-DICHLOROETHENE	1000	J	P									
1,2-DICHLOROETHANE	1500	U										
1,2-DICHLOROPROPANE	2500	U										
CARBON TETRACHLORIDE	1500	U										
CHLOROBENZENE	2500	U										
CHLOROETHANE	2500	U										
CHLOROFORM	2500	U	A									
CHLOROMETHANE	1000	UJ	C									
CIS-1,2-DICHLOROETHENE	290	J	P									
CIS-1,3-DICHLOROPROPENE	100	UJ	C									
METHYLENE CHLORIDE	2500	U	A									
TETRACHLOROETHENE	1500	U										
TRANS-1,2-DICHLOROETHENE	2500	U										
TRANS-1,3-DICHLOROPROPENE	100	UJ	C									
TRICHLOROETHENE	410000											
VINYL CHLORIDE	500	U										

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809117

SAMPLE NUMBER:	CEF-16-11DD-01	CEF-16-21S-01	CEF-16-23D-01	CEF-16-45I-01
SAMPLE DATE:	09/16/98	09/16/98	09/16/98	09/16/98
LABORATORY ID:	9809117 - 02	9809117 - 03	9809117 - 04	9809117 - 01
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	UG/L	UG/L	UG/L	UG/L
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ETHANE	5.8	U		5.8	U		5.8	U		5.8	U	
ETHENE	6.2	U		6.2	U		6.2	U		6.2	U	
METHANE	141	J	C	3.4	U	A	44.5	J	C	2.5	U	A

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809117

SAMPLE NUMBER:	CEF-16-DP1-01			
SAMPLE DATE:	09/16/98	/ /	/ /	/ /
LABORATORY ID:	9809117 - 05			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	UG/L			
FIELD DUPLICATE OF:	CEF-16-45I-01			

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
INORGANICS												
ETHANE	5.8	U										
ETHENE	6.2	U										
METHANE	2.5	U	A									

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809117

SAMPLE NUMBER:	CEF-16-11DD-01	CEF-16-21S-01	CEF-16-23D-01	CEF-16-45I-01
SAMPLE DATE:	09/16/98	09/16/98	09/16/98	09/16/98
LABORATORY ID:	9809117 - 02	9809117 - 03	9809117 - 04	9809117 - 01
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	UG/L	UG/L	UG/L	UG/L
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
BIS(2-ETHYLHEXYL)PHTHALATE	1	J	P	2	J	P	2	J	P	2	J	P

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809117

SAMPLE NUMBER:	CEF-16-DP1-01			
SAMPLE DATE:	09/16/98	/ /	/ /	/ /
LABORATORY ID:	9809117 - 05			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	UG/L			
FIELD DUPLICATE OF:	CEF-16-45I-01			

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
BIS(2-ETHYLHEXYL)PHTHALATE	1	J	P									

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809102

SAMPLE NUMBER:	CEF-16-41S-01			
SAMPLE DATE:	09/14/98	/ /	/ /	/ /
LABORATORY ID:	9809102 - 01			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	ug/L			
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
1,1,1-TRICHLOROETHANE	1	J	P									
1,1,2,2-TETRACHLOROETHANE	0.2	U										
1,1,2-TRICHLOROETHANE	5	U										
1,1-DICHLOROETHANE	1.7	J	P									
1,1-DICHLOROETHENE	2.4	J	P									
1,2-DICHLOROETHANE	3	U										
1,2-DICHLOROPROPANE	5	U										
CARBON TETRACHLORIDE	3	U										
CHLOROBENZENE	5	U										
CHLOROETHANE	5	U										
CHLOROFORM	5	U	A									
CHLOROMETHANE	2	U										
CIS-1,2-DICHLOROETHENE	13.7											
CIS-1,3-DICHLOROPROPENE	0.2	U										
METHYLENE CHLORIDE	5	U	A									
TETRACHLOROETHENE	0.2	J	P									
TRANS-1,2-DICHLOROETHENE	5	U										
TRANS-1,3-DICHLOROPROPENE	0.2	U										
TRICHLOROETHENE	228	J	H									
VINYL CHLORIDE	1	U										

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809102

SAMPLE NUMBER:	CEF-16-41S-01			
SAMPLE DATE:	09/14/98	/ /	/ /	/ /
LABORATORY ID:	9809102 - 01			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	mg/L			
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
ETHANE	5.8	U										
ETHENE	6.2	U										
SEMIVOLATILES												
METHANE	19.6	J	C									

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809102

SAMPLE NUMBER:	CEF-16-41S-01			
SAMPLE DATE:	09/14/98	/ /	/ /	/ /
LABORATORY ID:	9809102 - 01			
QC_TYPE:	NORMAL			
% SOLIDS:	0.0 %	100.0 %	100.0 %	100.0 %
UNITS:	ug/L			
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
BIS(2-ETHYLHEXYL)PHTHALATE	7	U										

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809110

SAMPLE NUMBER:	CEF-16-09D-01	CEF-16-10S-01	CEF-16-43S-01	CEF-16-44I-01
SAMPLE DATE:	09/15/98	09/15/98	09/15/98	09/15/98
LABORATORY ID:	9809110 - 04	9809110 - 03	9809110 - 01	9809110 - 02
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	ug/L	ug/L	ug/L	ug/L
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
1,1,1-TRICHLOROETHANE	5	U		1300	J	H	5	U		5	U	
1,1,2,2-TETRACHLOROETHANE	0.2	U		0.2	U		0.2	U		0.2	U	
1,1,2-TRICHLOROETHANE	5	U		5	U		5	U		5	U	
1,1-DICHLOROETHANE	5	U		220	J	HP	5	U		5	U	
1,1-DICHLOROETHENE	5	U		231	J	HP	5	U		5	U	
1,2-DICHLOROETHANE	3	U		3	U		3	U		3	U	
1,2-DICHLOROPROPANE	5	U		5	U		5	U		5	U	
CARBON TETRACHLORIDE	3	U		3	U		3	U		3	U	
CHLOROBENZENE	5	U		5	U		5	U		5	U	
CHLOROETHANE	5	U		5	U		5	U		5	U	
CHLOROFORM	5	U		5	U		5	U		5	U	
CHLOROMETHANE	2	U		2	U		2	U		2	U	
CIS-1,2-DICHLOROETHENE	5	U		60	J	HP	5	U		5	U	
CIS-1,3-DICHLOROPROPENE	0.2	U		0.2	U		0.2	U		0.2	U	
METHYLENE CHLORIDE	5	U		5	U		5	U		5	U	
TETRACHLOROETHENE	3	U		3	U		3	U		3	U	
TRANS-1,2-DICHLOROETHENE	5	U		5	U		5	U		5	U	
TRANS-1,3-DICHLOROPROPENE	0.2	U		0.2	U		0.2	U		0.2	U	
TRICHLOROETHENE	3	U		45.9	J	R	3	U	A	3	U	
VINYL CHLORIDE	1	U		32	J	HP	1	U		1	U	

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809110

SAMPLE NUMBER:	CEF-16-09D-01	CEF-16-10S-01	CEF-16-43S-01	CEF-16-44I-01
SAMPLE DATE:	09/15/98	09/15/98	09/15/98	09/15/98
LABORATORY ID:	9809110 - 04	9809110 - 03	9809110 - 01	9809110 - 02
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	ug/L	ug/L	ug/L	ug/L
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
ETHANE	5.8	U		47.7			5.8	U		5.8	U	
ETHENE	6.2	U		142			6.2	U		6.2	U	
SEMIVOLATILES												
METHANE	47.2	J	C	2590	J	C	31.5	J	C	54.9	J	C

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809110

SAMPLE NUMBER:	CEF-16-09D-01	CEF-16-10S-01	CEF-16-43S-01	CEF-16-44I-01
SAMPLE DATE:	09/15/98	09/15/98	09/15/98	09/15/98
LABORATORY ID:	9809110 - 04	9809110 - 03	9809110 - 01	9809110 - 02
QC_TYPE:	NORMAL	NORMAL	NORMAL	NORMAL
% SOLIDS:	0.0 %	0.0 %	0.0 %	0.0 %
UNITS:	ug/L	ug/L	ug/L	ug/L
FIELD DUPLICATE OF:				

	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
SEMIVOLATILES												
BIS(2-ETHYLHEXYL)PHTHALATE	1	J	P	1	J	P	1	J	P	1	J	P

CTO051 - NAS CECIL FIELD
WATER DATA
GP ENVIRONMENTAL SERVICES
SDG: 9809010

SAMPLE NUMBER:	CEF-16-IW01-01			CEF-16-IW02-01			TB-083198					
SAMPLE DATE:	08/31/98			08/31/98			08/31/98			/ /		
LABORATORY ID:	9809010 - 02			9809010 - 01			9809010 - 03					
QC_TYPE:	NORMAL			NORMAL			NORMAL					
% SOLIDS:	0.0 %			0.0 %			0.0 %			100.0 %		
UNITS:	ug/L			ug/L			ug/L					
FIELD DUPLICATE OF:												
	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE	RESULT	QUAL	CODE
VOLATILES												
1,1,1-TRICHLOROETHANE	7.9			33.5	J	R	1	UJ	R			
1,1,2,2-TETRACHLOROETHANE	0.2	U		0.2	UJ	R	0.2	UJ	R			
1,1,2-TRICHLOROETHANE	1	UJ	C	1	UJ	CR	1	UJ	CR			
1,1-DICHLOROETHANE	1.3			19.7	J	R	1	UJ	R			
1,1-DICHLOROETHENE	3.5	J	C	26.3	J	CR	1	UJ	CR			
1,2-DICHLOROETHANE	1	U		1	UJ	R	1	UJ	R			
1,2-DICHLOROPROPANE	1	U		1	UJ	R	1	UJ	R			
CARBON TETRACHLORIDE	1	U		1	UJ	R	1	UJ	R			
CHLOROBENZENE	1	U		1	UJ	R	1	UJ	R			
CHLOROETHANE	1	UJ	C	1	UJ	CR	1	UJ	CR			
CHLOROFORM	1	U		4.2	J	R	1	UJ	R			
CHLOROMETHANE	1	UJ	C	1	UJ	CR	1	UJ	CR			
CIS-1,2-DICHLOROETHENE	14.2	J	C	9.6	J	CR	1	UJ	CR			
CIS-1,3-DICHLOROPROPENE	0.2	U		0.2	UJ	R	0.2	UJ	R			
METHYLENE CHLORIDE	1	U	A	1	U	A	1	U	A			
TETRACHLOROETHENE	0.3	J	CP	0.6	J	CPR	1	UJ	CR			
TRANS-1,2-DICHLOROETHENE	1	U		0.2	J	PR	1	UJ	R			
TRANS-1,3-DICHLOROPROPENE	0.2	UJ	C	0.2	UJ	CR	0.2	UJ	CR			
TRICHLOROETHENE	10600	J	HR	1400	J	HR	1	UJ	R			
VINYL CHLORIDE	0.8	J	P	1	UJ	R	1	UJ	R			

APPENDIX B

RESULTS AS REPORTED BY THE LABORATORY

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-IW01-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809010-02A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14763.D

Level: (low/med) LOW Date Received: 09/01/98

% Moisture: not dec. _____ Date Analyzed: 09/14/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg)	UG/L	Q
74-87-3	Chloromethane	1.0	U
75-01-4	Vinyl chloride	0.8	J
75-00-3	Chloroethane	1.0	U
75-35-4	1,1-Dichloroethene	3.5	
75-09-2	Methylene chloride	0.5	JB
156-60-5	Trans-1,2-dichloroethene	1.0	U
75-34-3	1,1-Dichloroethane	1.3	
156-59-2	Cis-1,2-dichloroethene	14.2	
67-66-3	Chloroform	1.0	U
71-55-6	1,1,1-Trichloroethane	7.9	
56-23-5	Carbon tetrachloride	1.0	U
107-06-2	1,2-Dichloroethane	1.0	U
79-01-6	Trichloroethene	843.4	E
78-87-5	1,2-Dichloropropane	1.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	1.0	U
127-18-4	Tetrachloroethene	0.3	J
108-90-7	Chlorobenzene	1.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-IW01-01DL

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809010-02BDL

Sample wt/vol: 0.5 (g/ml) ML Lab File ID: B14885.D

Level: (low/med) LOW Date Received: 09/01/98

% Moisture: not dec. _____ Date Analyzed: 09/21/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 50.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	100	U
75-01-4	Vinyl chloride	50	U
75-00-3	Chloroethane	250	U
75-35-4	1,1-Dichloroethene	25	JD
75-09-2	Methylene chloride	60	JBD
156-60-5	Trans-1,2-dichloroethene	250	U
75-34-3	1,1-Dichloroethane	19	JD
156-59-2	Cis-1,2-dichloroethene	250	U
67-66-3	Chloroform	10	JBD
71-55-6	1,1,1-Trichloroethane	22	JD
56-23-5	Carbon tetrachloride	150	U
107-06-2	1,2-Dichloroethane	150	U
79-01-6	Trichloroethene	7800	ED
78-87-5	1,2-Dichloropropane	250	U
10061-01-5	Cis-1,3-dichloropropene	10	U
10061-02-6	Trans-1,3-dichloropropene	10	U
79-00-5	1,1,2-Trichloroethane	250	U
127-18-4	Tetrachloroethene	150	U
108-90-7	Chlorobenzene	250	U
79-34-5	1,1,2,2-Tetrachloroethane	10	U

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1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-IW01-01DL2

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 9809010-02ADL2

Sample wt/vol: 0.1 (g/ml) ML Lab File ID: B14930.D

Level: (low/med) LOW Date Received: 09/01/98

% Moisture: not dec. Date Analyzed: 09/23/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 250.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	500	U
75-01-4	Vinyl chloride	250	U
75-00-3	Chloroethane	1250	U
75-35-4	1,1-Dichloroethene	1250	U
75-09-2	Methylene chloride	78	JBD
156-60-5	Trans-1,2-dichloroethene	1250	U
75-34-3	1,1-Dichloroethane	1250	U
156-59-2	Cis-1,2-dichloroethene	218	JD
67-66-3	Chloroform	103	JBD
71-55-6	1,1,1-Trichloroethane	133	JD
56-23-5	Carbon tetrachloride	750	U
107-06-2	1,2-Dichloroethane	750	U
79-01-6	Trichloroethene	10565	D
78-87-5	1,2-Dichloropropane	1250	U
10061-01-5	Cis-1,3-dichloropropene	50	U
10061-02-6	Trans-1,3-dichloropropene	50	U
79-00-5	1,1,2-Trichloroethane	1250	U
127-18-4	Tetrachloroethene	750	U
108-90-7	Chlorobenzene	1250	U
79-34-5	1,1,2,2-Tetrachloroethane	50	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-IW02-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809010-01A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14761.D

Level: (low/med) LOW Date Received: 09/01/98

% Moisture: not dec. _____ Date Analyzed: 09/14/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	1.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	1.0	U
75-35-4	1,1-Dichloroethene	26.3	
75-09-2	Methylene chloride	3.7	B
156-60-5	Trans-1,2-dichloroethene	0.2	J
75-34-3	1,1-Dichloroethane	19.7	
156-59-2	Cis-1,2-dichloroethene	9.6	
67-66-3	Chloroform	4.2	
71-55-6	1,1,1-Trichloroethane	33.5	
56-23-5	Carbon tetrachloride	1.0	U
107-06-2	1,2-Dichloroethane	1.0	U
79-01-6	Trichloroethene	2154.8	E
78-87-5	1,2-Dichloropropane	1.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	1.0	U
127-18-4	Tetrachloroethene	0.6	J
108-90-7	Chlorobenzene	1.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-IW02-01DL

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809010-01BDL

Sample wt/vol: ~~0.1~~ .05 (g/ml) ML Lab File ID: B14884.D

Level: (low/med) LOW Date Received: 09/01/98

% Moisture: not dec. _____ Date Analyzed: 09/21/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 500.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	1000	U
75-01-4	Vinyl chloride	500	U
75-00-3	Chloroethane	2500	U
75-35-4	1,1-Dichloroethene	2500	U
75-09-2	Methylene chloride	570	JBD
156-60-5	Trans-1,2-dichloroethene	2500	U
75-34-3	1,1-Dichloroethane	2500	U
156-59-2	Cis-1,2-dichloroethene	2500	U
67-66-3	Chloroform	2500	U
71-55-6	1,1,1-Trichloroethane	2500	U
56-23-5	Carbon tetrachloride	1500	U
107-06-2	1,2-Dichloroethane	1500	U
79-01-6	Trichloroethene	1395	JD
78-87-5	1,2-Dichloropropane	2500	U
10061-01-5	Cis-1,3-dichloropropene	100	U
10061-02-6	Trans-1,3-dichloropropene	100	U
79-00-5	1,1,2-Trichloroethane	2500	U
127-18-4	Tetrachloroethene	1500	U
108-90-7	Chlorobenzene	2500	U
79-34-5	1,1,2,2-Tetrachloroethane	100	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

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Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809010-03A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14760.D

Level: (low/med) LOW Date Received: 09/01/98

% Moisture: not dec. _____ Date Analyzed: 09/14/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	1.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	1.0	U
75-35-4	1,1-Dichloroethene	1.0	U
75-09-2	Methylene chloride	0.5	JB
156-60-5	Trans-1,2-dichloroethene	1.0	U
75-34-3	1,1-Dichloroethane	1.0	U
156-59-2	Cis-1,2-dichloroethene	1.0	U
67-66-3	Chloroform	1.0	U
71-55-6	1,1,1-Trichloroethane	1.0	U
56-23-5	Carbon tetrachloride	1.0	U
107-06-2	1,2-Dichloroethane	1.0	U
79-01-6	Trichloroethene	1.0	U
78-87-5	1,2-Dichloropropane	1.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	1.0	U
127-18-4	Tetrachloroethene	1.0	U
108-90-7	Chlorobenzene	1.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-~~415~~ 915-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809102-01A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14857.D

Level: (low/med) LOW Date Received: 09/15/98

% Moisture: not dec. _____ Date Analyzed: 09/18/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	2.4	J
75-09-2	Methylene chloride	0.5	JB
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	1.7	J
156-59-2	Cis-1,2-dichloroethene	13.7	
67-66-3	Chloroform	0.1	JB
71-55-6	1,1,1-Trichloroethane	1.0	J
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	487.1	EB
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	0.2	J
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1641501DL

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809102-01ADL

Sample wt/vol: 0.5 (g/ml) ML Lab File ID: B15165.D

Level: (low/med) LOW Date Received: 09/15/98

% Moisture: not dec. _____ Date Analyzed: 10/07/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 50.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	100	U
75-01-4	Vinyl chloride	50	U
75-00-3	Chloroethane	250	U
75-35-4	1,1-Dichloroethene	250	U
75-09-2	Methylene chloride	250	U
156-60-5	Trans-1,2-dichloroethene	250	U
75-34-3	1,1-Dichloroethane	250	U
156-59-2	Cis-1,2-dichloroethene	250	U
67-66-3	Chloroform	250	U
71-55-6	1,1,1-Trichloroethane	250	U
56-23-5	Carbon tetrachloride	150	U
107-06-2	1,2-Dichloroethane	150	U
79-01-6	Trichloroethene	228	D
78-87-5	1,2-Dichloropropane	250	U
10061-01-5	Cis-1,3-dichloropropene	10	U
10061-02-6	Trans-1,3-dichloropropene	10	U
79-00-5	1,1,2-Trichloroethane	250	U
127-18-4	Tetrachloroethene	150	U
108-90-7	Chlorobenzene	250	U
79-34-5	1,1,2,2-Tetrachloroethane	10	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-09D-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809110-04A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14890.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: not dec. _____ Date Analyzed: 09/21/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg)	UG/L	Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	5.0	U
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	3.0	U
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1610S01

Lab Name: GP ENVIRONMENTAL Contract: _____

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809110-03A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14889.D

Level: (low/med) LOW Date Received: 09/18/98

% Moisture: not dec. _____ Date Analyzed: 09/21/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	66.2	E
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	100.8	E
75-09-2	Methylene chloride	5.0	U
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	113.0	E
156-59-2	Cis-1,2-dichloroethene	124.8	E
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	596.8	E
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	45.9	
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-10S-01DL

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809110-03BDL

Sample wt/vol: 0.5 (g/ml) ML Lab File ID: B15256.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: not dec. _____ Date Analyzed: 10/13/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 50.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	100	U
75-01-4	Vinyl chloride	32	JD
75-00-3	Chloroethane	250	U
75-35-4	1,1-Dichloroethene	231	JD
75-09-2	Methylene chloride	28	JBD
156-60-5	Trans-1,2-dichloroethene	250	U
75-34-3	1,1-Dichloroethane	220	JD
156-59-2	Cis-1,2-dichloroethene	60	JD
67-66-3	Chloroform	250	U
71-55-6	1,1,1-Trichloroethane	1301	D
56-23-5	Carbon tetrachloride	150	U
107-06-2	1,2-Dichloroethane	150	U
79-01-6	Trichloroethene	66	JD
78-87-5	1,2-Dichloropropane	250	U
10061-01-5	Cis-1,3-dichloropropene	10	U
10061-02-6	Trans-1,3-dichloropropene	10	U
79-00-5	1,1,2-Trichloroethane	250	U
127-18-4	Tetrachloroethene	150	U
108-90-7	Chlorobenzene	250	U
79-34-5	1,1,2,2-Tetrachloroethane	10	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1643S01

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GPES Case No.: SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 9809110-01A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14887.D

Level: (low/med) LOW Date Received: 09/18/98

% Moisture: not dec. Date Analyzed: 09/21/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	5.0	U
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	0.5	J
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1644I01

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GPES Case No.: SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 9809110-02A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14888.D

Level: (low/med) LOW Date Received: 09/18/98

% Moisture: not dec. Date Analyzed: 09/21/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	5.0	U
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	3.0	U
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-11DD-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809117-02A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14932.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: not dec. _____ Date Analyzed: 09/23/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	1.9	J
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	5.0	
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-21S-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809117-03A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14933.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: not dec. _____ Date Analyzed: 09/23/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg) UG/L		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	1.4	J
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	2.9	J
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-23D-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809117-04A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14934.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: not dec. _____ Date Analyzed: 09/23/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	1.4	J
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	5.6	
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-45I-01DL

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809117-01AD

Sample wt/vol: 10/13/98 ~~0.1~~ .05 (g/ml) ML Lab File ID: B14931.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: not dec. _____ Date Analyzed: 09/23/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 500.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	1000	U
75-01-4	Vinyl chloride	500	U
75-00-3	Chloroethane	2500	U
75-35-4	1,1-Dichloroethene	810	JD
75-09-2	Methylene chloride	1500	JBD
156-60-5	Trans-1,2-dichloroethene	2500	U
75-34-3	1,1-Dichloroethane	1500	JD
156-59-2	Cis-1,2-dichloroethene	780	JD
67-66-3	Chloroform	200	JBD
71-55-6	1,1,1-Trichloroethane	1600	JD
56-23-5	Carbon tetrachloride	1500	U
107-06-2	1,2-Dichloroethane	1500	U
79-01-6	Trichloroethene	210000	ED
78-87-5	1,2-Dichloropropane	2500	U
10061-01-5	Cis-1,3-dichloropropene	100	U
10061-02-6	Trans-1,3-dichloropropene	100	U
79-00-5	1,1,2-Trichloroethane	2500	U
127-18-4	Tetrachloroethene	1500	U
108-90-7	Chlorobenzene	2500	U
79-34-5	1,1,2,2-Tetrachloroethane	100	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

EF-16-45I-01DL

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809117-01ADL

MP 10/13/98 Sample wt/vol: .0025 ~~0.02 5ul~~ (g/ml) ML Lab File ID: B14939.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: not dec. _____ Date Analyzed: 09/23/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 10000.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	20000	U
75-01-4	Vinyl chloride	10000	U
75-00-3	Chloroethane	50000	U
75-35-4	1,1-Dichloroethene	50000	U
75-09-2	Methylene chloride	13000	JBD
156-60-5	Trans-1,2-dichloroethene	50000	U
75-34-3	1,1-Dichloroethane	50000	U
156-59-2	Cis-1,2-dichloroethene	50000	U
67-66-3	Chloroform	3000	JBD
71-55-6	1,1,1-Trichloroethane	50000	U
56-23-5	Carbon tetrachloride	30000	U
107-06-2	1,2-Dichloroethane	30000	U
79-01-6	Trichloroethene	220000	D
78-87-5	1,2-Dichloropropane	50000	U
10061-01-5	Cis-1,3-dichloropropene	2000	U
10061-02-6	Trans-1,3-dichloropropene	2000	U
79-00-5	1,1,2-Trichloroethane	50000	U
127-18-4	Tetrachloroethene	30000	U
108-90-7	Chlorobenzene	50000	U
79-34-5	1,1,2,2-Tetrachloroethane	2000	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-DP1-01DL

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809117-05ADL

Sample wt/vol: ~~0.1~~ 0.95 (g/ml) ML Lab File ID: B14935.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: not dec. _____ Date Analyzed: 09/23/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 500.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	1000	U
75-01-4	Vinyl chloride	500	U
75-00-3	Chloroethane	2500	U
75-35-4	1,1-Dichloroethene	1000	JD
75-09-2	Methylene chloride	1400	JBD
156-60-5	Trans-1,2-dichloroethene	2500	U
75-34-3	1,1-Dichloroethane	1700	JD
156-59-2	Cis-1,2-dichloroethene	290	JD
67-66-3	Chloroform	180	JBD
71-55-6	1,1,1-Trichloroethane	1600	JD
56-23-5	Carbon tetrachloride	1500	U
107-06-2	1,2-Dichloroethane	1500	U
79-01-6	Trichloroethene	230000	ED
78-87-5	1,2-Dichloropropane	2500	U
10061-01-5	Cis-1,3-dichloropropene	100	U
10061-02-6	Trans-1,3-dichloropropene	100	U
79-00-5	1,1,2-Trichloroethane	2500	U
127-18-4	Tetrachloroethene	1500	U
108-90-7	Chlorobenzene	2500	U
79-34-5	1,1,2,2-Tetrachloroethane	100	U

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VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-DP1-01DL

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809117-05ADL

MP Sample wt/vol: .0025 ~~0.0 2.5~~ (g/ml) ML Lab File ID: B14940.D

10/13/98 Level: (low/med) LOW Date Received: 09/17/98

% Moisture: not dec. _____ Date Analyzed: 09/23/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 10000.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	20000	U
75-01-4	Vinyl chloride	10000	U
75-00-3	Chloroethane	50000	U
75-35-4	1,1-Dichloroethene	50000	U
75-09-2	Methylene chloride	12000	JBD
156-60-5	Trans-1,2-dichloroethene	50000	U
75-34-3	1,1-Dichloroethane	50000	U
156-59-2	Cis-1,2-dichloroethene	50000	U
67-66-3	Chloroform	3500	JBD
71-55-6	1,1,1-Trichloroethane	50000	U
56-23-5	Carbon tetrachloride	30000	U
107-06-2	1,2-Dichloroethane	30000	U
79-01-6	Trichloroethene	410000	D
78-87-5	1,2-Dichloropropane	50000	U
10061-01-5	Cis-1,3-dichloropropene	2000	U
10061-02-6	Trans-1,3-dichloropropene	2000	U
79-00-5	1,1,2-Trichloroethane	50000	U
127-18-4	Tetrachloroethene	30000	U
108-90-7	Chlorobenzene	50000	U
79-34-5	1,1,2,2-Tetrachloroethane	2000	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-22I-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 9809129-02A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14937.D

Level: (low/med) LOW Date Received: 09/18/98

% Moisture: not dec. Date Analyzed: 09/23/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	1.9	JB
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	6.4	
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-42I-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 9809129-01A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14936.D

Level: (low/med) LOW Date Received: 09/18/98

% Moisture: not dec. Date Analyzed: 09/23/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	1.5	JB
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	4.7	
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-27I-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809149-04A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B15108.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: not dec. _____ Date Analyzed: 10/02/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg)	UG/L	Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	0.6	JB
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	0.6	J
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	33.3	
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-DP2-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809149-05A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B15109.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: not dec. _____ Date Analyzed: 10/02/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	0.7	JB
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	0.5	J
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	32.8	
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-32S-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: 9809149-01A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B15105.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: not dec. Date Analyzed: 10/02/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	0.3	J
75-09-2	Methylene chloride	0.3	JB
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	0.9	J
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	107.8	E
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	0.3	J
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-32S-01DL

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809149-01FDL

Sample wt/vol: 2.5 (g/ml) ML Lab File ID: B15160.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: not dec. _____ Date Analyzed: 10/07/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 10.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	20	U
75-01-4	Vinyl chloride	10	U
75-00-3	Chloroethane	50	U
75-35-4	1,1-Dichloroethene	50	U
75-09-2	Methylene chloride	5	JBD
156-60-5	Trans-1,2-dichloroethene	50	U
75-34-3	1,1-Dichloroethane	50	U
156-59-2	Cis-1,2-dichloroethene	50	U
67-66-3	Chloroform	50	U
71-55-6	1,1,1-Trichloroethane	50	U
56-23-5	Carbon tetrachloride	30	U
107-06-2	1,2-Dichloroethane	30	U
79-01-6	Trichloroethene	126	D
78-87-5	1,2-Dichloropropane	50	U
10061-01-5	Cis-1,3-dichloropropene	2	U
10061-02-6	Trans-1,3-dichloropropene	2	U
79-00-5	1,1,2-Trichloroethane	50	U
127-18-4	Tetrachloroethene	8	JD
108-90-7	Chlorobenzene	50	U
79-34-5	1,1,2,2-Tetrachloroethane	2	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-35S-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809149-03A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B15107.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: not dec. _____ Date Analyzed: 10/02/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	0.6	JB
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	3.0	U
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-38S-01

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: 9809149-02A

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B15106.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: not dec. _____ Date Analyzed: 10/02/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	0.3	JB
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	3.0	U
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GEF1641501

~~GEF1641501~~

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809102-01G

Sample wt/vol: 900 (g/ml) ML Lab File ID: C17007.D

Level: (low/med) LOW Date Received: 09/15/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/17/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/19/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
117-81-7	bis(2-Ethylhexyl)phthalate	7	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1609D01

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809110-04G

Sample wt/vol: 900 (g/ml) ML Lab File ID: C17013.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/17/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/19/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
117-81-7	bis(2-Ethylhexyl)phthalate	1	J

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1610S01

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809110-03G

Sample wt/vol: 860 (g/ml) ML Lab File ID: C17010.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/17/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/19/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
117-81-7	bis(2-Ethylhexyl)phthalate	1	J

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1643S01

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809110-01G

Sample wt/vol: 950 (g/ml) ML Lab File ID: C17008.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/17/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/19/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
117-81-7	bis(2-Ethylhexyl)phthalate	1	J

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1644I01

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809110-02G

Sample wt/vol: 870 (g/ml) ML Lab File ID: C17009.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/17/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/19/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
117-81-7	bis(2-Ethylhexyl)phthalate	1	J

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1611DD01

Lab Name: GPLL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809117-02G

Sample wt/vol: 960 (g/ml) ML Lab File ID: D13038.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/19/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/25/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
117-81-7	bis(2-Ethylhexyl)phthalate	1	J

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1621S01

Lab Name: GPLL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809117-03G

Sample wt/vol: 920 (g/ml) ML Lab File ID: D13046.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/19/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/26/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 6

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
117-81-7	bis(2-Ethylhexyl)phthalate	2	J

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1623D01

Lab Name: GPLL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809117-04G

Sample wt/vol: 940 (g/ml) ML Lab File ID: D13047.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/19/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/26/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
117-81-7	bis(2-Ethylhexyl)phthalate	2	J

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1645I01

Lab Name: GPLL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809117-01G

Sample wt/vol: 860 (g/ml) ML Lab File ID: D13037.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/19/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/25/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 5

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
117-81-7	bis(2-Ethylhexyl)phthalate	2	J

2015-A

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF16DP101

Lab Name: GPLL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809117-05G

Sample wt/vol: 890 (g/ml) ML Lab File ID: D13048.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/19/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/26/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 5

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
117-81-7	bis(2-Ethylhexyl)phthalate	1	J

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1622I01

Lab Name: GPLL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809129-02G

Sample wt/vol: 990 (g/ml) ML Lab File ID: D13050.D

Level: (low/med) LOW Date Received: 09/18/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/19/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/26/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 6

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
117-81-7	bis(2-Ethylhexyl)phthalate	1	J

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1642I01

Lab Name: GPLL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809129-01G

Sample wt/vol: 970 (g/ml) ML Lab File ID: D13049.D

Level: (low/med) LOW Date Received: 09/18/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/19/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 09/26/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 6

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
117-81-7	bis(2-Ethylhexyl)phthalate	3	J

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1627I01

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809149-04G

Sample wt/vol: 960 (g/ml) ML Lab File ID: C17459.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/28/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 10/14/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 6

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
117-81-7	bis(2-Ethylhexyl)phthalate	11	B

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF16DP201

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809149-05G

Sample wt/vol: 960 (g/ml) ML Lab File ID: C17463.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/28/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 10/14/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 6

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
117-81-7	bis(2-Ethylhexyl)phthalate	3	JB

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1632S01

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809149-01G

Sample wt/vol: 980 (g/ml) ML Lab File ID: C17466.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/28/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 10/14/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 6

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
117-81-7	bis(2-Ethylhexyl)phthalate	1	JB

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1635S01

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809149-03G

Sample wt/vol: 960 (g/ml) ML Lab File ID: C17458.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/28/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 10/14/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 6

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L	Q
117-81-7	bis(2-Ethylhexyl)phthalate	2	JB

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF1638S01
~~CEF1633S01~~

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809149-02G

Sample wt/vol: 970 (g/ml) ML Lab File ID: C17467.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: 09/28/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 10/14/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 6

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
117-81-7	bis(2-Ethylhexyl)phthalate	2	JB

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-415-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809102 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809102-01E

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11371.D

Level: (low/med) LOW Date Received: 09/15/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	19.6	B
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-09D-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809110 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809110-04D

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11375.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	45.9	EB
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-09D-01 DL

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809110 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809110-04D 2X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11376.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 2.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	47.2	BD
74-84-0	Ethane	11.6	U
74-85-1	Ethylene	12.5	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-10S-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809110 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809110-03D

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11374.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	1971.0	EB
74-84-0	Ethane	47.7	
74-85-1	Ethylene	127.6	E

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-10S-01 DL

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809110 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809110-03D 5X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11378.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	2157.8	ED
74-84-0	Ethane	29.0	U
74-85-1	Ethylene	141.9	D ✓

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

CEF-16-10S-01 DL

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809110 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809110-03D 100X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11381.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 100.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	2592.0	BD
74-84-0	Ethane	580.0	U
74-85-1	Ethylene	624.0	U

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-43S-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809110 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809110-01D

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11372.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-82-8	Methane	31.5	B
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-44I-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809110 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809110-02D

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11373.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	51.5	EB
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-44I-01 DL

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809110 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809110-02D 2X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11377.D

Level: (low/med) LOW Date Received: 09/16/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 2.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	54.9	BD
74-84-0	Ethane	11.6	U
74-85-1	Ethylene	12.5	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF -16-11DD-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809117 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809117-02D

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11383.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	98.0	EB
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D DEF-16-11DD-01 DL

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809117 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809117-02D 5X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11385.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 5.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	140.8	D
74-84-0	Ethane	29.0	U
74-85-1	Ethylene	31.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-21S-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809117 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809117-03D

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11384.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	3.4	B
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-23D-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809117 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809117-04D

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11386.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	38.5	EB
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-23D-01 DL

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809117 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809117-04D 2X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11388.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 2.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	44.5	D
74-84-0	Ethane	11.6	U
74-85-1	Ethylene	12.5	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-45I-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809117 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809117-01D

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11382.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	1.7	JB
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-DP1-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809117 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809117-05D

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11387.D

Level: (low/med) LOW Date Received: 09/17/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	1.8	JB
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-22I-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809129 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809129-02A

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11494.D

Level: (low/med) LOW Date Received: 09/18/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 10/01/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	14.7	B
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-42I-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809129 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809129-01A

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11493.D

Level: (low/med) LOW Date Received: 09/18/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 10/01/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-82-8	Methane	2.4	JB
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-27I-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809149 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809149-04D

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11499.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 10/01/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-82-8	Methane	14.0	B
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-DP2-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809149 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809149-05A

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11500.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 10/01/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	13.7	B
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-32S-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809149 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809149-01D

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11495.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 10/01/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	5.7	B
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-35S-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809149 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809149-03D

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11497.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 10/01/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	39.0	EB
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

refer to dilution MA 10/14/98

FORM I SV-1 8015M

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-35S-01 DL

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809149 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809149-03D 2X

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11498.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 10/01/98

Injection Volume: 500. (uL) Dilution Factor: 2.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	46.9	D
74-84-0	Ethane	11.6	U
74-85-1	Ethylene	12.5	U

1B
SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

D CEF-16-38S-01

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809149 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: 9809149-02D

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11496.D

Level: (low/med) LOW Date Received: 09/23/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 10/01/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-82-8	Methane	22.5	B
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

APPENDIX C

SUPPORT DOCUMENTATION

GP Work Order # 9809010

SAMPLE ANALYSIS REPORT

Prepared For:

TETRATECH NUS
661 ANDERSON DRIVE
PITTSBURGH, PA 15220-2745

NAS CECIL FIELD CTO-051

Prepared By:

GPL Laboratories, LLLP
202 Perry Parkway
Gaithersburg, MD 20877

October 9, 1998

for Yemane Yohannes, Laboratory Director

GPL LABORATORIES, LLLP
ANALYTICAL RESULTS

Project: NAS CECIL FIELD CTO-051

TETRATECH NUS
661 ANDERSON DRIVE
PITTSBURGH, PA 15220-2745
Atten: LEE LECK

GPL LABORATORIES, LLLP
202 Perry Parkway
Gaithersburg, MD 20877

Atten: Client Services
Phone: (301) 926-6802

Certified by:

SAMPLE IDENTIFICATION

GP ID	Client ID
9809010-01A	CEF-16-IW02-01
9809010-01B	
9809010-01C	
9809010-02A	CEF-16-IW01-01
9809010-02B	
9809010-02C	
9809010-03A	TRIP BLANK

Tetra Tech NUS, Inc.

Brown & Root Environmental

REPORT TO ADDRESS: 7018 AC Skinner Pkwy. Ste 200
Jacksonville, FL 32256
TELEPHONE: 904-281-0409 FAX: 904-281-0070

SITE MANAGER: Tom Nicotera
PROJECT NAME: NAS Cecil Field
BRE PROJECT NO.: 7792 CODE:
P.O. NO.:

SHIPPED TO: Gaithersburg, MD.
GP Environmental Services Inc.
(LABORATORY NAME, CITY)

PAGE 1 OF 1

CHAIN OF CUSTODY RECORD

SAMPLED BY (PRINT): Tom Nicotera
SAMPLER SIGNATURE: Tom Nicotera

LABORATORY ANALYSIS

☐ STANDARD TAT ☐ RUSH
☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☒ 7 DAYS
RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	PARAMETERS: TCL-VOC	PRES. TYPE: HCl	NUMBER OF CONTAINERS	COMMENTS
	8-31-98	12:15	CEF-16-IW02-01		X	GW	3		3	Samples put on
	8-31-98	1630	CEF-16-IW01-01		X	GW	3		3	Ice to 4°C.
TOTAL NUMBER OF CONTAINERS							6		6	

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 8-28-98 TIME: 17:00
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 8-31-98 TIME: 20:00	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS: 7-day Turnaround on samples

LABORATORY REMARKS: Airbill # 807868582259

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X Airbill #

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera

RECEIVED FOR LABORATORY BY (SIGNATURE): C. Lyons
DATE: 9/01/98 TIME: 9:20 A

No. 2854

GP Work Order # 9809110

SAMPLE ANALYSIS REPORT

Prepared For:

TETRATECH NUS
661 ANDERSON DRIVE
PITTSBURGH, PA 15220-2745

NAS CECIL FIELD CTO-051

Prepared By:

GPL Laboratories, LLLP
202 Perry Parkway
Gaithersburg, MD 20877

October 8, 1998

for Yemane Yohannes, Laboratory Director

GPL LABORATORIES, LLLP
ANALYTICAL RESULTS

Project: NAS CECIL FIELD CTO-051

TETRATECH NUS
661 ANDERSON DRIVE
PITTSBURGH, PA 15220-2745
Atten: LEE LECK

GPL LABORATORIES, LLLP
202 Perry Parkway
Gaithersburg, MD 20877

Atten: Client Services
Phone: (301) 926-6802

Certified by:

SAMPLE IDENTIFICATION

GP ID	Client ID
9809110-01A	CEF-16-43S-01
9809110-01B	
9809110-01C	
9809110-01D	
9809110-01E	
9809110-01F	
9809110-01G	
9809110-01H	
9809110-01I	
9809110-01J	
9809110-01K	
9809110-01L	
9809110-01M	
9809110-01N	
9809110-02A	CEF-16-44I-01
9809110-02B	
9809110-02C	
9809110-02D	
9809110-02E	
9809110-02F	
9809110-02G	
9809110-02H	
9809110-02I	
9809110-02J	
9809110-02K	
9809110-02L	
9809110-02M	
9809110-02N	

SAMPLE IDENTIFICATION

GP ID	Client ID
9809110-03A	CEF-16-10S-01
9809110-03B	
9809110-03C	
9809110-03D	
9809110-03E	
9809110-03F	
9809110-03G	
9809110-03H	
9809110-03I	
9809110-03J	
9809110-03K	
9809110-03L	
9809110-03M	
9809110-03N	
9809110-04A	CEF-16-09D-01
9809110-04B	
9809110-04C	
9809110-04D	
9809110-04E	
9809110-04F	
9809110-04G	
9809110-04H	
9809110-04I	
9809110-04J	
9809110-04K	
9809110-04L	
9809110-04M	
9809110-04N	

KIRA TECH NAS, INC.

Brown & Root Environmental

REPORT TO ADDRESS: 7018 AC Skinner Pkwy Ste 250
Jacksonville, Fl. 32256

TELEPHONE: 904-281-0400 FAX: 904-281-0070

SITE MANAGER: Tom Nicotera
PROJECT NAME: NAS Cecil Field
BRE PROJECT NO.: 7792 CODE:
P.O. NO.:

SHIPPED TO: Gaithersburg Cof Environmental Services MD.
(LABORATORY NAME, CITY)

PAGE 1 OF 2

CHAIN OF CUSTODY RECORD

LABORATORY ANALYSIS

SAMPLED BY (PRINT): Tom Nicotera + Don Westerhoff
SAMPLER SIGNATURE: Tom Nicotera + [signature]

☐ STANDARD TAT ☐ RUSH
☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☒ 7 DAYS
RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	VOC (PRES. HCl)	GASSES (PRES. HCl)	SVOC (PRES. ICE)	DOC (PRES. H2SO4)	METALS (PRES. HNO3)	ALKOLINITY (PRES. ICE)	BOD (PRES. ICE)	COD (PRES. H2SO4)	SULFIDE (PRES. NaOH)	NUMBER OF CONTAINERS
	9-15-98	12:00	CEF-16-43S-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-15-98	13:00	CEF-16-44I-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-15-98	15:00	CEF-16-10S-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-15-98	18:00	CEF16-09D-01		X	GW	3	3	1	1	1	1	1	1	1	13
TOTAL NUMBER OF CONTAINERS							12	12	4	4	4	4	4	4	4	52

COMMENTS: Samples put on ice to 4°c

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotera	SEAL INTACT? (YES) NO N/A	DATE: 9-1-98 TIME: 17:00
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotera	SEAL INTACT? (YES) NO N/A	DATE: 9-15-98 TIME: 20:00	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: 8078685822 48

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X AIRBILL #

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera + Don Westerhoff

RECEIVED FOR LABORATORY BY (SIGNATURE): [signature]
DATE: 9/16/98 TIME: 8:50 am

No. 2118

PACKAGE TRACKING

CTO: 051

SDG: 9809102

DATE RECEIVED: 10-12-98

JOB NO: 7792

VALIDATION REQUIRED: L

PROJECT MANAGER: M. SPERANZA

FRACTIONS RECEIVED:
- VOA
- SVOA
- METALS
- MISC
- DISS. GASES

BOXED:

NOTES: CEF-16-415-01 changed to CEF-16-415-01

DATE PACKAGE SHIPPED OFF-SITE:

GP Work Order # 9809102

SAMPLE ANALYSIS REPORT

Prepared For:

TETRATECH NUS
661 ANDERSON DRIVE
PITTSBURGH, PA 15220-2745

NAS CECIL FIELD CTO-051

Prepared By:

GPL Laboratories, LLLP
202 Perry Parkway
Gaithersburg, MD 20877

October 12, 1998

for Yemane Yohannes, Laboratory Director

GPL LABORATORIES, LLLP
ANALYTICAL RESULTS

Project: NAS CECIL FIELD CTO-051

TETRATECH NUS
661 ANDERSON DRIVE
PITTSBURGH, PA 15220-2745
Atten: LEE LECK

GPL LABORATORIES, LLLP
202 Perry Parkway
Gaithersburg, MD 20877

Atten: Client Services
Phone: (301) 926-6802

Certified by:

SAMPLE IDENTIFICATION

GP ID	Client ID
9809102-01A	CEF-16-415-01
9809102-01B	
9809102-01C	
9809102-01D	
9809102-01E	
9809102-01F	
9809102-01G	
9809102-01H	
9809102-01I	
9809102-01J	
9809102-01K	
9809102-01L	
9809102-01M	
9809102-01N	

Tetra Tech NUS, Inc.

Brown & Root Environmental

REPORT TO ADDRESS: 7018 AC Skinner Pkwy Ste 350
Tallahassee FL 32256

TELEPHONE: 904-281-0991 FAX: 904-281-0990

SITE MANAGER: Tom Nicotera
PROJECT NAME: NAS Cecil Field
BRE PROJECT NO.: 7772 CODE:
P.O. NO.:

SHIPPED TO: GJ Environmental Services, Gaithersburg MD.
(LABORATORY NAME, CITY)

PAGE 1 OF 2

CHAIN OF CUSTODY RECORD

SAMPLED BY (PRINT): Tom Nicotera (TN)
SAMPLER SIGNATURE: Tom Nicotera

LABORATORY ANALYSIS

☐ STANDARD TAT ☐ RUSH
☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☒ 7 DAYS
RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	VOC (HCl)	GASES (HCl)	SVOC (1)	PCC (HNO3)	METALS (HNO3)	ALKDS (1)	BOD (1)	COD (H2SO4)	SO4 (1)	NUMBER OF CONTAINERS
	9-14-98	15:30	CEF-16-415-01				3	3	1	1	1	1	1	1	1	13
TOTAL NUMBER OF CONTAINERS							3	3	1	1	1	1	1	1	1	13

COMMENTS: Samples put on Ice to 4°C.

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 9-1-98 TIME: 12:00
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 9-14-98 TIME: 20:00	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: AirBill # 805921689860

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera & Don Westerhoff

RECEIVED FOR LABORATORY BY (SIGNATURE): C Lyons
DATE: 9/15/98 TIME: 9:00 AM

No. 3165

PACKAGE TRACKING

CTO: 051

SDG: 9809117

DATE RECEIVED: 10-22-98

JOB NO: 7792

VALIDATION REQUIRED: L

PROJECT MANAGER: M. SPERANZA

FRACTIONS RECEIVED: VOA
SVOA
METALS
MISC

BOXED:

NOTES: CEF-16-DP1-01 missing from EDD (9809117-05)

Missing DOC results - Did not analyze

DATE PACKAGE SHIPPED OFF-SITE:

BOX NUMBER:

GP Work Order # 9809117

SAMPLE ANALYSIS REPORT

Prepared For:

TETRATECH NUS
661 ANDERSON DRIVE
PITTSBURGH, PA 15220-2745

NAS CECIL FIELD CTO-051

Prepared By:

GPL Laboratories, LLLP
202 Perry Parkway
Gaithersburg, MD 20877

October 8, 1998

Yemane Yohannes, Laboratory Director

for

GPL LABORATORIES, LLLP
ANALYTICAL RESULTS

Project: NAS CECIL FIELD CTO-051

TETRATECH NUS
661 ANDERSON DRIVE
PITTSBURGH, PA 15220-2745
Atten: LEE LECK

GPL LABORATORIES, LLLP
202 Perry Parkway
Gaithersburg, MD 20877

Atten: Client Services
Phone: (301) 926-6802

Certified by:

SAMPLE IDENTIFICATION

GP ID	Client ID
9809117-01A	CEF-16-45I-01
9809117-01B	
9809117-01C	
9809117-01D	
9809117-01E	
9809117-01F	
9809117-01G	
9809117-01H	
9809117-01I	
9809117-01J	
9809117-01K	
9809117-01L	
9809117-01M	
9809117-01N	
9809117-02A	CEF-16-11DD-01
9809117-02B	
9809117-02C	
9809117-02D	
9809117-02E	
9809117-02F	
9809117-02G	
9809117-02H	
9809117-02I	
9809117-02J	
9809117-02K	
9809117-02L	
9809117-02M	
9809117-02N	
9809117-03A	CEF-16-21S-01
9809117-03B	
9809117-03C	
9809117-03D	
9809117-03E	
9809117-03F	
9809117-03G	

SAMPLE IDENTIFICATION

GP ID	Client ID
9809117-03H	
9809117-03I	
9809117-03J	
9809117-03K	
9809117-03L	
9809117-03M	
9809117-03N	
9809117-04A	CEF-16-23D-01
9809117-04B	
9809117-04C	
9809117-04D	
9809117-04E	
9809117-04F	
9809117-04G	
9809117-04H	
9809117-04I	
9809117-04J	
9809117-04K	
9809117-04L	
9809117-04M	
9809117-04N	
9809117-05A	CEF-16-DP1-01
9809117-05B	
9809117-05C	
9809117-05D	
9809117-05E	
9809117-05F	
9809117-05G	
9809117-05H	
9809117-05I	
9809117-05J	
9809117-05K	
9809117-05L	
9809117-05M	
9809117-05N	

Brown & Root Environmental

REPORT TO ADDRESS: 7018 A. Skinner Pkwy Ste 350, Jacksonville, FL 32256

TELEPHONE: 904-281-0400 FAX: 904-281-0020

SITE MANAGER: Tom Nicotera

PROJECT NAME: NAS Cecil Field

BRE PROJECT NO.: 7772 CODE:

P.O. NO.:

SHIPPED TO: GP Environmental Services MD. Gaithersburg

(LABORATORY NAME, CITY)

CHAIN OF CUSTODY RECORD

LABORATORY ANALYSIS

SAMPLED BY (PRINT): Tom Nicotera + Don Westerhoff

SAMPLER SIGNATURE: Tom Nicotera + Don Westerhoff

☐ STANDARD TAT ☐ RUSH

☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☒ 7 DAYS

RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	COMP.	GRAB	MATRIX	VOC	Gases	SVOC	PCB	Metals	Anions	Pesticides	Cd	Sulfide	NUMBER OF CONTAINERS	COMMENTS
			PRES. TYPE				HCl	HCl		HNO3				HNO3	NaOH		
	9-16-98	10:40	CEF-16-45I-01		X	GW	3	3	1	1	1	1	1	1	1	13	Samples put on
	9-16-98	12:30	CEF-16-110D-01		X	GW	3	3	1	1	1	1	1	1	1	13	Ice to 4°C.
	9-16-98	15:15	CEF-16-21S-01		X	GW	3	3	1	1	1	1	1	1	1	13	
	9-16-98	18:30	CEF-16-23D-01		X	GW	3	3	1	1	1	1	1	1	1	13	
	9-16-98	—	CEF-16-dP1-01		X	GW	3	3	1	1	1	1	1	1	1	13	
TOTAL NUMBER OF CONTAINERS							15	15	5	5	5	5	5	5	5	65	

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotera	SEAL INTACT? (YES) NO N/A	DATE: 9-1-98 TIME: 17:00
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotera	SEAL INTACT? (YES) NO N/A	DATE: 9-16-98 TIME: 20:00	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: Airbill # 264766862

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X Airbill #

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera + Don Westerhoff

RECEIVED FOR LABORATORY BY (SIGNATURE): [illegible]

DATE: 9-17-98 TIME: 10:06

No. 2117

GP Work Order # 9809149

SAMPLE ANALYSIS REPORT

Prepared For:

TETRATECH NUS
661 ANDERSON DRIVE
PITTSBURGH, PA 15220-2745

NAS CECIL FIELD CTO-051

Prepared By:

GPL Laboratories, LLLP
202 Perry Parkway
Gaithersburg, MD 20877

October 9, 1998

Yemane Yohannes, Laboratory Director
for

GPL LABORATORIES, LLLP
ANALYTICAL RESULTS

Project: NAS CECIL FIELD CTO-051

TETRATECH NUS
661 ANDERSON DRIVE
PITTSBURGH, PA 15220-2745
Atten: LEE LECK

GPL LABORATORIES, LLLP
202 Perry Parkway
Gaithersburg, MD 20877

Atten: Client Services
Phone: (301) 926-6802

Certified by:

SAMPLE IDENTIFICATION

GP ID	Client ID
9809149-01A	CEF-16-32S-01
9809149-01B	
9809149-01C	
9809149-01D	
9809149-01E	
9809149-01F	
9809149-01G	
9809149-01H	
9809149-01I	
9809149-01J	
9809149-01K	
9809149-01L	
9809149-01M	
9809149-01N	
9809149-02A	CEF-16-38S-01
9809149-02B	
9809149-02C	
9809149-02D	
9809149-02E	
9809149-02F	
9809149-02G	
9809149-02H	
9809149-02I	
9809149-02J	
9809149-02K	
9809149-02L	
9809149-02M	
9809149-02N	
9809149-03A	CEF-16-35S-01
9809149-03B	
9809149-03C	
9809149-03D	
9809149-03E	
9809149-03F	
9809149-03G	

SAMPLE IDENTIFICATION

GP ID	Client ID
9809149-03H	
9809149-03I	
9809149-03J	
9809149-03K	
9809149-03L	
9809149-03M	
9809149-03N	
9809149-04A	CEF-16-271-01
9809149-04B	
9809149-04C	
9809149-04D	
9809149-04E	
9809149-04F	
9809149-04G	
9809149-04H	
9809149-04I	
9809149-04J	
9809149-04K	
9809149-04L	
9809149-04M	
9809149-04N	
9809149-05A	CEF-16-DP2-01
9809149-05B	
9809149-05C	
9809149-05D	
9809149-05E	
9809149-05F	
9809149-05G	
9809149-05H	
9809149-05I	
9809149-05J	
9809149-05K	
9809149-05L	
9809149-05M	

Jetka Tech NAS, Inc

Brown & Root Environmental STE 22

REPORT TO ADDRESS: 7018 AC Skinner Pkwy
Jacksonville, Fl. 32256

TELEPHONE: 904-281-0400 FAX: 904-281-0020

SITE MANAGER: Tom Nicotera
PROJECT NAME: NAS Cecil Field
BRE PROJECT NO.: 2792 CODE:
P.O. NO.:

SHIPPED TO: GAI Laboratories MD.
GP Environmental Services
(LABORATORY NAME, CITY)

PAGE 1 OF 2

CHAIN OF CUSTODY RECORD

SAMPLED BY (PRINT): Tom Nicotera & Jason McCann
SAMPLER SIGNATURE: Tom Nicotera & Jason McCann

LABORATORY ANALYSIS

☒ STANDARD TAT ☐ RUSH
☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☐ 7 DAYS
RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	VOC (HCl)	Gasses (HCl)	SVOC (1)	DOC (H2SO4)	Metals (HNO3)	Alk/Dis/Hardness (1)	BOD	COD	dis. Sulfide (NaOH)	NUMBER OF CONTAINERS
	9-22-98	12:00	CEF-16-325-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-22-98	13:00	CEF-16-385-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-22-98	15:00	CEF-16-355-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-22-98	18:00	CEF-16-27I-01		X	GW	3	3	1	1	1	1	1	1	1	13
	9-22-98	—	CEF-16-dP2-01		X	GW	3	3	1	1	1	1	1	1	1	13
TOTAL NUMBER OF CONTAINERS							15	15	5	5	5	5	5	5	5	65

COMMENTS: Samples put on ice to 4°C.

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotera
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotera	SEAL INTACT? YES NO N/A	DATE: 9-22-98 TIME: 20:00	RECEIVED BY (SIGNATURE) ④
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥

SEAL INTACT? YES NO N/A	DATE: 9-1-98 TIME: 17:00
SEAL INTACT? YES NO N/A	DATE: TIME:
SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: 80704137831

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X AirBill #

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera + Jason McCann

RECEIVED FOR LABORATORY BY (SIGNATURE): [illegible]
DATE: 9/23/98 TIME: 9:05 A

No. 2190

GP Work Order # 9809129

SAMPLE ANALYSIS REPORT

Prepared For:

TETRATECH NUS
661 ANDERSON DRIVE
PITTSBURGH, PA 15220-2745

NAS CECIL FIELD CTO-051

Prepared By:

GPL Laboratories, LLLP
202 Perry Parkway
Gaithersburg, MD 20877

October 8, 1998

for Marty Sadoughi, Laboratory Director

GPL LABORATORIES, LLLP
ANALYTICAL RESULTS

Project: NAS CECIL FIELD CTO-051

TETRATECH NUS
661 ANDERSON DRIVE
PITTSBURGH, PA 15220-2745
Atten: LEE LECK

GPL LABORATORIES, LLLP
202 Perry Parkway
Gaithersburg, MD 20877

Atten: Client Services
Phone: (301) 926-6802

Certified by:

SAMPLE IDENTIFICATION

GP ID	Client ID
9809129-01A	CEF-16-42I-01
9809129-01B	
9809129-01C	
9809129-01D	
9809129-01E	
9809129-01F	
9809129-01G	
9809129-01H	
9809129-01I	
9809129-01J	
9809129-01K	
9809129-01L	
9809129-01M	
9809129-01N	
9809129-02A	CEF-16-22I-01
9809129-02B	
9809129-02C	
9809129-02D	
9809129-02E	
9809129-02F	
9809129-02G	
9809129-02H	
9809129-02I	
9809129-02J	
9809129-02K	
9809129-02L	
9809129-02M	
9809129-02N	

Brown & Root Environmental

REPORT TO ADDRESS: 7018 AC Skinner Pkwy Ste
Jacksonville, FL 32256

TELEPHONE: 904-281-0400 FAX: 904-281-6020

SITE MANAGER: Tom Nicotera
PROJECT NAME: NAS Cecil Field
BRE PROJECT NO.: 7792 CODE:
P.O. NO.:

SHIPPED TO: G-P Environmental Services, Gaithersburg, MD.
(LABORATORY NAME, CITY)

PAGE 1 OF 2

CHAIN OF CUSTODY RECORD

LABORATORY ANALYSIS

SAMPLED BY (PRINT): Tom Nicotera + Don Westerhoff
SAMPLER SIGNATURE: Tom Nicotera + [illegible]

☒ STANDARD TAT ☐ RUSH
☐ 24 HR. ☐ 48 HR. ☐ 72 HR. ☐ 7 DAYS
RESULTS DUE DATE:

LAB NO.	DATE	TIME	SAMPLE IDENTIFICATION	SAMPLE TYPE COMP.	SAMPLE TYPE GRAB	MATRIX	VOC (PRES. HCl)	Gases (PRES. HCl)	SVOC (PRES. 1)	DOC (PRES. H2SO4)	METALS (PRES. HNO3)	Alkalinity (PRES. 1)	BOD (PRES. 1)	COD (PRES. 1)	diss. sulfide (PRES. NaOH)	NUMBER OF CONTAINERS	COMMENTS:
	9-17-98	1030	CEF-16-42I-01		X	GW	3	3	1	1	1	1	1	1	1	13	
	9-17-98	1145	CEF-16-22I-01		X	GW	3	3	1	1	1	1	1	1	1	13	Samples put on ice to 4°C.
TOTAL NUMBER OF CONTAINERS							6	6	2	2	2	2	2	2	2	26	

EMPTY BOTTLES RELINQUISHED BY (SIGNATURE) ①	SEAL INTACT? YES NO N/A	DATE: TIME:	EMPTY BOTTLES RECEIVED BY (SIGNATURE) ② Tom Nicotera	SEAL INTACT? (YES) NO N/A	DATE: 9-18 TIME: 1700
RELINQUISHED BY (SIGNATURE) ③ Tom Nicotera	SEAL INTACT? (YES) NO N/A	DATE: 9-17-98 TIME: 2100	RECEIVED BY (SIGNATURE) ④	SEAL INTACT? YES NO N/A	DATE: TIME:
RELINQUISHED BY (SIGNATURE) ⑤	SEAL INTACT? YES NO N/A	DATE: TIME:	RECEIVED BY (SIGNATURE) ⑥	SEAL INTACT? YES NO N/A	DATE: TIME:

SPECIAL INSTRUCTIONS:

LABORATORY REMARKS: 8070413782 0

SAMPLE CONTAINERS PRECLEANED BY: ☐ BRE ☐ LABORATORY ☒ MANUFACTURER

METHOD OF SHIPMENT: Fed-X AirBill #

BILL OF LADING NO.:

WHITE-FULLY EXECUTED COPY
YELLOW-RECEIVING LABORATORY COPY
PINK-SAMPLERS' COPY/QA COPY
GOLDENROD-SITE MANAGERS' COPY

SAMPLING TEAM: Tom Nicotera + Don Westerhoff

RECEIVED FOR LABORATORY BY (SIGNATURE): [illegible]
DATE: 9/18/98 TIME: 3:15 pm

No. 2169

CASE NARRATIVE

VOLATILES

Client	:	NUS_SOUTH
Work Order	:	9809010
SDG No.	:	N/A
Date	:	10/8/98

1. Three water samples were received on September 1, 1998. The samples were analyzed for volatile organics using EPA method 8260B.

2. Matrix spike and duplicate analyses were shared with work order 9809110 and performed on sample CEF-16-09D-01.

3. Samples CEF-16-IW02-01 and CEF-IW02-IW01-01 were reanalyzed at a dilution due to high levels of target analytes. The reanalyses were performed outside the holding time. The trip blank had two surrogate recoveries outside QC limits.

4. The continuing calibration on 9/14/98 had percent difference for vinyl chloride and 1,1-dichloroethene at 23 and 28, respectively. The continuing calibration on 9/23/98 had percent difference for 1,2-dichloropropane at 24.

5. Laboratory control standards were analyzed and results were submitted. VLCSB had one surrogate recovery outside the QC limits.

MP 10/8/98

RHC 10/8/98

CASE NARRATIVE

VOLATILES

Client	:	NUS_SOUTH
Work Order	:	9809102
SDG No.	:	N/A
Date	:	10/9/98

1. One water sample was received on September 15, 1998. The sample was analyzed for volatile organics using EPA method 8260B.

2. Matrix spike and duplicate analyses were shared with work order 9810017 and performed on sample MW-7A(47.5-57.5).

3. Sample CEF-16-415-01 was reanalyzed outside the holding time at a dilution due to high levels of target analytes.

4. A laboratory control standard was analyzed each day and results were submitted.

10/9/98

MP 10/9/98

CASE NARRATIVE

VOLATILES

Client	:	NUS_SOUTH
Work Order	:	9809110
SDG No.	:	N/A
Date	:	10/12/98

1. Four water samples were received on September 16, 1998. The samples were analyzed for volatile organics using EPA method 8260B.

2. Matrix spike and duplicate analyses were performed on sample CEF-16-09D-01. The MS/MSD had internal standards and surrogate recoveries outside the QC limits.

3. Samples CEF-16-10S-01 was reanalyzed at 50x due to high levels of target analytes. The initial analysis had one surrogate recovery outside the QC limits. Sample CEF-16-09D-01 had two surrogate recoveries outside the QC limit. The same sample was used for MS/MSD and yielded same result. The reanalysis of sample CEF-16-10S-01 was performed outside the holding time.

4. Laboratory control standards were analyzed and results were submitted. VLCSA had one surrogate recovery outside the QC limits.

W
10/13/98
MP 10/13/98

CASE NARRATIVE

VOLATILES

Client	:	NUS_SOUTH
Work Order	:	9809117
SDG No.	:	N/A
Date	:	10/12/98

1. Five water samples were received on September 17, 1998. The samples were analyzed for volatile organics using EPA method 8260B.

2. Matrix spike and duplicate analyses were shared with work order 9809110 and performed on sample CEF-16-09D-01. The MS/MSD had internal standards and surrogate recoveries outside the QC limits.

3. Samples CEF-16-45I-01 and CEF-16-DP1-01 were initially analyzed at a dilution due to high levels of target analytes. Both samples were reanalyzed at a further dilution due to target analytes exceeding the calibration range.

4. A laboratory control standard was analyzed and results were submitted.

5. The percent difference for 1,2-dichloropropane was 24 in the continuing calibration. This target analyte was not found in the samples.

MP 10/13/98

RHC 10/13/98

CASE NARRATIVE VOLATILES

Client	:	NUS_SOUTH
Work Order	:	9809129
SDG No.	:	N/A
Date	:	10/13/98

1. Two water samples were received on September 18, 1998. The samples were analyzed for volatile organics using EPA method 8260B.

2. Matrix spike and duplicate analyses were shared with work order 9809110 and performed on sample CEF-16-09D-01. The MS/MSD had internal standards and surrogate recoveries outside the QC limits.

3. A laboratory control standard was analyzed and results were submitted.

4. The percent difference for 1,2-dichloroproprane in the continuing calibration was 24. This target analyte was not found in the samples.

10/14/98

MP 10/14/98

CASE NARRATIVE

VOLATILES

Client	:	NUS_SOUTH
Work Order	:	9809149
SDG No.	:	N/A
Date	:	10/9/98

1. Five water samples were received on September 23, 1998. The samples were analyzed for volatile organics using EPA method 8260B.

2. Matrix spike and duplicate analyses were shared with work order 9810017 and performed on sample MW-7A(47.5-57.5).

3. Sample CEF-16-32S-01 was reanalyzed outside the holding time at a dilution due to high levels of target analytes.

4. A laboratory control standard was analyzed and results were submitted.

W- 10/9/98

MP 10/9/98

2A
WATER VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUTHDIV

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: N/A

	EPA SAMPLE NO.	SMC1 #	SMC2 #	SMC3 #	SMC4 #	TOT OUT
01	VBLKA	90	109	102	101	0
02	TRIP BLANK	69*	103	87	79*	2
03	CEF-16-IW02-01	79*	97	87	89	1
04	CEF-16-IW01-01	85	102	94	89	0
05	VLCSA	83	98	95	94	0
06	VBLKB	111	106	110	120	0
07	VLCSB	104	100	114	124*	1
08	CEF-16-IW02-01DL	111	102	107	113	0
09	CEF-16-IW01-01DL	122*	103	110	117	1
10	VBLKC	99	97	96	86	0
11	VLCSC	103	95	90	84	0
12	CEF-16-IW01-01DL2	103	108	112	100	0

			QC LIMITS
SMC1	=	1,2-Dichloroethane-d4	(80-120)
SMC2	=	Toluene-d8	(88-110)
SMC3	=	4-Bromofluorobenzene	(86-115)
SMC4	=	1,2-Dichlorobenzene-d4	(80-120)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D System Monitoring Compound diluted out

2A

WATER VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUTHDIV

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

	EPA SAMPLE NO.	SMC1 #	SMC2 #	SMC3 #	SMC4 #	TOT OUT
01	VBLKA	98	91	98	100	0
02	VLCSA	95	106	116 *	124 *	2
03	CEF-16-415-01	106	95	99	111	0
04	VBLKB	102	105	104	91	0
05	VLCSB	104	87 *	93	87	1
06	CEF1641501DL	115	102	106	95	0

			QC LIMITS
SMC1	=	1,2-Dichloroethane-d4	(80-120)
SMC2	=	Toluene-d8	(88-110)
SMC3	=	4-Bromofluorobenzene	(86-115)
SMC4	=	1,2-Dichlorobenzene-d4	(80-120)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D System Monitoring Compound diluted out

2A

WATER VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUTHDIV

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

	EPA SAMPLE NO.	SMC1 #	SMC2 #	SMC3 #	SMC4 #	TOT OUT
01	VBLKA	111	106	110	120	0
02	VLCSA	104	100	114	124 *	1
03	CEF-16-43S-01	112	94	110	116	0
04	CEF-16-44I-01	107	97	109	116	0
05	CEF-16-10S-01	113	102	113	124 *	1
06	CEF-16-09D-01	103	107	122 *	128 *	2
07	CEF-16-09D-01MS	114	106	128 *	134 *	2
08	CEF-16-09D-01MSD	100	101	124 *	130 *	2
09	VBLKC	109	104	104	100	0
10	CEF-16-10S-01DL	108	102	104	104	0
11	VLCSC	116	98	102	108	0

			QC LIMITS
SMC1	=	1,2-Dichloroethane-d4	(80-120)
SMC2	=	Toluene-d8	(88-110)
SMC3	=	4-Bromofluorobenzene	(86-115)
SMC4	=	1,2-Dichlorobenzene-d4	(80-120)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D System Monitoring Compound diluted out

2A

WATER VOLATILE SYSTEM MONITORING COMPOUND RECOVERY

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUTH

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

	EPA SAMPLE NO.	SMC1 #	SMC2 #	SMC3 #	SMC4 #	TOT OUT
01	VBLKA	92	89	93	93	0
02	CEF-16-32S-01	95	94	93	94	0
03	CEF-16-38S-01	99	97	88	85	0
04	CEF-16-35S-01	103	97	90	93	0
05	CEF-16-27I-01	94	100	92	93	0
06	CEF-16-DP2-01	91	100	92	94	0
07	VBLKB	102	105	104	91	0
08	CEF-16-32S-01DL	111	94	100	87	0
09	VLCSB	104	87*	93	87	1

			QC LIMITS
SMC1	=	1,2-Dichloroethane-d4	(80-120)
SMC2	=	Toluene-d8	(88-110)
SMC3	=	4-Bromofluorobenzene	(86-115)
SMC4	=	1,2-Dichlorobenzene-d4	(80-120)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D System Monitoring Compound diluted out

LAB CONTROL STANDARD RECOVERY

Lab Name :	GP Environmental	Contract :	NUS_SOUTH
Case No :	N/A	SDG NO :	N/A
Lab Code :	GPENV	Lab Sample ID:	VLCS0917
Lab File ID :	B14840.D Matrix: WATER	Date analyzed :	09/17/98

Compound	LCS Added (ug/L)	Conc. Found (ug/L)	Percent Recovery	Internal Laboratory Limits	
				Lower	Upper
Vinyl chloride	10	14	143	79	157
1,1-Dichloroethene	10	12	122	53	129
Chloroform	10	10	99	65	143
1,1,1-Trichloroethane	10	11	112	80	120
Carbon tetrachloride	10	11	106	74	120
Benzene	10	11	113	80	120
1,2-Dichloroethane	10	10	102	80	127
Trichloroethene	10	11	110	79	120
Bromodichloromethane	10	10	98	74	128
Dibromochloromethane	10	10	104	80	120
Bromoform	10	13	129 *	80	128

* Values outside internal laboratory limits

comments _____

LAB CONTROL STANDARD RECOVERY

Lab Name :	GP Environmental	Contract :	NUS_SOUTH
Case No :	N/A	SDG NO :	N/A
Lab Code :	GPENV	Lab Sample ID:	VLCS0914
Lab File ID :	B14764.D Matrix: WATER	Date analyzed :	09/14/98

Compound	LCS Added (ug/L)	Conc. Found (ug/L)	Percent Recovery		Internal Laboratory Limits Lower	Upper
Vinyl chloride	10	5	50	*	79	157
1,1-Dichloroethene	10	13	125		53	129
Chloroform	10	12	116		65	143
1,1,1-Trichloroethane	10	11	111		80	120
Carbon tetrachloride	10	11	108		74	120
Benzene	10	10	99		80	120
1,2-Dichloroethane	10	9	92		80	127
Trichloroethene	10	14	143	*	79	120
Bromodichloromethane	10	11	112		74	128
Dibromochloromethane	10	12	116		80	120
Bromoform	10	12	116		80	128

* Values outside internal laboratory limits

comments _____

8A

VOLATILE INTERNAL STANDARD AREA AND RT SUMMARY

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUTH

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID (Standard): B14876.D Date Analyzed: 09/21/98

Instrument ID: 5970-B Time Analyzed: 10:02

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

		IS1 AREA #	RT #	IS2 AREA #	RT #	IS3 AREA #	RT #
	12 HOUR STD	1007343	11.66	991771	11.81	710190	16.44
	UPPER LIMIT	2014686	12.16	1983542	12.31	1420380	16.94
	LOWER LIMIT	503672	11.16	495886	11.31	355095	15.94
	EPA SAMPLE NO.						
01	VBLKA	1010921	11.66	986714	11.83	636825	16.45
02	VLCSA	882621	11.66	880147	11.81	580654	16.44
03	CEF-16-43S-01	1074135	11.66	1072034	11.81	727388	16.44
04	CEF-16-44I-01	1030183	11.64	993288	11.81	712008	16.44
05	CEF-16-10S-01	813487	11.65	760780	11.82	553152	16.44
06	CEF-16-09D-01	743163	11.64	674283	11.81	482037	16.43
07	CEF-16-09D-01MS	437957*	11.65	400654 *	11.81	265889*	16.44
08	CEF-16-09D-01MS	410654*	11.66	384278 *	11.81	259068*	16.43

IS1 = Fluorobenzene
IS2 = 1,4-Diflurobenzene
IS3 = Chlorobenzene-d5

AREA UPPER LIMIT = +100% of internal standard area
AREA LOWER LIMIT = - 50% of internal standard area
RT UPPER LIMIT = +0.50 minutes of internal standard RT
RT LOWER LIMIT = -0.50 minutes of internal standard RT

Column to be used to flag values outside QC limit with an asterisk.
* Values outside of contract required QC limits

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: _____

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B14270.D BFB Injection Date: 08/21/98

Instrument ID: 5970-B BFB Injection Time: 10:24

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	21.5
75	30.0 - 60.0% of mass 95	47.4
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	6.9
173	Less than 2.0% of mass 174	0.8 (1.5)1
174	>50% of mass 95	50.7
175	5.0 - 9.0% of mass 174	3.0 (5.8)1
176	95.0 - 101.0% of mass 174	50.8 (100.1)1
177	5.0 - 9.0% of mass 176	4.5 (8.9)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD020	VSTD020	B14272.D	08/21/98	11:13
02	VSTD00.5	VSTD00.5	B14273.D	08/21/98	11:47
03	VSTD001	VSTD001	B14274.D	08/21/98	12:22
04	VSTD010	VSTD010	B14275.D	08/21/98	12:56
05	VSTD040	VSTD040	B14276.D	08/21/98	13:30
06	VSTD005	VSTD005	B14278.D	08/21/98	14:48

Response Factor Report 5970 - B

Method : C:\HPCHEM\2\METHODS\82625WT1.M
Title : USEPA Method 8260 Volatiles 25ml Purge
Last Update : Tue Sep 08 16:09:06 1998
Response via : Initial Calibration

Calibration Files
005 =B14278.D 040 =B14276.D 020 =B14272.D
010 =B14275.D 001 =B14274.D 0005 =B14273.D

		Compound	005	040	020	010	001	0005	Avg	%RSD
1)	I	Fluorobenzene	---ISTD---							
2)	T@	Chloromethane	0.286	0.372	0.530	0.368	0.399		0.391	22.64
3)	T*	Vinyl chloride	0.308	0.409	0.517	0.388	0.383		0.401	18.78
4)	T	Bromomethane	0.349	0.262	0.550	0.437	0.140		0.348	45.34
5)	T	Chloroethane	0.220	0.179	0.334	0.290	0.087		0.222	43.39
6)	M*	1,1-Dichloroethene	0.228	0.223	0.220	0.359	0.196		0.245	26.48
7)	T	Methylene chloride	0.239	0.216	0.232	0.369	0.361		0.283	26.53
8)	T	Trans-1,2-dichloroe	0.261	0.252	0.232	0.400	0.188		0.267	29.87
9)	T@	1,1-Dichloroethane	0.606	0.593	0.511	0.938	0.648		0.659	24.84
10)	T	Acetone	0.030	0.024	0.021	0.038	0.007		0.024	48.22
11)	T	MTBE	0.281	0.299	0.213	0.407	0.249		0.290	25.28
12)	T	Carbon disulfide	0.742	0.782	0.815	1.189	0.693		0.844	23.48
13)	T	Cis-1,2-dichloroeth	0.276	0.251	0.221	0.257	0.270		0.255	8.43
14)	T	1,2-Dichloroethene(	0.268	0.253	0.228	0.334	0.229		0.262	16.50
15)	T*	Chloroform	0.675	0.648	0.554	0.674	0.702		0.651	8.77
16)	T	1,1,1-Trichloroetha	0.582	0.565	0.532	0.593	0.487		0.552	7.78
17)	T	Carbon tetrachlorid	0.585	0.595	0.536	0.603	0.552		0.574	5.05
18)	S	1,2-Dichloroethane-	0.291	0.305	0.246	0.320	0.281		0.288	9.71
19)	I	1,4-Diflurobenzene	---ISTD---							
20)	T	2-Butanone	0.011	0.042	0.012	0.044	0.031		0.028	56.66
21)	T	1,1-Dichloropropene	0.531	0.481	0.449	0.497	0.488		0.489	6.04
22)	T	Vinyl Acetate	0.003	0.008	0.007	0.007	0.008		0.007	30.26
23)	T	2-Chloroethylvinyl	0.192	0.050	0.048	0.050	0.049		0.078	81.88
24)	M	Benzene	0.704	0.649	0.648	0.701	0.829		0.706	10.46
25)	T	1,2-Dichloroethane	0.323	0.318	0.266	0.314	0.306		0.305	7.53
26)	M	Trichloroethene	0.468	0.411	0.431	0.474	0.500		0.457	7.76
27)	T*	1,2-Dichloropropane	0.354	0.335	0.322	0.346	0.323		0.336	4.19
28)	T	Bromodichloromethan	0.647	0.662	0.615	0.696	0.650		0.654	4.46
29)	T	Cis-1,3-dichloropro	0.346	0.361	0.339	0.377	0.380	0.380	0.364	5.00
30)	S	Toluene-d8	0.602	0.768	0.897	0.872	0.880		0.804	15.39
31)	M*	Toluene	0.307	0.380	0.496	0.445	0.514		0.428	19.95
32)	T	Trans-1,3-dichlorop	0.173	0.260	0.236	0.254	0.266	0.175	0.227	18.66
33)	T	1,1,2-Trichloroetha	0.107	0.156	0.142	0.170	0.178		0.150	18.75
34)	I	Chlorobenzene-d5	---ISTD---							
35)	T	4-Methyl-2-pentanon	0.224	0.148	0.114	0.167	0.172		0.165	24.12
36)	T	2-Hexanone	0.139	0.093	0.073	0.106	0.098		0.102	23.48
37)	T	Tetrachloroethene	0.786	0.651	0.672	0.767	0.810		0.737	9.66
38)	T	Dibromochloromethan	0.607	0.581	0.483	0.616	0.584		0.574	9.24
39)	M@	Chlorobenzene	0.977	0.805	0.818	0.880	0.917		0.880	8.08
40)	T*	Ethylbenzene	1.428	1.227	1.323	1.396	1.364		1.347	5.78
41)	T	m,p-xylene	0.491	0.807	0.878	0.939	0.949		0.813	23.20

(#) = Out of Range

Response Factor Report 5970 - B

Method : C:\HPCHEM\2\METHODS\82625WT1.M
Title : USEPA Method 8260 Volatiles 25ml Purge
Last Update : Tue Sep 08 16:09:06 1998
Response via : Initial Calibration

Calibration Files
005 =B14278.D 040 =B14276.D 020 =B14272.D
010 =B14275.D 001 =B14274.D 0005 =B14273.D

		Compound	005	040	020	010	001	0005	Avg	%RSD
42)	T	xylenes(total)	0.463	0.393	0.424	0.443	0.396		0.424	7.05
43)	T	o-xylene	0.463	0.393	0.424	0.443	0.396		0.424	7.05
44)	T	Styrene	0.702	0.590	0.655	0.644	0.664		0.651	6.26
45)	T@	Bromoform	0.365	0.394	0.286	0.375	0.270		0.338	16.62
46)	S	4-Bromofluorobenzen	1.186	1.015	1.081	1.100	1.134		1.103	5.77
47)	T@	1,1,2,2-Tetrachloro	0.348	0.327	0.272	0.325	0.325	0.338	0.322	8.20
48)	S	1,2-Dichlorobenzene	0.571	0.461	0.470	0.509	0.638		0.530	14.06

(#) = Out of Range

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: N/A

Lab File ID: B14755.D BFB Injection Date: 09/14/98

Instrument ID: 5970-B BFB Injection Time: 08:11

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	20.2
75	30.0 - 60.0% of mass 95	46.9
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.1
173	Less than 2.0% of mass 174	0.0 (0.0)1
174	>50% of mass 95	67.4
175	5.0 - 9.0% of mass 174	5.9 (8.8)1
176	95.0 - 101.0% of mass 174	65.6 (97.2)1
177	5.0 - 9.0% of mass 176	4.3 (6.6)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010	VSTD010	B14758.D	09/14/98	10:18
02	VBLKA	VBLK0914	B14759.D	09/14/98	10:53
03	TRIP BLANK	9809010-03A	B14760.D	09/14/98	11:36
04	CEF-16-IW02-01	9809010-01A	B14761.D	09/14/98	12:10
05	CEF-16-IW01-01	9809010-02A	B14763.D	09/14/98	13:19
06	VLCSA	VLCS0914	B14764.D	09/14/98	13:55

Evaluate Continuing Calibration Report

Data File : J:\GCMSDATA\B\091498\B14758.D
Acq On : 14 Sep 98 10:18
Sample : VSTD010
Misc : VSTD010,WF

Vial: 9
Operator: WF
Inst : 5970 - B
Multiplr: 1.00

Method : C:\HPCHEM\2\METHODS\82625WT1.M
Title : USEPA Method 8260 Volatiles 25ml Purge
Last Update : Mon Sep 14 10:58:41 1998
Response via : Multiple Level Calibration

Min. RRF : 0.001 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
1	I	Fluorobenzene	1.000	1.000	0.0	212#	0.01
2	T@	Chloromethane	0.391	0.273	30.2#	157#	0.00
3	T*	Vinyl chloride	0.401	0.307	23.4#	168#	0.00
4	T	Bromomethane	0.348	0.401	-15.2	195#	0.01
5	T	Chloroethane	0.222	0.214	3.6	157#	0.00
6	M*	1,1-Dichloroethene	0.245	0.314	-28.2#	186#	0.01
7	T	Methylene chloride	0.283	0.262	7.4	151#	0.00
8	T	Trans-1,2-dichloroethene	0.267	0.330	-23.6#	175#	0.01
9	T@	1,1-Dichloroethane	0.659	0.529	19.7	120	0.01
10	T	Acetone	0.024	0.015	37.5#	81	0.00
11	T	MTBE	0.290	0.212	26.9#	110	0.01
12	T	Carbon disulfide	0.844	0.698	17.3	125	0.01
13	T	Cis-1,2-dichloroethene	0.255	0.336	-31.8#	277#	0.01
14	T	1,2-Dichloroethene(total)	0.262	0.168	35.9#	107	0.01
15	T*	Chloroform	0.661	0.729	-10.3	230#	0.00
16	T	1,1,1-Trichloroethane	0.552	0.659	-19.4	236#	0.01
17	T	Carbon tetrachloride	0.574	0.667	-16.2	235#	0.01
18	S	1,2-Dichloroethane-d4	0.288	0.243	15.6	161#	0.00
19	I	1,4-Diflurobenzene	1.000	1.000	0.0	218#	0.00
20	T	2-Butanone	0.028	0.028	0.0	141	0.00
21	T	1,1-Dichloropropene	0.489	0.532	-8.8	234#	0.00
22	T	Vinyl Acetate	0.007	0.004	42.9#	131	-0.04
23	T	2-Chloroethylvinyl ether	0.078	0.025	67.9#	109	0.00
24	M	Benzene	0.706	0.730	-3.4	227#	0.01
25	T	1,2-Dichloroethane	0.305	0.298	2.3	208#	0.00
26	M	Trichloroethene	0.504	0.566	-12.3	261#	0.01
27	T*	1,2-Dichloropropane	0.336	0.367	-9.2	232#	0.00
28	T	Bromodichloromethane	0.654	0.791	-20.9#	248#	0.00
29	T	Cis-1,3-dichloropropene	0.364	0.429	-17.9	248#	0.01
30	S	Toluene-d8	0.804	0.886	-10.2	222#	0.01
31	M*	Toluene	0.428	0.515	-20.3#	253#	0.00
32	T	Trans-1,3-dichloropropene	0.227	0.285	-25.6#	245#	0.01
33	T	1,1,2-Trichloroethane	0.150	0.195	-30.0#	250#	0.00
34	I	Chlorobenzene-d5	1.000	1.000	0.0	202#	0.00
35	T	4-Methyl-2-pentanone	0.165	0.128	22.4#	155#	0.00
36	T	2-Hexanone	0.102	0.081	20.6#	156#	0.00
37	T	Tetrachloroethene	0.737	1.323	-79.5#	349#	0.00
38	T	Dibromochloromethane	0.574	0.821	-43.0#	270#	0.00
39	M@	Chlorobenzene	0.880	0.970	-10.2	223#	0.01
40	T*	Ethylbenzene	1.347	1.659	-23.2#	241#	0.00

(#) = Out of Range

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B14829.D BFB Injection Date: 09/17/98

Instrument ID: 5970-B BFB Injection Time: 08:25

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	20.0
75	30.0 - 60.0% of mass 95	49.7
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.8
173	Less than 2.0% of mass 174	0.0 (0.0)1
174	>50% of mass 95	65.4
175	5.0 - 9.0% of mass 174	5.1 (7.8)1
176	95.0 - 101.0% of mass 174	64.9 (99.2)1
177	5.0 - 9.0% of mass 176	4.8 (7.5)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010	VSTD010	B14830.D	09/17/98	08:39
02	VSTD020	VSTD020	B14831.D	09/17/98	09:14
03	VSTD00.5	VSTD00.5	B14832.D	09/17/98	09:52
04	VSTD001	VSTD001	B14833.D	09/17/98	10:26
05	VSTD040	VSTD040	B14834.D	09/17/98	11:01
06	VSTD060	VSTD060	B14835.D	09/17/98	11:36

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B14837.D BFB Injection Date: 09/17/98

Instrument ID: 5970-B BFB Injection Time: 12:53

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	19.5
75	30.0 - 60.0% of mass 95	49.1
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.6
173	Less than 2.0% of mass 174	0.3 (0.5)1
174	>50% of mass 95	63.9
175	5.0 - 9.0% of mass 174	5.1 (8.0)1
176	95.0 - 101.0% of mass 174	61.8 (96.6)1
177	5.0 - 9.0% of mass 176	4.7 (7.6)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010	VSTD010	B14838.D	09/17/98	13:13
02	VBLKA	VBLK0917	B14839.D	09/17/98	13:47
03	VLCSA	VLCS0917	B14840.D	09/17/98	14:22
04	CEF-16-415-01	9809102-01A	B14857.D	09/18/98	00:11

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: SAS No.: SDG No.:

Lab File ID: B14875.D BFB Injection Date: 09/21/98

Instrument ID: 5970-B BFB Injection Time: 09:48

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	20.7
75	30.0 - 60.0% of mass 95	50.9
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	6.6
173	Less than 2.0% of mass 174	0.6 (0.9)1
174	>50% of mass 95	67.3
175	5.0 - 9.0% of mass 174	4.8 (7.1)1
176	95.0 - 101.0% of mass 174	67.9 (100.9)1
177	5.0 - 9.0% of mass 176	5.2 (7.6)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010	VSTD010	B14876.D	09/21/98	10:02
02	VBLKB	VBLK0921	B14877.D	09/21/98	10:36
03	VLCSB	VLCS0921	B14878.D	09/21/98	11:12
04	CEF-16-IW02-01DL	9809010-01BDL	B14884.D	09/21/98	14:42
05	CEF-16-IW01-01DL	9809010-02BDL	B14885.D	09/21/98	15:17

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B14875.D BFB Injection Date: 09/21/98

Instrument ID: 5970-B BFB Injection Time: 09:48

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	20.7
75	30.0 - 60.0% of mass 95	50.9
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	6.6
173	Less than 2.0% of mass 174	0.6 (0.9)1
174	>50% of mass 95	67.3
175	5.0 - 9.0% of mass 174	4.8 (7.1)1
176	95.0 - 101.0% of mass 174	67.9 (100.9)1
177	5.0 - 9.0% of mass 176	5.2 (7.6)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010	VSTD010	B14876.D	09/21/98	10:02
02	VBLKA	VBLK0921	B14877.D	09/21/98	10:36
03	VLCSA	VLCS0921	B14878.D	09/21/98	11:12
04	CEF-16-43S-01	9809110-01A	B14887.D	09/21/98	16:26
05	CEF-16-44I-01	9809110-02A	B14888.D	09/21/98	17:01
06	CEF-16-10S-01	9809110-03A	B14889.D	09/21/98	17:36
07	CEF-16-09D-01	9809110-04A	B14890.D	09/21/98	18:11
08	CEF-16-09D-01MS	9809110-04BMS	B14891.D	09/21/98	18:46
09	CEF-16-09D-01MSD	9809110-04BMSD	B14892.D	09/21/98	19:21

Evaluate Continuing Calibration Report

Data File : J:\GCMSDATA\B\092198\B14876.D
Acq On : 21 Sep 98 10:02
Sample : VSTD010
Misc : VSTD010,WF

Vial: 9
Operator: WF
Inst : 5970 - B
Multiplr: 1.00

Method : J:\GCMSDATA\METHODS\82625WT2.M
Title : USEPA Method 8260 Volatiles 25ml Purge
Last Update : Mon Oct 12 13:35:59 1998
Response via : Multiple Level Calibration

Min. RRF : 0.001 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
1	I	Fluorobenzene	1.000	1.000	0.0	100	0.00
2	T@	Chloromethane	0.238	0.178	25.2#	68	0.03
3	T*	Vinyl chloride	0.245	0.198	19.2	72	0.00
4	T	Bromomethane	0.346	0.261	24.6#	68	0.02
5	T	Chloroethane	0.183	0.151	17.5	72	0.00
6	M*	1,1-Dichloroethene	0.338	0.308	8.9	83	0.00
7	T	Methylene chloride	0.308	0.257	16.6	86	0.02
8	T	Trans-1,2-dichloroethene	0.315	0.312	1.0	87	0.00
9	T@	1,1-Dichloroethane	0.584	0.545	6.7	82	0.02
10	T	Acetone	0.025	0.019	24.0#	76	-0.02
11	T	MTBE	0.221	0.224	-1.4	79	0.02
12	T	Carbon disulfide	0.699	0.558	20.2#	69	0.00
13	T	Cis-1,2-dichloroethene	0.352	0.345	2.0	87	0.00
14	T	1,2-Dichloroethene(total)	0.206	0.173	16.0	87	0.00
15	T*	Chloroform	0.921	0.781	15.2	90	0.00
16	T	1,1,1-Trichloroethane	0.636	0.691	-8.6	96	0.00
17	T	Carbon tetrachloride	0.641	0.658	-2.7	93	0.02
18	S	1,2-Dichloroethane-d4	0.255	0.276	-8.2	103	0.00
19	I	1,4-Diflurobenzene	1.000	1.000	0.0	99	0.00
20	T	2-Butanone	0.034	0.027	20.6#	84	-0.02
21	T	1,1-Dichloropropene	0.516	0.499	3.3	89	0.00
22	T	Vinyl Acetate	0.004	0.005	-25.0#	124	0.02
23	T	2-Chloroethylvinyl ether	0.023	0.015	34.8#	44#	0.00
24	M	Benzene	0.756	0.680	10.1	84	0.00
25	T	1,2-Dichloroethane	0.290	0.269	7.2	88	0.00
26	M	Trichloroethene	0.541	0.483	10.7	85	0.02
27	T*	1,2-Dichloropropane	0.353	0.331	6.2	85	0.02
28	T	Bromodichloromethane	0.748	0.714	4.5	91	0.02
29	T	Cis-1,3-dichloropropene	0.407	0.389	4.4	90	0.00
30	S	Toluene-d8	0.871	0.920	-5.6	104	0.00
31	M*	Toluene	0.509	0.478	6.1	96	0.00
32	T	Trans-1,3-dichloropropene	0.252	0.244	3.2	88	0.00
33	T	1,1,2-Trichloroethane	0.182	0.160	12.1	84	0.02
34	I	Chlorobenzene-d5	1.000	1.000	0.0	102	0.00
35	T	4-Methyl-2-pentanone	0.106	0.086	18.9	85	0.00
36	T	2-Hexanone	0.071	0.061	14.1	89	0.00
37	T	Tetrachloroethene	0.850	0.820	3.5	92	0.02
38	T	Dibromochloromethane	0.623	0.618	0.8	93	0.02
39	M@	Chlorobenzene	0.880	0.888	-0.9	96	0.00
40	T*	Ethylbenzene	1.437	1.449	-0.8	99	0.00

(#) = Out of Range

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: _____

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B14902.D BFB Injection Date: 09/22/98

Instrument ID: 5970-B BFB Injection Time: 13:48

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	17.4
75	30.0 - 60.0% of mass 95	44.3
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	6.5
173	Less than 2.0% of mass 174	0.9 (1.1)1
174	>50% of mass 95	83.6
175	5.0 - 9.0% of mass 174	5.7 (6.8)1
176	95.0 - 101.0% of mass 174	82.2 (98.3)1
177	5.0 - 9.0% of mass 176	4.4 (5.3)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD00.5	VSTD00.5	B14903.D	09/22/98	14:02
02	VSTD001	VSTD001	B14904.D	09/22/98	14:36
03	VSTD010	VSTD010	B14905.D	09/22/98	15:10
04	VSTD020	VSTD020	B14906.D	09/22/98	15:45
05	VSTD040	VSTD040	B14907.D	09/22/98	16:19
06	VSTD060	VSTD060	B14908.D	09/22/98	16:56

Response Factor Report 5970 - B

Method : C:\HPCHEM\2\METHODS\86_25BW1.M
Title : USEPA Method 8260 Volatiles 25ml Purge
Last Update : Wed Sep 23 08:57:58 1998
Response via : Initial Calibration

Calibration Files
060 =B14908.D 040 =B14907.D 020 =B14906.D
010 =B14905.D 001 =B14904.D 0005 =B14903.D

		Compound	060	040	020	010	001	0005	Avg	%RSD
1)	I	Fluorobenzene	----------	----------	----------	ISTD	----------	----------		
2)	T	Dichlorodifluoromet	0.340	0.370	0.380	0.495	0.541		0.425	20.54
3)	T@	Chloromethane	0.211	0.227	0.223	0.285	0.321		0.253	18.72
4)	T*	Vinyl chloride	0.254	0.254	0.254	0.343	0.260		0.273	14.43
5)	T	Bromomethane	0.263	0.433	0.412	0.483	0.521		0.423	23.37
6)	T	Chloroethane	0.145	0.215	0.149	0.232	0.267		0.201	26.46
7)	T	Trichlorofluorometh	0.654	1.017	0.708	0.769	1.275		0.885	29.23
8)	M*	1,1-Dichloroethene	0.229	0.237	0.234	0.243	0.328		0.254	16.41
9)	T	Methylene chloride	0.190	0.189	0.189	0.222	0.488		0.255	51.14
10)	T	Iodomethane	0.603	0.642	0.628	0.661	0.822		0.671	12.98
11)	T	Trans-1,2-dichloroe	0.238	0.227	0.240	0.252	0.252		0.242	4.30
12)	T@	1,1-Dichloroethane	0.415	0.392	0.422	0.425	0.426		0.416	3.34
13)	T	Acetone	0.019	0.020	0.008	0.022	0.084		0.031	98.66
14)	T	Acrolein	0.003	0.004	0.002	0.002	0.004		0.003	28.62
15)	T	Acrylonitrile	0.012	0.012	0.010	0.010	0.008		0.010	16.31
16)	T	Acetonitrile	0.004	0.004	0.004	0.005	0.012		0.006	55.90
17)	T	MTBE	0.174	0.136	0.188	0.198	0.231		0.185	18.87
18)	T	Carbon disulfide	0.658	0.683	0.668	0.721	0.977		0.741	18.07
19)	T	Chloroprene	0.370	0.374	0.392	0.404	0.385		0.385	3.59
20)	T	Propionitrile	0.006	0.005	0.005	0.006	0.004		0.005	14.28
21)	T	Allyl Chloride	0.392	0.372	0.397	0.395	0.507		0.413	13.01
22)	T	2,2-Dichloropropane	0.126	0.069	0.252	0.061	0.228		0.147	60.20
23)	T	Cis-1,2-dichloroeth	0.249	0.231	0.242	0.250	0.241		0.243	3.12
24)	T	1,2-dichloroethene	0.125	0.116	0.121	0.125	0.121		0.121	3.12
25)	T	Bromochloromethane	0.133	0.135	0.143	0.138	0.138		0.137	2.72
26)	T*	Chloroform	0.563	0.529	0.578	0.578	0.810	1.021	0.680	28.74
27)	T	Methacrylonitrile	0.039	0.035	0.038	0.044	0.035		0.038	9.24
28)	T	1,1,1-Trichloroetha	0.478	0.472	0.511	0.505	0.455		0.484	4.84
29)	T	Carbon tetrachlorid	0.471	0.490	0.503	0.526	0.463		0.491	5.10
30)	T	Methyl Methacrylate	0.067	0.056	0.063	0.061	0.058		0.061	6.97
31)	T	1,4-Dioxane	0.001	0.001	0.001	0.001	0.001		0.001#	26.00
32)	T	Ethyl Methacrylate	0.149	0.137	0.129	0.136	0.102		0.130	13.52
33)	S	1,2-Dichloroethane-	0.284	0.271	0.269	0.263	0.296		0.277	4.69
34)	T	Isobutyl Alcohol	0.002	0.002	0.002	0.002	0.007		0.003	73.48
35)	I	1,4-Diflurobenzene	----------	----------	----------	ISTD	----------	----------		
36)	T	2-Butanone	0.029	0.027	0.025	0.025	0.017		0.025	18.04
37)	T	1,1-Dichloropropene	0.400	0.398	0.410	0.438	0.452		0.419	5.75
38)	T	Vinyl Acetate	0.004	0.004	0.003	0.017	0.045		0.015	122.86
39)	T	2-Chloroethylvinyl	0.002	0.001	0.007	0.000	0.008		0.004	106.03
40)	M	Benzene	0.549	0.538	0.576	0.557	0.624		0.569	5.92
41)	T	1,2-Dichloroethane	0.229	0.211	0.229	0.221	0.207		0.219	4.65
42)	M	Trichloroethene	0.390	0.397	0.421	0.467	0.445	0.413	0.422	6.93

(#) = Out of Range

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B14924.D BFB Injection Date: 09/23/98

Instrument ID: 5970-B BFB Injection Time: 09:08

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	20.1
75	30.0 - 60.0% of mass 95	48.0
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.0
173	Less than 2.0% of mass 174	0.2 (0.3)1
174	>50% of mass 95	67.7
175	5.0 - 9.0% of mass 174	5.2 (7.6)1
176	95.0 - 101.0% of mass 174	68.2 (100.7)1
177	5.0 - 9.0% of mass 176	4.7 (7.0)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010	VSTD010	B14925.D	09/23/98	09:21
02	VBLKC	VBLK0923	B14926.D	09/23/98	09:56
03	VLCSC	VLCS0923	B14927.D	09/23/98	10:30
04	CEF-16-IW01-01DL2	9809010-02ADL	B14930.D	09/23/98	13:05

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B14924.D BFB Injection Date: 09/23/98

Instrument ID: 5970-B BFB Injection Time: 09:08

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	20.1
75	30.0 - 60.0% of mass 95	48.0
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.0
173	Less than 2.0% of mass 174	0.2 (0.3)1
174	>50% of mass 95	67.7
175	5.0 - 9.0% of mass 174	5.2 (7.6)1
176	95.0 - 101.0% of mass 174	68.2 (100.7)1
177	5.0 - 9.0% of mass 176	4.7 (7.0)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010	VSTD010	B14925.D	09/23/98	09:21
02	VBLKA	VBLK0923	B14926.D	09/23/98	09:56
03	VLCSA	VLCS0923	B14927.D	09/23/98	10:30
04	CEF-16-45I-01DL	9809117-01ADL	B14931.D	09/23/98	13:40
05	CEF-16-11DD-01	9809117-02A	B14932.D	09/23/98	14:14
06	CEF-16-21S-01	9809117-03A	B14933.D	09/23/98	14:49
07	CEF-16-23D-01	9809117-04A	B14934.D	09/23/98	15:28
08	CEF-16-DP1-01DL	9809117-05ADL	B14935.D	09/23/98	16:04
09	CEF-16-45I-01DL1	9809117-01ADL1	B14939.D	09/23/98	18:21
10	CEF-16-DP1-01DL1	9809117-05ADL1	B14940.D	09/23/98	18:56

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B14924.D BFB Injection Date: 09/23/98

Instrument ID: 5970-B BFB Injection Time: 09:08

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	20.1
75	30.0 - 60.0% of mass 95	48.0
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.0
173	Less than 2.0% of mass 174	0.2 (0.3)1
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175	5.0 - 9.0% of mass 174	5.2 (7.6)1
176	95.0 - 101.0% of mass 174	68.2 (100.7)1
177	5.0 - 9.0% of mass 176	4.7 (7.0)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010	VSTD010	B14925.D	09/23/98	09:21
02	VBLKA	VBLK0923	B14926.D	09/23/98	09:56
03	VLCSA	VLCS0923	B14927.D	09/23/98	10:30
04	CEF-16-42I-01	9809129-01A	B14936.D	09/23/98	16:38
05	CEF-16-22I-01	9809129-02A	B14937.D	09/23/98	17:13

Evaluate Continuing Calibration Report

Data File : J:\GCMSDATA\B\092398\B14925.D
Acq On : 23 Sep 98 9:21
Sample : VSTD010
Misc : VSTD010,WF

Vial: 9
Operator: WF
Inst : 5970 - B
Multiplr: 1.00

Method : C:\HPCHEM\2\METHODS\86_25BW1.M
Title : USEPA Method 8260 Volatiles 25ml Purge
Last Update : Wed Sep 23 08:57:58 1998
Response via : Multiple Level Calibration

Min. RRF : 0.001 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
1	I	Fluorobenzene	1.000	1.000	0.0	317#	0.00
2	T	Dichlorodifluoromethane	0.425	0.320	24.7#	205#	0.00
3	T@	Chloromethane	0.253	0.183	27.7#	203#	0.00
4	T*	Vinyl chloride	0.273	0.221	19.0	204#	0.00
5	T	Bromomethane	0.423	0.321	24.1#	211#	0.00
6	T	Chloroethane	0.201	0.180	10.4	246#	0.00
7	T	Trichlorofluoromethane	0.885	0.822	7.1	339#	0.00
8	M*	1,1-Dichloroethene	0.254	0.264	-3.9	344#	0.00
9	T	Methylene chloride	0.255	0.223	12.5	319#	0.00
10	T	Iodomethane	0.671	0.620	7.6	297#	0.00
11	T	Trans-1,2-dichloroethene	0.242	0.261	-7.9	329#	0.00
12	T@	1,1-Dichloroethane	0.416	0.434	-4.3	324#	0.00
13	T	Acetone	0.031	0.015	51.6#	217#	0.00
14	T	Acrolein	0.003	0.002	33.3#	389#	0.00
15	T	Acrylonitrile	0.010	0.011	-10.0	338#	0.00
16	T	Acetonitrile	0.006	0.005	16.7	336#	0.00
17	T	MTBE	0.185	0.223	-20.5#	358#	0.00
18	T	Carbon disulfide	0.741	0.732	1.2	322#	0.00
19	T	Chloroprene	0.385	0.423	-9.9	332#	0.00
20	T	Propionitrile	0.005	0.005	0.0	284#	0.00
21	T	Allyl Chloride	0.413	0.405	1.9	325#	0.00
22	T	2,2-Dichloropropane	0.147	0.385	-161.9#	2009#	0.00
23	T	Cis-1,2-dichloroethene	0.243	0.261	-7.4	331#	0.00
24	T	1,2-dichloroethene (total)	0.121	0.130	-7.4	331#	0.00
25	T	Bromochloromethane	0.137	0.144	-5.1	330#	0.00
26	T*	Chloroform	0.680	0.585	14.0	321#	0.00
27	T	Methacrylonitrile	0.038	0.034	10.5	246#	0.00
28	T	1,1,1-Trichloroethane	0.484	0.505	-4.3	317#	0.00
29	T	Carbon tetrachloride	0.491	0.495	-0.8	299#	0.00
30	T	Methyl Methacrylate	0.061	0.038	37.7#	199#	0.00
31	T	1,4-Dioxane	0.001	0.000#	100.0#	193#	0.00
32	T	Ethyl Methacrylate	0.130	0.078	40.0#	182#	0.00
33	S	1,2-Dichloroethane-d4	0.277	0.280	-1.1	338#	0.00
34	T	Isobutyl Alcohol	0.003	0.001	66.7#	198#	0.00
35	I	1,4-Diflurobenzene	1.000	1.000	0.0	319#	0.00
36	T	2-Butanone	0.025	0.024	4.0	309#	0.00
37	T	1,1-Dichloropropene	0.419	0.411	1.9	300#	0.00
38	T	Vinyl Acetate	0.015	0.003	80.0#	62	0.00
39	T	2-Chloroethylvinyl ether	0.004	0.013	-225.0#	10308#	0.00
40	M	Benzene	0.569	0.549	3.5	315#	0.00
41	T	1,2-Dichloroethane	0.219	0.215	1.8	310#	0.00

(#) = Out of Range

Evaluate Continuing Calibration Report

Data File : J:\GCMSDATA\B\092398\B14925.D
Acq On : 23 Sep 98 9:21
Sample : VSTD010
Misc : VSTD010,WF

Vial: 9
Operator: WF
Inst : 5970 - B
Multiplr: 1.00

Method : C:\HPCHEM\2\METHODS\86_25BW1.M
Title : USEPA Method 8260 Volatiles 25ml Purge
Last Update : Wed Sep 23 08:57:58 1998
Response via : Multiple Level Calibration

Min. RRF : 0.001 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
42	M	Trichloroethene	0.422	0.330	21.8#	226#	0.00
43	T*	1,2-Dichloropropane	0.275	0.208	24.4#	241#	0.00
44	T	Dibromomethane	0.254	0.157	38.2#	194#	0.00
45	T	Bromodichloromethane	0.543	0.371	31.7#	209#	0.00
46	T	Cis-1,3-dichloropropene	0.267	0.198	25.8#	226#	0.00
47	S	Toluene-d8	0.919	0.595	35.3#	219#	0.00
48	M*	Toluene	0.384	0.242	37.0#	192#	0.00
49	T	Trans-1,3-dichloropropene	0.160	0.117	26.9#	257#	0.00
50	T	1,1,2-Trichloroethane	0.128	0.074	42.2#	175#	0.00
51	t	1-Chlorohexane	0.345	0.189	45.2#	166#	0.00
52	I	Chlorobenzene-d5	1.000	1.000	0.0	160#	0.00
53	T	4-Methyl-2-pentanone	0.096	0.110	-14.6	192#	0.00
54	T	2-Hexanone	0.093	0.064	31.2#	198#	0.00
55	T	Tetrachloroethene	0.774	0.844	-9.0	157#	0.00
56	T	1,3-Dichloropropane	0.304	0.376	-23.7#	195#	0.00
57	T	Dibromochloromethane	0.490	0.563	-14.9	174#	0.00
58	T	1,2-Dibromoethane	0.327	0.376	-15.0	178#	0.00
59	M@	Chlorobenzene	0.718	0.721	-0.4	153#	0.00
60	T	1,1,1,2-Tetrachloroethane	0.430	0.434	-0.9	155#	0.00
61	T*	Ethylbenzene	1.936	1.830	5.5	142	0.00
62	T	m,p-xylene	0.395	0.397	-0.5	154#	0.00
63	T	o-xylene	0.365	0.366	-0.3	148	0.00
64	T	Styrene	0.566	0.530	6.4	137	0.00
65	T@	Bromoform	0.286	0.250	12.6	133	0.00
66	T	Isopropylbenzene	0.935	0.890	4.8	144	0.00
67	S	4-Bromofluorobenzene	1.190	1.122	5.7	151#	0.00
68	T	Bromobenzene	0.421	0.379	10.0	129	0.00
69	T@	1,1,2,2-Tetrachloroethane	0.258	0.224	13.2	139	0.00
70	T	1,2,3-Trichloropropane	0.049	0.047	4.1	137	0.00
71	T	N-propylbenzene	1.411	1.374	2.6	143	0.00
72	T	2-Chlorotoluene	1.167	1.047	10.3	127	0.00
73	T	4-Chlorotoluene	1.171	1.086	7.3	143	0.00
74	T	1,3,5-Trimethylbenzene	0.919	0.834	9.2	137	0.00
75	T	Tert-butylbenzene	1.312	1.250	4.7	149	0.00
76	T	1,2,4-Trimethylbenzene	0.912	0.864	5.3	143	0.00
77	T	Sec-butylbenzene	1.284	1.238	3.6	144	0.00
78	T	Trans-1,4-Dichloro-2-butene	0.019	0.036	-89.5#	2241#	0.00
79	T	Pentachloroethane	0.415	0.350	15.7	143	0.00
80	T	1,3-Dichlorobenzene	0.684	0.650	5.0	140	0.00
81	T	4-Isopropyltoluene	1.033	0.983	4.8	143	0.00
82	T	1,4-Dichlorobenzene	0.684	0.650	5.0	140	0.00

(#) = Out of Range

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: _____

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B15092.D BFB Injection Date: 10/02/98

Instrument ID: 5970-B BFB Injection Time: 10:01

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	21.3
75	30.0 - 60.0% of mass 95	48.5
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.7
173	Less than 2.0% of mass 174	0.2 (0.3)1
174	>50% of mass 95	58.4
175	5.0 - 9.0% of mass 174	4.4 (7.5)1
176	95.0 - 101.0% of mass 174	58.9 (100.8)1
177	5.0 - 9.0% of mass 176	4.2 (7.1)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD001	VSTD001	B15096.D	10/02/98	13:43
02	VSTD010	VSTD010	B15097.D	10/02/98	14:17
03	VSTD020	VSTD020	B15098.D	10/02/98	14:52
04	VSTD040	VSTD040	B15099.D	10/02/98	15:28
05	VSTD060	VSTD060	B15100.D	10/02/98	16:03
06	VSTD00.5	VSTD00.5	B15101.D	10/02/98	16:48

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B15092.D BFB Injection Date: 10/02/98

Instrument ID: 5970-B BFB Injection Time: 10:01

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	21.3
75	30.0 - 60.0% of mass 95	48.5
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.7
173	Less than 2.0% of mass 174	0.2 (0.3)1
174	>50% of mass 95	58.4
175	5.0 - 9.0% of mass 174	4.4 (7.5)1
176	95.0 - 101.0% of mass 174	58.9 (100.8)1
177	5.0 - 9.0% of mass 176	4.2 (7.1)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD001	VSTD001	B15096.D	10/02/98	13:43
02	VSTD010	VSTD010	B15097.D	10/02/98	14:17
03	VSTD020	VSTD020	B15098.D	10/02/98	14:52
04	VSTD040	VSTD040	B15099.D	10/02/98	15:28
05	VSTD060	VSTD060	B15100.D	10/02/98	16:03
06	VSTD00.5	VSTD00.5	B15101.D	10/02/98	16:48
07	VBLKA	VBLK1002	B15104.D	10/02/98	18:39
08	CEF-16-32S-01	9809149-01A	B15105.D	10/02/98	19:15
09	CEF-16-38S-01	9809149-02A	B15106.D	10/02/98	19:51
10	CEF-16-35S-01	9809149-03A	B15107.D	10/02/98	20:27
11	CEF-16-27I-01	9809149-04A	B15108.D	10/02/98	21:03
12	CEF-16-DP2-01	9809149-05A	B15109.D	10/02/98	21:39

Response Factor Report 5970 - B

Method : C:\HPCHEM\2\METHODS\86_25BW1.M
Title : USEPA Method 8260 Volatiles 25ml Purge
Last Update : Fri Oct 02 17:43:09 1998
Response via : Initial Calibration

Calibration Files
060 =B15100.D 040 =B15099.D 020 =B15098.D
010 =B15097.D 001 =B15096.D 0005 =B15101.D

		Compound	060	040	020	010	001	0005	Avg	%RSD
1)	I	Fluorobenzene	----------	----------	----------	ISTD	----------	----------		
2)	T	Dichlorodifluoromet	0.283	0.310	0.332	0.269	0.133		0.265	29.42
3)	T@	Chloromethane	0.145	0.164	0.218	0.166	0.192		0.177	15.87
4)	T*	Vinyl chloride	0.171	0.187	0.217	0.175	0.093		0.169	27.22
5)	T	Bromomethane	0.226	0.271	0.364	0.251	0.243		0.271	20.12
6)	T	Chloroethane	0.144	0.157	0.172	0.138	0.096		0.141	20.16
7)	T	Trichlorofluorometh	0.638	0.684	0.640	0.549	0.272		0.557	29.90
8)	M*	1,1-Dichloroethene	0.290	0.302	0.290	0.249	0.165		0.259	21.74
9)	T	Methylene chloride	0.264	0.283	0.342	0.343	1.163		0.479	80.20
10)	T	Iodomethane	0.464	0.479	0.517	0.384	0.354		0.440	15.49
11)	T	Trans-1,2-dichloroe	0.287	0.292	0.275	0.264	0.222		0.268	10.38
12)	T@	1,1-Dichloroethane	0.513	0.510	0.526	0.471	0.455		0.495	6.10
13)	T	Acetone	0.021	0.026	0.029	0.027	0.114		0.043	91.27
14)	T	Acrolein	0.013	0.014	0.017	0.015	0.011		0.014	17.08
15)	T	Acrylonitrile	0.027	0.029	0.033	0.031	0.032		0.030	7.55
16)	T	Acetonitrile	0.004	0.004	0.004	0.004	0.013		0.006	73.26
17)	T	MTBE	0.260	0.209	0.205	0.283	0.263		0.244	14.20
18)	T	Carbon disulfide	0.383	0.394	0.345	0.320	0.240		0.336	18.29
19)	T	Chloroprene	0.301	0.309	0.282	0.260	0.162		0.263	22.64
20)	T	Propionitrile	0.007	0.007	0.008	0.007	0.007		0.007	5.34
21)	T	Allyl Chloride	0.352	0.361	0.352	0.329	0.277		0.334	10.24
22)	T	2,2-Dichloropropane	0.284	0.183	0.081	0.218	0.137		0.181	42.83
23)	T	Cis-1,2-dichloroeth	0.296	0.304	0.311	0.292	0.277		0.296	4.33
24)	T	1,2-dichloroethene	0.294	0.299	0.296	0.279	0.254		0.285	6.57
25)	T	Bromochloromethane	0.184	0.185	0.209	0.176	0.162		0.183	9.36
26)	T*	Chloroform	0.660	0.656	0.661	0.631	0.898		0.701	15.78
27)	T	Methacrylonitrile	0.043	0.044	0.053	0.042	0.047		0.046	9.50
28)	T	1,1,1-Trichloroetha	0.575	0.566	0.518	0.490	0.271		0.484	25.67
29)	T	Carbon tetrachlorid	0.570	0.581	0.506	0.470	0.208		0.467	32.49
30)	T	Methyl Methacrylate	0.080	0.081	0.082	0.075	0.068		0.077	7.58
31)	T	1,4-Dioxane	0.001	0.001	0.002	0.001	0.001		0.001	21.41
32)	T	Ethyl Methacrylate	0.174	0.179	0.189	0.170	0.167		0.176	5.00
33)	S	1,2-Dichloroethane-	0.254	0.284	0.307	0.319	0.277		0.288	8.88
34)	T	Isobutyl Alcohol	0.003	0.003	0.003	0.003	0.003		0.003	6.82
35)	I	1,4-Diflurobenzene	----------	----------	----------	ISTD	----------	----------		
36)	T	2-Butanone	0.035	0.034	0.039	0.039	0.050		0.039	16.13
37)	T	1,1-Dichloropropene	0.476	0.470	0.439	0.404	0.231		0.404	24.97
38)	T	Vinyl Acetate	0.004	0.004	0.004	0.005	0.006		0.005	19.15
39)	T	2-Chloroethylvinyl	0.042	0.009	0.004	0.010	0.004		0.014	115.28
40)	M	Benzene	0.697	0.679	0.691	0.628	0.485		0.636	13.93
41)	T	1,2-Dichloroethane	0.300	0.307	0.321	0.294	0.259		0.296	7.87
42)	M	Trichloroethene	0.469	0.450	0.465	0.421	0.326	0.755	0.481	30.04

(#) = Out of Range

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B15148.D BFB Injection Date: 10/07/98

Instrument ID: 5970-B BFB Injection Time: 07:13

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	20.5
75	30.0 - 60.0% of mass 95	46.0
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.0
173	Less than 2.0% of mass 174	0.0 (0.0)1
174	>50% of mass 95	66.2
175	5.0 - 9.0% of mass 174	4.7 (7.1)1
176	95.0 - 101.0% of mass 174	66.0 (99.6)1
177	5.0 - 9.0% of mass 176	5.4 (8.2)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010	VSTD010	B15150.D	10/07/98	08:05
02	VBLKB	VBLK1007	B15151.D	10/07/98	08:39
03	VLCSB	VLCS1007	B15161.D	10/07/98	14:19
04	CEF1641501DL	9809102-01ADL	B15165.D	10/07/98	16:37

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B15148.D BFB Injection Date: 10/07/98

Instrument ID: 5970-B BFB Injection Time: 07:13

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	20.5
75	30.0 - 60.0% of mass 95	46.0
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.0
173	Less than 2.0% of mass 174	0.0 (0.0)1
174	>50% of mass 95	66.2
175	5.0 - 9.0% of mass 174	4.7 (7.1)1
176	95.0 - 101.0% of mass 174	66.0 (99.6)1
177	5.0 - 9.0% of mass 176	5.4 (8.2)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010	VSTD010	B15150.D	10/07/98	08:05
MP 02	VBLKB	VBLK100~~6~~7	B15151.D	10/07/98	08:39
10/9/98 03	CEF-16-32S-01DL	9809149-01FDL	B15160.D	10/07/98	13:45
04	VLCSB	VLCS1007	B15161.D	10/07/98	14:19

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: _____

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B15243.D BFB Injection Date: 10/13/98

Instrument ID: 5970-B BFB Injection Time: 08:25

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	20.6
75	30.0 - 60.0% of mass 95	49.4
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.7
173	Less than 2.0% of mass 174	0.3 (0.6)1
174	>50% of mass 95	60.5
175	5.0 - 9.0% of mass 174	4.2 (7.0)1
176	95.0 - 101.0% of mass 174	59.6 (98.5)1
177	5.0 - 9.0% of mass 176	4.3 (7.3)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD00.5	VSTD00.5	B15245.D	10/13/98	09:13
02	VSTD001	VSTD001	B15246.D	10/13/98	09:48
03	VSTD020	VSTD020	B15247.D	10/13/98	10:22
04	VSTD040	VSTD040	B15248.D	10/13/98	10:57
05	VSTD060	VSTD060	B15249.D	10/13/98	11:32
06	VSTD010	VSTD010	B15250.D	10/13/98	12:06

5A-8240

VOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK
BROMOFLUOROBENZENE (BFB)

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Lab File ID: B15253.D BFB Injection Date: 10/13/98

Instrument ID: 5970-B BFB Injection Time: 13:14

GC Column: RTXVOA ID: 0.53 (mm) Heated Purge: (Y/N) N

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
50	15.0 - 40.0% of mass 95	22.3
75	30.0 - 60.0% of mass 95	49.7
95	Base peak, 100% relative abundance	100.0
96	5.0 - 9.0% of mass 95	7.4
173	Less than 2.0% of mass 174	0.8 (1.5)1
174	>50% of mass 95	53.0
175	5.0 - 9.0% of mass 174	4.7 (8.9)1
176	95.0 - 101.0% of mass 174	53.3 (100.6)1
177	5.0 - 9.0% of mass 176	3.6 (6.7)2

1-Value is % mass 174 2-Value is % mass 176

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	VSTD010	VSTD010	B15254.D	10/13/98	13:34
02	VBLKC	VBLK1013	B15255.D	10/13/98	14:08
03	CEF-16-10S-01DL	9809110-03BDL	B15256.D	10/13/98	14:43
04	VLCSC	VLCS1013	B15258.D	10/13/98	15:52

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKA

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: SAS No.: SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: VBLK0914

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14759.D

Level: (low/med) LOW Date Received:

% Moisture: not dec. Date Analyzed: 09/14/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	0.8	J
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	5.0	U
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	3.0	U
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKC

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: VBLK0923

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14926.D

Level: (low/med) LOW Date Received:

% Moisture: not dec. Date Analyzed: 09/23/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	1.0	J
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	0.3	J
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	3.0	U
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKA

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: VBLK0917

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14839.D

Level: (low/med) LOW Date Received:

% Moisture: not dec. Date Analyzed: 09/17/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	0.8	J
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	0.3	J
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	0.2	J
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKB

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: VBLK1007

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B15151.D

Level: (low/med) LOW Date Received:

% Moisture: not dec. Date Analyzed: 10/07/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	0.5	J
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	0.5	J
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	3.0	U
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A
VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKA

Lab Name: GP ENVIRONMENTAL Contract:

Lab Code: GPES Case No.: SAS No.: SDG No.:

Matrix: (soil/water) WATER Lab Sample ID: VBLK0921

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B14877.D

Level: (low/med) LOW Date Received:

% Moisture: not dec. Date Analyzed: 09/21/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: (uL) Soil Aliquot Volume: (uL)

CONCENTRATION UNITS:
(ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	0.6	J
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	0.3	J
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	3.0	U
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKC

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: VBLK1013

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B15255.D

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. _____ Date Analyzed: 10/13/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS:

CAS NO.	COMPOUND (ug/L or ug/Kg)	UG/L	Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	0.6	J
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	0.6	J
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	3.0	U
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

1A

VOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

VBLKA

Lab Name: GP ENVIRONMENTAL Contract: NUS_SOUT

Lab Code: GPES Case No.: _____ SAS No.: _____ SDG No.: _____

Matrix: (soil/water) WATER Lab Sample ID: VBLK1002

Sample wt/vol: 25.0 (g/ml) ML Lab File ID: B15104.D

Level: (low/med) LOW Date Received: _____

% Moisture: not dec. _____ Date Analyzed: 10/02/98

GC Column: RTXVOA ID: 0.53 (mm) Dilution Factor: 1.0

Soil Extract Volume: _____ (uL) Soil Aliquot Volume: _____ (uL)

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
74-87-3	Chloromethane	2.0	U
75-01-4	Vinyl chloride	1.0	U
75-00-3	Chloroethane	5.0	U
75-35-4	1,1-Dichloroethene	5.0	U
75-09-2	Methylene chloride	0.4	J
156-60-5	Trans-1,2-dichloroethene	5.0	U
75-34-3	1,1-Dichloroethane	5.0	U
156-59-2	Cis-1,2-dichloroethene	5.0	U
67-66-3	Chloroform	0.5	J
71-55-6	1,1,1-Trichloroethane	5.0	U
56-23-5	Carbon tetrachloride	3.0	U
107-06-2	1,2-Dichloroethane	3.0	U
79-01-6	Trichloroethene	3.0	U
78-87-5	1,2-Dichloropropane	5.0	U
10061-01-5	Cis-1,3-dichloropropene	0.2	U
10061-02-6	Trans-1,3-dichloropropene	0.2	U
79-00-5	1,1,2-Trichloroethane	5.0	U
127-18-4	Tetrachloroethene	3.0	U
108-90-7	Chlorobenzene	5.0	U
79-34-5	1,1,2,2-Tetrachloroethane	0.2	U

Quantitation Report (QT Reviewed)

Data File : J:\GCMSDATA\B\092398\B14930.D
Acq On : 23 Sep 98 13:05
Sample : 9809010-02ADL,250X
Misc : CEF-16-IW01-01,WF
Quant Time: Oct 8 12:00 1998

Vial: 1
Operator: WF
Inst : 5970 - B
Multiplr: 1.00
Quant Results File: 86_25BW1.RES

Quant Method : C:\HPCHEM\2\METHODS\86_25BW1.M
Title : USEPA Method 8260 Volatiles 25ml Purge
Last Update : Thu Oct 08 11:54:46 1998
Response via : Initial Calibration
DataAcq Meth : 86_25BW1

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) Fluorobenzene	11.66	96	629813	10.00 ug/L	0.10
35) 1,4-Diflurobenzene	11.83	114	596767	10.00 ug/L	0.12
52) Chlorobenzene-d5	16.45	117	383949	10.00 ug/L	0.12
System Monitoring Compounds					
33) 1,2-Dichloroethane-d4	11.07	65	187401	10.32 ug/L	0.10
Surrogate Spike 10.000	Range 80 - 120		Recovery = 103.20%		
47) Toluene-d8	14.13	98	529095	10.79 ug/L	0.10
Surrogate Spike 10.000	Range 88 - 110		Recovery = 107.90%		
67) 4-Bromofluorobenzene	18.44	95	471620	11.18 ug/L	0.12
Surrogate Spike 10.000	Range 86 - 115		Recovery = 111.80%		
83) 1,2-Dichlorobenzene-d4	20.99	152	213997	9.95 ug/L	0.12
Surrogate Spike 10.000	Range 80 - 120		Recovery = 99.50%		

Target Compounds					Qvalue
9) Methylene chloride	7.35	84	9372	0.31 ug/L	91
23) Cis-1,2-dichloroethene	9.74	96	16161	0.87 ug/L	90
26) Chloroform	10.01	83	18105	0.41 ug/L	96
28) 1,1,1-Trichloroethane	10.68	97	16096	0.53 ug/L	92
42) Trichloroethene	12.30	95	1212737	42.26 ug/L	97

(#) = qualifier out of range (m) = manual integration

CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT CTO 81 Cecil Field	JOB NUMBER 9809010
SUBJECT VOA	
BASED ON SW-846 8260B	DRAWING NUMBER
BY	CHECKED BY / APPROVED BY / DATE

CEF-16-IW01-01 trichloroethene 10565 µg/L 250DF

$$\frac{1212737}{596767} \times \frac{10}{0.422} = 48.16 \times 250 = 12040 \ \mu g/L$$

~~353947~~

CASE NARRATIVE

SEMI-VOLATILE

Client	:	NUS_SOUTHDIV
Work Order	:	98-09-102
SDG	:	N/A
Date	:	9/22/98

1. One water sample was received on 9/15/98. This sample was extracted and analyzed for one semivolatile organic compound, bis(2-Ethylhexyl)phthalate using USEPA method 8270C.

2. QC was shared with work order #98-09-101. Matrix spike and duplicate analysis was performed on sample RINSATEBLK1. A laboratory control sample was extracted and analyzed with this batch.

3. Manual integration was performed on some data files as integration provided by the software was inappropriate for this analysis.

W
9/22/98
MP 9/22/98

CASE NARRATIVE

SEMI-VOLATILE

Client	:	NUS_SOUTHDIV
Work Order	:	98-09-110
SDG	:	N/A
Date	:	9/22/98

1. Four water samples were received on 9/16/98. These samples were extracted and analyzed for one semivolatile organic compound, bis(2-Ethylhexyl)phthalate using USEPA method 8270C.

2. QC was shared with work order #98-09-101. Matrix spike and duplicate analysis was performed on sample RINSATEBLK1. A laboratory control sample was extracted and analyzed with this batch.

3. Manual integration was performed on some data files as integration provided by the software was inappropriate for this analysis.

W 9/22/98

MP 9/22/98

CASE NARRATIVE

SEMI-VOLATILE

Client	:	NUS_SOUTHDIV
Work Order	:	98-09-117/129
SDG	:	N/A
Date	:	09/29/98

1. Seven water samples were received on 09/17/98 and 09/18/98. The samples were extracted and analyzed for bis(2-Ethylhexyl)phthalate using USEPA method 8270C.

2. Matrix spike and matrix spike duplicate analysis was performed on blank spike.

HN
09.29.98

MP 10/5/98

CASE NARRATIVE

SEMI-VOLATILE

Client	:	NUS_SOUTHDIV
Work Order	:	98-09-149
SDG	:	N/A
Date	:	10/14/98

1. Five water samples were received on 9/23/98. These samples were extracted and analyzed for one semivolatile organic compound, bis(2-Ethylhexyl)phthalate using USEPA method 8270C.

2. QC was performed on a blank spike and blank spike duplicate.

3. Manual integration was performed on some data files as integration provided by the software was inappropriate for this analysis.

W 10/14/98

MP 10/15/98

2C
WATER SEMIVOLATILE SURROGATE RECOVERY

Lab Name: GPL_LABORATORIES Contract: NUS_SOUTHDIV

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

	EPA SAMPLE NO.	S1 (NBZ) #	S2 (FBP) #	S3 (TPH) #	TOT OUT
01	SBLKA	81	75	82	0
02	LCSA	90	81	86	0
03	CEF1643S01	43	41 *	48	~~0~~ 1
04	CEF1644I01	74	66	69	0
05	CEF1610S01	72	70	72	0
06	CEF1609D01	81	67	76	0

MP 9-22-98

				QC LIMITS
S1	(NBZ)	=	Nitrobenzene-d5	(35-114)
S2	(FBP)	=	2-Fluorobiphenyl	(43-116)
S3	(TPH)	=	Terphenyl-d14	(33-141)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogate diluted out

2C
WATER SEMIVOLATILE SURROGATE RECOVERY

Lab Name: GPLL_LABORATORIES Contract: NUS_SOUTHDIV

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

	EPA SAMPLE NO.	S1 (2FP) #	S2 (PHL) #	S3 (NBZ) #	S4 (FBP) #	S5 (TBP) #	S6 (TPH) #	TOT OUT
01	CEF1645I01	44	47	63	80	108	157*	1
02	CEF1611DD01	49	51	75	94	89	148*	1
03	SBLKA	47	50	71	76	65	135	0
04	SBLK407MS	50	57	74	94	82	100	0
05	SBLK407MSD	48	56	79	80	90	122	0
06	CEF1621S01	65	63	70	84	74	147*	1
07	CEF1623D01	51	53	66	77	78	136	0
08	CEF16DP101	65	59	73	83	83	140*	0 1
09	CEF1642I01	31	43	74	84	52	120	0
10	CEF1622I01	62	62	73	76	69	143*	1

HN 09.29.98

				QC LIMITS
S1	(2FP)	=	2-Fluorophenol	(21-100)
S2	(PHL)	=	Phenol-d5	(10-94)
S3	(NBZ)	=	Nitrobenzene-d5	(35-114)
S4	(FBP)	=	2-Fluorobiphenyl	(43-116)
S5	(TBP)	=	2,4,6-Tribromophenol	(10-123)
S6	(TPH)	=	Terphenyl-d14	(33-141)

Column to be used to flag recovery values

* Values outside of contract required QC limits

D Surrogate diluted out

5B-8270

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Lab File ID: C16981.D DFTPP Injection Date: 09/18/98

Instrument ID: HP#C DFTPP Injection Time: 11:22

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	54.7
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 Relative abundance	63.7
70	Less than 2.0% of mass 69	0.3 (0.4)1
127	40.0 - 60.0% of mass 198	44.2
197	Less than 1.0% of mass 198	0.5
198	Base Peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	7.4
275	10.0 - 30.0% of mass 198	22.9
365	Greater than 1.0% of mass 198	2.4
441	Present, but less than mass 443	13.1
442	40.0 - 110.0% of mass 198	85.5
443	17.0 - 23.0% of mass 442	17.8 (20.8)2

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	C16982.D	09/18/98	11:38
02	SSTD160	SSTD160	C16983.D	09/18/98	12:25
03	SSTD010	SSTD010	C16984.D	09/18/98	13:16
04	SSTD020	SSTD020	C16985.D	09/18/98	14:04
05	SSTD080	SSTD080	C16986.D	09/18/98	14:54
06	SSTD120	SSTD120	C16987.D	09/18/98	15:42

Response Factor Report 5970 - In

Method : C:\HPCHEM\1\METHODS\ME8270C.M
Title : SW-846 Method 8270
Last Update : Sat Sep 19 09:00:15 1998
Response via : Initial Calibration

Calibration Files
50 =C16982.D 160 =C16983.D 10 =C16984.D
20 =C16985.D 80 =C16986.D 120 =C16987.D

		Compound	50	160	10	20	80	120	Avg	%RSD
41)	T	2,6-Dinitrotoluene	0.370	0.329	0.377	0.363	0.357	0.353	0.358	4.64
42)	MC	Acenaphthene	1.134	0.792	1.446	1.316	1.005	0.912	1.101	22.52
43)	T	3-Nitroaniline	0.310	0.248	0.412	0.362	0.289	0.267	0.315	19.65
44)	TP	2,4-Dinitrophenol	0.181	0.181	0.133	0.144	0.194	0.188	0.170	14.78
45)	T	Dibenzofuran	1.575	1.250	1.944	1.725	1.465	1.352	1.552	16.38
46)	M	2,4-Dinitrotoluene	0.491	0.450	0.497	0.486	0.486	0.473	0.480	3.54
47)	MP	4-Nitrophenol	0.171	0.155	0.191	0.178	0.176	0.160	0.172	7.45
48)	T	Fluorene	1.129	0.840	1.530	1.394	1.010	0.912	1.136	24.12
49)	T	4-Chlorophenyl-phen	0.622	0.509	0.777	0.718	0.615	0.561	0.634	15.61
50)	T	Diethylphthalate	1.432	1.162	1.727	1.650	1.395	1.281	1.441	14.93
51)	T	4-Nitroaniline	0.338	0.263	0.424	0.407	0.326	0.288	0.341	18.73
52)	S	2,4,6 Tribromopheno	0.299	0.279	0.309	0.308	0.303	0.289	0.298	3.96
53)	I	Phenanthrene-d10	----------	----------	----------	ISTD	----------	----------	----------	
54)	T	4,6-Dinitro-2-methy	0.133	0.137	0.136	0.132	0.146	0.129	0.135	4.20
55)	TC	n-Nitrosodiphenylam	0.494	0.458	0.633	0.577	0.520	0.456	0.523	13.39
56)	T	4-Bromophenyl-pheny	0.204	0.182	0.254	0.234	0.207	0.191	0.212	12.84
57)	T	Hexachlorobenzene	0.316	0.276	0.399	0.374	0.319	0.292	0.329	14.50
58)	MC	Pentachlorophenol	0.189	0.193	0.161	0.164	0.202	0.188	0.183	9.04
59)	T	Benzidine	0.006	0.006	0.006	0.006	0.007	0.006	0.006#	2.23
60)	T	Phenanthrene	0.974	0.786	1.261	1.103	0.928	0.883	0.989	17.12
61)	T	Anthracene	0.988	0.802	1.226	1.104	0.951	0.883	0.992	15.41
62)	T	Carbazole	0.889	0.773	1.123	1.016	0.892	0.824	0.920	14.00
63)	T	Di-n-butylphthalate	1.430	1.126	1.757	1.532	1.303	1.218	1.394	16.47
64)	TC	Fluoranthene	1.030	0.887	1.361	1.155	1.020	0.872	1.054	17.36
65)	I	Chrysene-d12	----------	----------	----------	ISTD	----------	----------	----------	
66)	M	Pyrene	1.159	1.127	1.497	1.391	1.234	1.218	1.271	11.28
67)	S	Terphenyl-d14	0.788	0.756	1.041	0.968	0.838	0.827	0.870	12.73
68)	T	Butylbenzylphthalat	0.715	0.707	0.861	0.836	0.768	0.762	0.775	8.09
69)	T	3,3'-Dichlorobenzid	0.452	0.391	0.529	0.485	0.436	0.409	0.450	11.31
70)	T	Benzo[a]anthracene	1.165	1.138	1.379	1.288	1.171	1.165	1.218	7.79
71)	T	Chrysene	1.111	1.026	1.278	1.228	1.094	1.090	1.138	8.37
72)	T	bis(2-Ethylhexyl)ph	1.069	0.945	1.186	1.155	1.012	1.027	1.066	8.54
73)	I	Perylene-d12	----------	----------	----------	ISTD	----------	----------	----------	
74)	TC	Di-n-octylphthalate	1.804	1.789	2.079	1.987	1.862	1.989	1.918	6.10
75)	T	Benzo[b]fluoranthen	1.294	1.188	1.386	1.295	1.247	1.332	1.290	5.29
76)	T	Benzo[k]fluoranthen	1.139	1.052	1.318	1.228	1.112	1.211	1.177	8.05
77)	TC	Benzo[a]pyrene	1.095	1.106	1.279	1.205	1.133	1.135	1.159	6.07
78)	T	Indeno[1,2,3-cd]pyr	1.291	0.967	1.421	1.350	1.206	1.176	1.235	12.90
79)	T	Dibenz[a,h]anthrace	1.060	0.859	1.155	1.139	1.007	0.955	1.029	10.98
80)	T	Benzo[g,h,i]perylen	0.984	0.703	1.149	1.130	1.001	0.973	0.990	16.15

(#) = Out of Range

5B-8270

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Lab File ID: C16996.D DFTPP Injection Date: 09/18/98

Instrument ID: HP#C DFTPP Injection Time: 22:32

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	54.8
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 Relative abundance	61.6
70	Less than 2.0% of mass 69	0.3 (0.5)1
127	40.0 - 60.0% of mass 198	42.7
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	7.3
275	10.0 - 30.0% of mass 198	23.3
365	Greater than 1.0% of mass 198	2.4
441	Present, but less than mass 443	14.4
442	40.0 - 110.0% of mass 198	91.9
443	17.0 - 23.0% of mass 442	18.8 (20.5)2

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	C16997.D	09/18/98	22:50
02	SBLKA	SBLK-402	C17002.D	09/19/98	03:01
03	LCSA	SBLK-402MS	C17003.D	09/19/98	03:52
04	CEF1641501	9809102-01G	C17007.D	09/19/98	07:13

5B-8270

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Lab File ID: C16996.D DFTPP Injection Date: 09/18/98

Instrument ID: HP#C DFTPP Injection Time: 22:32

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	54.8
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 Relative abundance	61.6
70	Less than 2.0% of mass 69	0.3 (0.5)1
127	40.0 - 60.0% of mass 198	42.7
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	7.3
275	10.0 - 30.0% of mass 198	23.3
365	Greater than 1.0% of mass 198	2.4
441	Present, but less than mass 443	14.4
442	40.0 - 110.0% of mass 198	91.9
443	17.0 - 23.0% of mass 442	18.8 (20.5)2

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	C16997.D	09/18/98	22:50
02	SBLKA	SBLK-402	C17002.D	09/19/98	03:01
03	LCSA	SBLK-402MS	C17003.D	09/19/98	03:52
04	CEF1643S01	9809110-01G	C17008.D	09/19/98	08:03
05	CEF1644I01	9809110-02G	C17009.D	09/19/98	08:54
06	CEF1610S01	9809110-03G	C17010.D	09/19/98	09:41

5B-8270

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Lab File ID: C17011.D DFTPP Injection Date: 09/19/98

Instrument ID: HP#C DFTPP Injection Time: 10:28

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	55.8
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 Relative abundance	62.3
70	Less than 2.0% of mass 69	0.3 (0.5)1
127	40.0 - 60.0% of mass 198	44.9
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	7.3
275	10.0 - 30.0% of mass 198	23.3
365	Greater than 1.0% of mass 198	2.5
441	Present, but less than mass 443	14.7
442	40.0 - 110.0% of mass 198	94.7
443	17.0 - 23.0% of mass 442	19.5 (20.6)2

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	C17012.D	09/19/98	10:44
02	CEF1609D01	9809110-04G	C17013.D	09/19/98	11:31

5B-8270

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: GPLL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Lab File ID: D12960.D DFTPP Injection Date: 09/22/98

Instrument ID: HP#D DFTPP Injection Time: 09:47

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	58.2
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 Relative abundance	61.9
70	Less than 2.0% of mass 69	0.5 (0.8)1
127	40.0 - 60.0% of mass 198	43.3
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	7.1
275	10.0 - 30.0% of mass 198	24.4
365	Greater than 1.0% of mass 198	2.5
441	Present, but less than mass 443	10.1
442	40.0 - 110.0% of mass 198	65.4
443	17.0 - 23.0% of mass 442	13.0 (19.9)2

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	D12961.D	09/22/98	10:11
02	SSTD020	SSTD020	D12964.D	09/22/98	13:19
03	SSTD080	SSTD080	D12965.D	09/22/98	14:18
04	SSTD120	SSTD120	D12966.D	09/22/98	15:15
05	SSTD160	SSTD160	D12967.D	09/22/98	16:14
06	SSTD010	SSTD010	D12969.D	09/22/98	18:12

6C
SEMIVOLATILE ORGANICS INITIAL CALIBRATION DATA

Lab Name: GPLL_LABORATORIES Contract: NUS_SOUTH

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Instrument ID: HP#D Calibration Date(s): 09/22/98 09/22/98

Calibration Times: 10:11 18:12

LAB FILE ID: RRF10 = D12969.D RRF20 = D12964.D RRF160 = D12967.D
RRF50 = D12961.D RRF80 = D12965.D RRF120 = D12966.D

COMPOUND		RRF10	RRF20	RRF50	RRF80	RRF120	RRF160	$\overline{RRF}$	% RSD
4-Nitrophenol	*		0.114	0.149	0.131	0.133	0.130	0.132	9.4
Fluorene		1.474	1.474	1.110	0.971	0.876	0.780	1.114	26.9
4-Chlorophenyl-phenylether		0.645	0.633	0.589	0.501	0.441	0.347	0.526	22.4
Diethylphthalate		1.621	1.626	1.364	1.287	1.188	1.023	1.351	17.7
4-Nitroaniline		0.293	0.344	0.302	0.256	0.242	0.234	0.278	15.1
4,6-Dinitro-2-methylphenol			0.114	0.144	0.137	0.134	0.142	0.134	9.1
n-Nitrosodiphenylamine	*	0.546	0.592	0.537	0.497	0.438	0.427	0.506	12.8
4-Bromophenyl-phenylether		0.176	0.185	0.162	0.151	0.142	0.132	0.158	12.9
Hexachlorobenzene		0.216	0.221	0.193	0.176	0.161	0.153	0.187	15.1
Benzidine		0.005	0.007	0.006	0.006	0.007	0.007	0.006	10.5
Pentachlorophenol	*		0.063	0.089	0.086	0.095	0.099	0.086	16.4
Phenanthrene		1.131	1.181	1.005	0.915	0.825	0.749	0.968	17.6
Anthracene		1.129	1.155	1.012	0.938	0.803	0.769	0.968	16.7
Carbazole		0.887	0.983	0.912	0.814	0.775	0.732	0.850	11.0
Di-n-butylphthalate		1.633	1.788	1.449	1.354	1.204	1.117	1.424	17.9
Fluoranthene	*	0.956	1.068	0.998	0.859	0.813	0.771	0.911	12.6
Pyrene		1.750	1.764	1.576	1.641	1.423	1.382	1.589	10.1
Butylbenzylphthalate		1.094	1.188	1.061	1.121	0.993	0.937	1.065	8.5
3,3'-Dichlorobenzidine		0.363	0.443	0.409	0.363	0.339	0.329	0.374	11.6
Benzo[a]anthracene		1.184	1.321	1.212	1.242	1.221	1.211	1.232	3.9
Chrysene		1.171	1.276	1.164	1.141	1.123	1.079	1.159	5.7
bis(2-Ethylhexyl)phthalate		1.614	1.808	1.579	1.707	1.466	1.365	1.590	10.1
Di-n-octylphthalate	*	2.616	3.223	2.893	3.134	2.776	2.573	2.869	9.3
Benzo[b]fluoranthene		1.216	1.456	1.240	1.335	1.314	1.352	1.319	6.5
Benzo[k]fluoranthene		1.248	1.344	1.243	1.166	1.202	1.127	1.222	6.2
Benzo[a]pyrene	*	1.049	1.309	1.170	1.097	1.112	1.073	1.135	8.3
Indeno[1,2,3-cd]pyrene		1.213	1.316	1.131	1.099	1.244	1.169	1.195	6.6
Dibenz[a,h]anthracene		1.036	1.162	0.874	0.916	0.964	1.043	0.999	10.4
Benzo[g,h,i]perylene		0.956	1.085	0.981	0.961	1.034	1.030	1.008	5.0
2-Fluorophenol		1.228	1.283	1.164	1.125	1.096	1.089	1.164	6.7
Phenol-d5		1.725	2.056	1.699	1.740	1.694	1.662	1.763	8.3
Nitrobenzene-d5		0.423	0.466	0.421	0.392	0.401	0.373	0.413	7.8
2-Fluorobiphenyl		1.239	1.308	1.052	0.957	0.892	0.810	1.043	18.9
2,4,6-Tribromophenol		0.104	0.135	0.129	0.106	0.112	0.106	0.115	11.8
Terphenyl-d14		1.120	1.132	0.987	1.026	0.905	0.856	1.004	11.1

(1) Cannot be separated from Diphenylamine
* Compounds with required minimum RRF and maximum %RSD values.
All other compounds must meet a minimum RRF of 0.010.

5B-8270

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: GPLL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Lab File ID: D13025.D DFTPP Injection Date: 09/25/98

Instrument ID: HP#D DFTPP Injection Time: 09:57

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	57.4
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 Relative abundance	59.0
70	Less than 2.0% of mass 69	0.0 (0.0)1
127	40.0 - 60.0% of mass 198	40.2
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	7.6
275	10.0 - 30.0% of mass 198	24.5
365	Greater than 1.0% of mass 198	2.5
441	Present, but less than mass 443	10.4
442	40.0 - 110.0% of mass 198	61.0
443	17.0 - 23.0% of mass 442	12.5 (20.4)2

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	D13026.D	09/25/98	10:17
02	CEF1645I01	9809117-01G	D13037.D	09/25/98	20:15
03	CEF1611DD01	9809117-02G	D13038.D	09/25/98	21:12

5B-8270

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: GPLL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Lab File ID: D13041.D DFTPP Injection Date: 09/25/98

Instrument ID: HP#D DFTPP Injection Time: 23:17

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	59.1
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 Relative abundance	56.5
70	Less than 2.0% of mass 69	0.0 (0.0)1
127	40.0 - 60.0% of mass 198	40.8
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	6.4
275	10.0 - 30.0% of mass 198	25.5
365	Greater than 1.0% of mass 198	2.9
441	Present, but less than mass 443	11.5
442	40.0 - 110.0% of mass 198	64.9
443	17.0 - 23.0% of mass 442	12.8 (19.8)2

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	D13042.D	09/25/98	23:37
02	SBLKA	SBLK-407	D13043.D	09/26/98	00:35
03	SBLK407MS	SBLK-407MS	D13044.D	09/26/98	01:32
04	SBLK407MSD	SBLK-407MSD	D13045.D	09/26/98	02:29
05	CEF1621S01	9809117-03G	D13046.D	09/26/98	03:27
06	CEF1623D01	9809117-04G	D13047.D	09/26/98	04:24
07	CEF16DP101	9809117-05G	D13048.D	09/26/98	05:21
08	CEF1642I01	9809129-01G	D13049.D	09/26/98	06:19
09	CEF1622I01	9809129-02G	D13050.D	09/26/98	07:16

5B-8270

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Lab File ID: C17437.D DFTPP Injection Date: 10/13/98

Instrument ID: HP#C DFTPP Injection Time: 09:31

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	36.4
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 Relative abundance	49.1
70	Less than 2.0% of mass 69	0.2 (0.4)1
127	40.0 - 60.0% of mass 198	49.7
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	7.1
275	10.0 - 30.0% of mass 198	22.4
365	Greater than 1.0% of mass 198	2.4
441	Present, but less than mass 443	10.2
442	40.0 - 110.0% of mass 198	67.9
443	17.0 - 23.0% of mass 442	13.7 (20.1)2

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	C17438.D	10/13/98	09:49
02	SSTD160	SSTD160	C17439.D	10/13/98	10:40
03	SSTD010	SSTD010	C17440.D	10/13/98	11:30
04	SSTD020	SSTD020	C17441.D	10/13/98	12:21
05	SSTD080	SSTD080	C17442.D	10/13/98	13:12
06	SSTD120	SSTD120	C17443.D	10/13/98	14:04

Response Factor Report 5970 - In

Method : C:\HPCHEM\1\METHODS\ME8270C.M
Title : SW-846 Method 8270
Last Update : Tue Oct 13 15:07:03 1998
Response via : Initial Calibration

Calibration Files
50 =C17438.D 160 =C17439.D 10 =C17440.D
20 =C17441.D 80 =C17442.D 120 =C17443.D

		Compound	50	160	10	20	80	120	Avg	%RSD
41)	T	2,6-Dinitrotoluene	0.342	0.351	0.309	0.339	0.344	0.374	0.343	6.19
42)	MC	Acenaphthene	1.169	1.187	1.163	1.230	1.178	1.243	1.195	2.81
43)	T	3-Nitroaniline	0.303	0.215	0.314	0.366	0.276	0.229	0.284	19.81
44)	TP	2,4-Dinitrophenol	0.145	0.186		0.118	0.189	0.205	0.169	21.27
45)	T	Dibenzofuran	1.551	1.625	1.599	1.752	1.664	1.681	1.645	4.26
46)	M	2,4-Dinitrotoluene	0.451	0.501	0.393	0.441	0.482	0.514	0.464	9.65
47)	MP	4-Nitrophenol	0.142	0.161	0.105	0.128	0.168	0.163	0.144	16.93
48)	T	Fluorene	1.261	1.238	1.300	1.385	1.320	1.282	1.298	3.96
49)	T	4-Chlorophenyl-phen	0.591	0.632	0.592	0.613	0.613	0.616	0.609	2.58
50)	T	Diethylphthalate	1.382	1.441	1.362	1.523	1.457	1.492	1.443	4.30
51)	T	4-Nitroaniline	0.319	0.320	0.347	0.373	0.366	0.356	0.347	6.62
52)	S	2,4,6 Tribromopheno	0.203	0.224	0.167	0.186	0.207	0.210	0.200	10.13
53)	I	Phenanthrene-d10	----------	----------	----------	ISTD	----------	----------	----------	
54)	T	4,6-Dinitro-2-methy	0.139	0.136	0.090	0.122	0.143	0.142	0.129	16.01
55)	TC	n-Nitrosodiphenylam	0.560	0.538	0.531	0.561	0.521	0.528	0.540	3.16
56)	T	4-Bromophenyl-pheny	0.191	0.190	0.177	0.195	0.186	0.179	0.186	3.84
57)	T	Hexachlorobenzene	0.274	0.254	0.244	0.270	0.252	0.246	0.257	4.92
58)	MC	Pentachlorophenol	0.150	0.154	0.102	0.136	0.155	0.151	0.141	14.51
59)	T	Benzidine	0.006	0.006	0.005	0.006	0.006	0.006	0.006#	5.60
60)	T	Phenanthrene	1.035	0.990	1.008	1.121	1.043	1.009	1.034	4.52
61)	T	Anthracene	1.042	1.003	0.989	1.099	1.052	1.038	1.037	3.76
62)	T	Carbazole	0.929	0.930	0.922	1.033	0.966	0.953	0.956	4.36
63)	T	Di-n-butylphthalate	1.421	1.242	1.377	1.573	1.381	1.319	1.385	7.99
64)	TC	Fluoranthene	0.981	0.960	1.017	1.189	1.039	1.014	1.033	7.87
65)	I	Chrysene-d12	----------	----------	----------	ISTD	----------	----------	----------	
66)	M	Pyrene	1.517	1.584	1.484	1.492	1.446	1.416	1.490	3.92
67)	S	Terphenyl-d14	0.966	1.004	0.939	0.952	0.919	0.885	0.944	4.31
68)	T	Butylbenzylphthalat	0.888	0.913	0.823	0.888	0.878	0.883	0.879	3.40
69)	T	3,3'-Dichlorobenzid	0.399	0.351	0.390	0.425	0.417	0.361	0.390	7.64
70)	T	Benzo[a]anthracene	1.211	1.242	1.180	1.321	1.233	1.246	1.239	3.81
71)	T	Chrysene	1.119	1.152	1.114	1.238	1.178	1.146	1.158	3.96
72)	T	bis(2-Ethylhexyl)ph	1.208	1.252	1.167	1.264	1.267	1.217	1.229	3.18
73)	I	Perylene-d12	----------	----------	----------	ISTD	----------	----------	----------	
74)	TC	Di-n-octylphthalate	2.490	2.796	2.243	2.542	2.593	2.927	2.599	9.24
75)	T	Benzo[b]fluoranthen	1.378	1.484	1.260	1.517	1.465	1.566	1.445	7.61
76)	T	Benzo[k]fluoranthen	1.280	1.397	1.252	1.437	1.431	1.501	1.383	7.01
77)	TC	Benzo[a]pyrene	1.152	1.247	1.112	1.249	1.224	1.269	1.209	5.19
78)	T	Indeno[1,2,3-cd]pyr	1.014	1.012	0.871	0.945	1.000	0.952	0.966	5.72
79)	T	Dibenz[a,h]anthrace	0.829	0.850	0.701	0.760	0.851	0.799	0.798	7.38
80)	T	Benzo[g,h,i]perylen	0.792	0.701	0.698	0.768	0.753	0.676	0.731	6.31

(#) = Out of Range

5B-8270

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Lab File ID: C17445.D DFTPP Injection Date: 10/13/98

Instrument ID: HP#C DFTPP Injection Time: 16:34

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	40.1
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 Relative abundance	53.0
70	Less than 2.0% of mass 69	0.3 (0.5)1
127	40.0 - 60.0% of mass 198	51.9
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	7.3
275	10.0 - 30.0% of mass 198	20.0
365	Greater than 1.0% of mass 198	2.0
441	Present, but less than mass 443	8.5
442	40.0 - 110.0% of mass 198	54.5
443	17.0 - 23.0% of mass 442	11.0 (20.1)2

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	C17446.D	10/13/98	16:51
02	SBLKA	SBLK-419	C17453.D	10/13/98	23:04
03	SBLKAMS	SBLK-419MS	C17454.D	10/13/98	23:58
04	CEF1635S01	9809149-03G	C17458.D	10/14/98	03:33
05	CEF1627I01	9809149-04G	C17459.D	10/14/98	04:26

5B-8270

SEMIVOLATILE ORGANIC INSTRUMENT PERFORMANCE CHECK

DECAFLUOROTRIPHENYLPHOSPHINE (DFTPP)

Lab Name: GPLL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Lab File ID: C17461.D DFTPP Injection Date: 10/14/98

Instrument ID: HP#C DFTPP Injection Time: 08:38

m/e	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE
51	30.0 - 60.0% of mass 198	31.9
68	Less than 2.0% of mass 69	0.0 (0.0)1
69	Mass 69 Relative abundance	44.0
70	Less than 2.0% of mass 69	0.2 (0.5)1
127	40.0 - 60.0% of mass 198	46.9
197	Less than 1.0% of mass 198	0.0
198	Base Peak, 100% relative abundance	100.0
199	5.0 to 9.0% of mass 198	7.6
275	10.0 - 30.0% of mass 198	21.5
365	Greater than 1.0% of mass 198	2.4
441	Present, but less than mass 443	10.6
442	40.0 - 110.0% of mass 198	71.4
443	17.0 - 23.0% of mass 442	14.8 (20.8)2

1-Value is % mass 69 2-Value is % mass 442

THIS CHECK APPLIES TO THE FOLLOWING SAMPLES, MS, MSD, BLANKS, AND STANDARDS:

	EPA SAMPLE NO.	LAB SAMPLE ID	LAB FILE ID	DATE ANALYZED	TIME ANALYZED
01	SSTD050	SSTD050	C17462.D	10/14/98	08:55
02	CEF16DP201	9809149-05G	C17463.D	10/14/98	09:49
03	CEF1632S01	9809149-01G	C17466.D	10/14/98	12:22
04	CEF1633S01	9809149-02G	C17467.D	10/14/98	13:16
05	SBLKAMSD	SBLK-419MSD	C17468.D	10/14/98	14:07

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

SBLKA

Lab Name: GPL_LABORATORIES Contract: NUS_SOUT

Lab Code: GPLL Case No.: N/A SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: SBLK-419

Sample wt/vol: 1000 (g/ml) ML Lab File ID: C17453.D

Level: (low/med) LOW Date Received:

% Moisture: decanted:(Y/N) N Date Extracted: 09/28/98

Concentrated Extract Volume: 1000 (uL) Date Analyzed: 10/13/98

Injection Volume: 1.0 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7

CONCENTRATION UNITS: (ug/L or ug/Kg) UG/L

CAS NO.	COMPOUND		Q
117-81-7	bis(2-Ethylhexyl)phthalate	1	J

extracted w/SDG 9809149
LLK 10/28

Quantitation Report

Data File : H:\GCMSDATA\C\OCT1398\C17459.D Vial: 15
Acq On : 14 Oct 98 4:26 Operator: CJD
Sample : 9809149-04G Inst : 5970 - In
Misc : CEF1627I01 NUS_SOUTHDIV 960mls. HP#C CJD Multiplr: 1.00
Quant Time: Oct 14 10:26 1998

Method : C:\HPCHEM\1\METHODS\ME8270C.M
Title : SW-846 Method 8270
Last Update : Tue Oct 13 15:07:03 1998
Response via : Initial Calibration

Internal Standards	R.T.	QIon	Response	Conc Units	Dev(Min)
1) 1,4-Dichlorobenzene-d4	11.86	152	1427394	40.00 ug/ml	0.01
17) Naphthalene-d8	14.19	136	4599712	40.00 ug/ml	0.00
32) Acenaphthene-d10	17.43	164	2496911	40.00 ug/ml	0.00
53) Phenanthrene-d10	20.21	188	4173740	40.00 ug/ml	0.00
65) Chrysene-d12	26.19	240	2982820	40.00 ug/ml	0.01
73) Perylene-d12	33.29	264	2081528	40.00 ug/ml	0.04
System Monitoring Compounds					%Recovery
3) 2-Fluorophenol	9.51	112	2325607	51.87 ug/ml	25.94%
5) Phenol-d5	11.06	99	4631337	87.43 ug/ml	43.71%
18) Nitrobenzene-d5	12.84	82	2821765	60.16 ug/ml	60.16%
36) 2-Fluorobiphenyl	16.09	172	5553527	69.28 ug/ml	69.28%
52) 2,4,6 Tribromophenol	18.89	330	2239645	179.83 ug/ml	89.92%
67) Terphenyl-d14	23.11	244	6047673	85.89 ug/ml	85.89%
Target Compounds					Qvalue
72) bis(2-Ethylhexyl)phthalate	25.54	149	921322	10.05 ug/ml	97

10/14/98

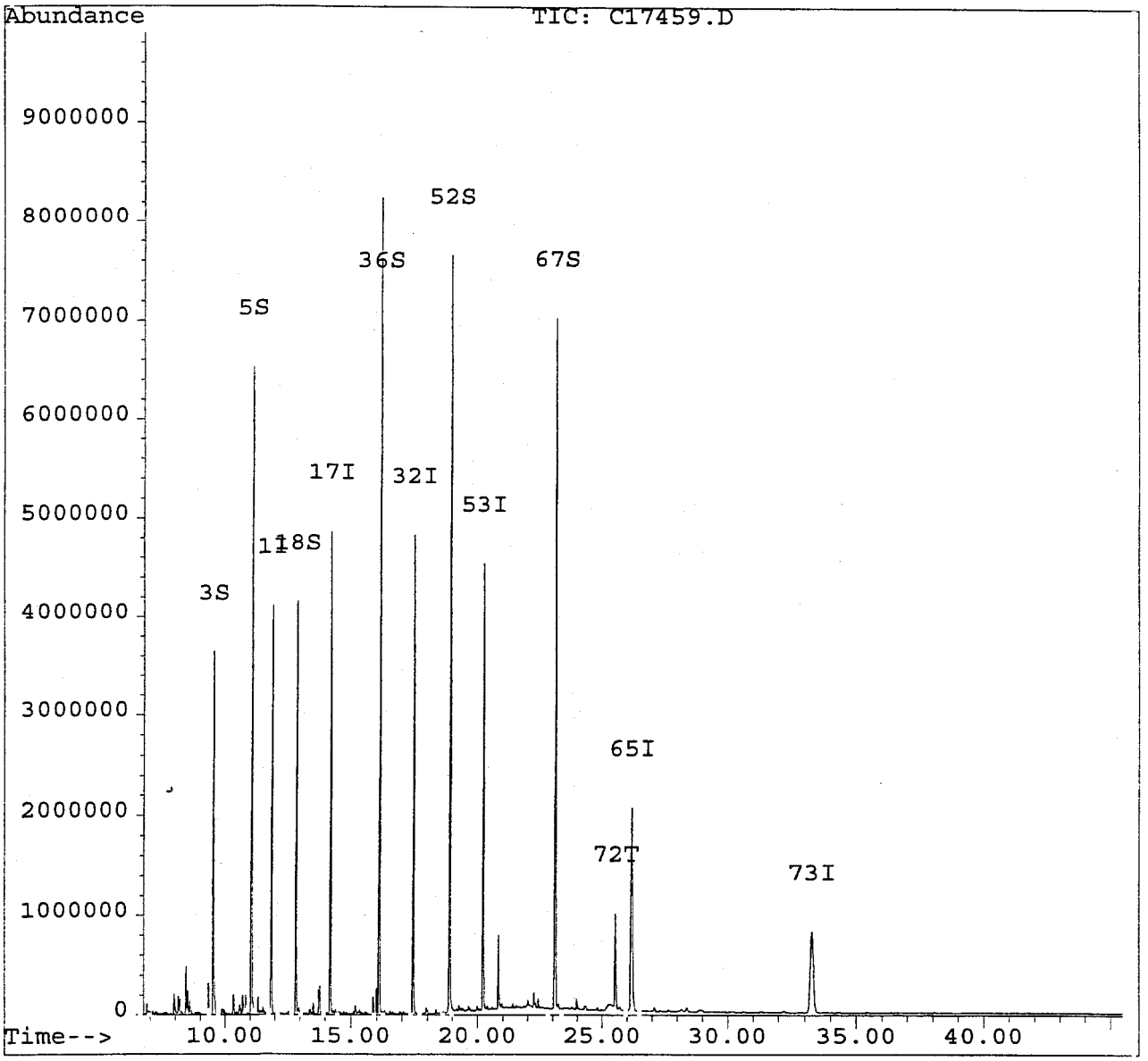
(#) = qualifier out of range (m) = manual integration

Quantitation Report

Data File : H:\GCMSDATA\C\OCT1398\C17459.D
Acq On : 14 Oct 98 4:26
Sample : 9809149-04G
Misc : CEF1627I01 NUS_SOUTHDIV 960mls. HP#C CJD
Quant Time: Oct 14 10:26 1998

Vial: 15
Operator: CJD
Inst : 5970 - In
Multiplr: 1.00

Method : C:\HPCHEM\1\METHODS\ME8270C.M
Title : SW-846 Method 8270
Last Update : Wed Oct 14 10:10:27 1998
Response via : Single Level Calibration



CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT CTO 51 Cecil Field	JOB NUMBER 9809149
SUBJECT SVOA	
BASED ON SW-846 8270C	DRAWING NUMBER
BY [signature] / CHECKED BY	APPROVED BY JAD / DATE 10-5-98

CEF-16-271-01 BEHP 11 µg/L

$$\frac{921322}{2982820} \times \frac{40}{1.229} = 10.05 \times \frac{1000\,\mu l}{960\,ml} = 10.47\ \mu g/L$$

CASE NARRATIVE

DISSOLVED GASES IN WATER

Client : NUS_SOUTHDIV

W.O. No. : 9809102

SDG# : N/A

Date : October 9, 1998

1. One water sample was received on September 15, 1998. The sample was analyzed for dissolved gases by GC (FID).

2. MS/MSD analyses were shared with wo# 9809117 and performed on sample D CEF-16-45I-01M.

TAR
10/9/98
MP 10/9/98

CASE NARRATIVE

DISSOLVED GASES IN WATER

Client : NUS_SOUTHDIV

W.O. No. : 9809110

SDG# : N/A

Date : October 9, 1998

1. Four water samples were received on September 16, 1998. The samples were analyzed for dissolved gases by GC (FID).

2. MS/MSD analyses were shared with wo# 9809117 and performed on sample D CEF-16-45I-01M.

3. Due to high methane levels, samples CEF-16-44I-01, CEF-16-10S-01, and CEF-16-09D-01 were reanalyzed at a dilution.

JK 10/9/98

MP 10/9/98

CASE NARRATIVE

DISSOLVED GASES IN WATER

Client : NUS_SOUTHDIV

W.O. No. : 9809117

SDG# : N/A

Date : October 9, 1998

1. Five water samples were received on September 17, 1998. The samples were analyzed for dissolved gases by GC (FID).

2. MS/MSD analyses were performed on sample D CEF-16-45I-01M.

3. Due to high methane levels, samples D CEF-16-11DD-01 and D CEF-16-23D-01 were reanalyzed at a dilution.

JK 10/9/98

CASE NARRATIVE

DISSOLVED GASES IN WATER

Client : NUS_SOUTHDIV

W.O. No. : 9809129

SDG# : N/A

Date : October 9, 1998

1. Two water samples were received on September 18, 1998. The samples were analyzed for dissolved gases by GC (FID).

2. MS/MSD analyses were shared with wo# 9809117 and performed on sample D CEF-16-45I-01M.

TK
10/9/98
MP 10/9/98

CASE NARRATIVE

DISSOLVED GASES and ALCOHOLS IN WATER

Client : NUS_SOUTHDIV

W.O. No. : 9809149

SDG# : N/A

Date : October 12, 1998

1. Five water samples were received on September 23, 1998. The samples were analyzed for dissolved gases by GC (FID).

2. MS/MSD analyses for dissolved gases were shared with WO# 9809~~7~~117 performed on sample D CEF-16-45I-01. TR 10/12/98

3. Due to high methane levels, sample D CEF-16-35S-01 was reanalyzed at a dilution.

TR
10/12/98

MA 10/15/98

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GBLKA

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809102 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: GBLKA

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11370.D

Level: (low/med) LOW Date Received: 09/15/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 09/28/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	2.2	J
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

1B

SEMIVOLATILE ORGANICS ANALYSIS DATA SHEET

EPA SAMPLE NO.

GBLKA

Lab Name: GPL LABORATORIES Contract: NUS_SOUT

Lab Code: GPES Case No.: 9809129 SAS No.: N/A SDG No.: N/A

Matrix: (soil/water) WATER Lab Sample ID: GBLKA

Sample wt/vol: 10 (g/ml) ML Lab File ID: N11491.D

Level: (low/med) LOW Date Received: 09/18/98

% Moisture: _____ decanted:(Y/N) N Date Extracted: _____

Concentrated Extract Volume: 1 (uL) Date Analyzed: 10/01/98

Injection Volume: 500. (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: _____

CONCENTRATION UNITS:

CAS NO.	COMPOUND	(ug/L or ug/Kg) UG/L	Q
74-82-8	Methane	1.7	J
74-84-0	Ethane	5.8	U
74-85-1	Ethylene	6.2	U

Method : H:\GCLCDATA\GAS\GASFID.M
Title : DISSOLVED GASES
Last Update : Fri Sep 18 14:03:30 1998

Calibration Files
1 =N11242.D 2 =N11240.D 4 =N11241.D
5 =N11243.D 10 =N11244.D

		Compound	1	2	4	5	10	Avg	%RSD
1)	T	Methane	142.0	154.3	109.3	114.2	96.7	123.3	19.44
2)	T	Ethane	16.7	17.3	18.2	19.2	17.0	17.7	5.69
3)	T	Ethylene	15.7	14.0	13.4	13.9	12.7	13.9	7.95
4)	T	Propane	18.1	16.4	11.1	9.2	7.4	12.4	37.30

#) = Out of Range

Quantitation Report (QT Reviewed)

Data File : J:\GCLCDATA\GAS\SEP2898\N11381.D Vial: 13
Acq On : 28 Sep 98 15:19 Operator: TK
Sample : 9809110-03D 100X Inst : GC/FPD
Misc : Multiplr: 1.00
IntFile : rteint.p
Quant Time: Sep 28 15:30 1998 Quant Results File: GASFID.RES

Quant Method : H:\GCLCDATA\GAS\GASFID.M
Title : DISSOLVED GASES
Last Update : Thu Sep 24 18:13:58 1998
Response via : Multiple Level Calibration
DataAcq Meth : METPRO.MTH

Volume Inj. : 0.5 ML
Signal Phase : CARBOXEN 1006 PLOT
Signal Info : 30M X 0.53mm

Compound	R.T.	Response	Conc	Units
Target Compounds				
1) T Methane	1.26	3197	25.924	ppb
2) T Ethane	0.00	0	N.D.	ppb
3) T Ethylene	0.00	0	N.D.	ppb
4) T Propane	0.00	0	N.D.	ppb

(f)=RT Delta > 1/2 Window (m)=manual int.

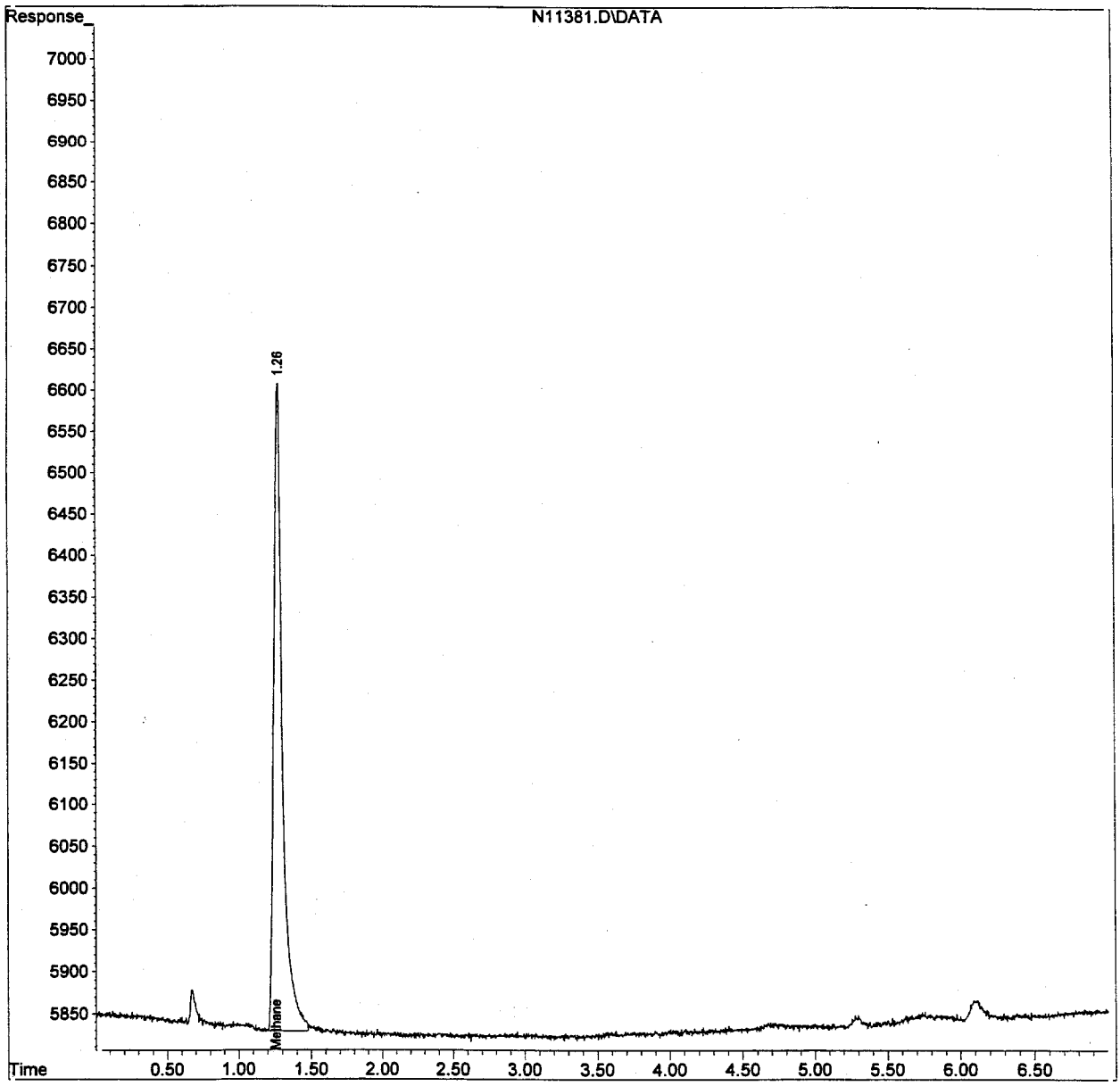
Quantitation Report

Data File : J:\GCLCDATA\GAS\SEP2898\N11381.D
Acq On : 28 Sep 98 15:19
Sample : 9809110-03D 100X
Misc :
IntFile : rteint.p
Quant Time: Sep 28 15:30 1998 Quant Results File: GASFID.RES

Vial: 13
Operator: TK
Inst : GC/FPD
Multiplr: 1.00

Quant Method : H:\GCLCDATA\GAS\GASFID.M
Title : DISSOLVED GASES
Last Update : Thu Sep 24 18:13:58 1998
Response via : Multiple Level Calibration
DataAcq Meth : METPRO.MTH

Volume Inj. : 0.5 ML
Signal Phase : CARBOXEN 1006 PLOT
Signal Info : 30M X 0.53mm



CALCULATION WORKSHEET Order No. 19116 (01-91)

PAGE ____ OF ____

CLIENT CTO 51 Cecil Field	JOB NUMBER 9809110
SUBJECT Methane	
BASED ON SW-846 8015	DRAWING NUMBER
BY	CHECKED BY / APPROVED BY / DATE

CEF-16-105-01 Methane 2592 µg/L 100X

$\frac{3197}{123.3} = 25.93 \times 100 = 2593$ µg/L

Data File : J:\GCLCDATA\GAS\SEP2898\N11369.D Vial: 1
Acq On : 28 Sep 98 11:48 Operator: TK
Sample : 5 STD CCC Inst : GC/FPD
Misc : Multiplr: 1.00
IntFile : rteint.p

Method : H:\GCLCDATA\GAS\GASFID.M
Title : DISSOLVED GASES
Last Update : Thu Sep 24 18:13:58 1998
Response via : Multiple Level Calibration

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
1	T	Methane	123.321	100.241	18.7	31#	0.00
2	T	Ethane	17.670	18.866	-6.8	27#	0.00
3	T	Ethylene	13.947	12.276	12.0	26#	-0.01

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Data File : J:\GCLCDATA\GAS\OCT0198\N11490.D
Acq On : 01 Oct 98 10:11
Sample : 5 STD CCC
Misc :
IntFile : rteint.p

Vial: 3
Operator: TK
Inst : GC/FPD
Multiplr: 1.00

Method : H:\GCLCDATA\GAS\GASFID23.M
Title : DISSOLVED GASES
Last Update : Thu Sep 24 18:13:58 1998
Response via : Multiple Level Calibration

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
1	T	Methane	123.321	101.265	17.9	89	0.00
2	T	Ethane	17.670	19.588	-10.9	102	0.00
3	T	Ethylene	13.947	12.756	8.5	92	0.00

(#) = Out of Range SPCC's out = 0 CCC's out = 0

Evaluate Continuing Calibration Report

Data File : J:\GCLCDATA\GAS\OCT0198\N11501.D Vial: 14
Acq On : 01 Oct 98 13:20 Operator: TK
Sample : CCV Inst : GC/FPD
Misc : Multiplr: 1.00
IntFile : rteint.p

Method : H:\GCLCDATA\GAS\GASFID23.M
Title : DISSOLVED GASES
Last Update : Thu Sep 24 18:13:58 1998
Response via : Multiple Level Calibration

Min. RRF : 0.000 Min. Rel. Area : 50% Max. R.T. Dev 0.50min
Max. RRF Dev : 20% Max. Rel. Area : 150%

		Compound	AvgRF	CCRF	%Dev	Area%	Dev(min)
1	T	Methane	123.321	103.434	16.1	91	0.00
2	T	Ethane	17.670	18.866	-6.8	98	0.00
3	T	Ethylene	13.947	13.141	5.8	94	0.00

(#) = Out of Range SPCC's out = 0 CCC's out = 0

GAS CHROMATOGRAPH INJECTION LOG

Injector Temp.:	200°	Instrument:	5890 (FPD/FID)
Detector Temp.:	250°	Reviewed By:	[illegible]
Initial Temp.:	40	Review Date:	9/22/98
Initial Time:	2		
Ramp Rate:	250	Column (1):	DB-5
Final Temp.:	250	ID: length	0.53 mm 30 M
Injection Volume:	2ul	Detector No.:	M

Quant. Method	Run Seq. File	Work Order No.	Dash No.	Dil. Fact.	Matrix	Anal. Init.	Date	Comments
LL03	N11216	9809092	-05C	1X	H_2O	TK	9/22/98	
	17	DCM						
	18	9809092	-02CMS		H_2O			
	19	9809092	-02CMSD					
	20	DCM			STD			
	21	LL03-4						
	22	DCM						
	23	OS BLK-799	-LL					
	24		HL-1					
	25		HL-2					
	26	DCM						
	27	LL03-4						
8141	28	Instrument BLK		1X	—	ARC	9/23/98	
	29	10,000 PPB STD			STD			
	30	10,000 PPB STD						
	31	6000 PPB STD						
	32	3000 PPB STD						
	33	9808266	-02E		H_2O			
	34	3000 PPB STD						
GAS FID	35	5 std		1X	STD	TK	9/23/98	
	36	5 std						
	37	10 std						
	38	10 std						
	39	1 std						
	40	2 std						
	41	4 std						
	42	1 std						
	43	5 std						
	44	10 std						

Comments:

3045

GP Environmental Services, Inc. Notebook No. GP-F-008

GAS CHROMATOGRAPH INJECTION LOG

Injector Temp.:	200
Detector Temp.:	250
Initial Temp.:	40
Initial Time:	2
Ramp Rate:	250
Final Temp.:	250
Injection Volume:	3 ul

Instrument:	5890 (FPD/FID)
Reviewed By:	[illegible]
Review Date:	9/29/98
Column (1):	DB-5
ID: length	0.53 mm 30 M
Detector No.:	M

Quant. Method	Run Seq. File	Work Order No.	Dash No.	Dil. Fact.	Matrix	Anal. Init.	Date	Comments
LL03	N11347	05BLK-803 MS	HL-1	1	W	[illegible]	9/27/98	
	348	803 MS	HL-2					
	349	05BLK-804	BLANK		S			
	350	804 MS	LL					
	351	804 MS	HL-1					
	352	804 MS	HL-2					
	353	LL03-4			SPD			
	354	98-08-243	02C		S			DATA WERE
	355		03B					NOT USEP.
	356		04C					INJECTION FAILURE
LL03	N11357	LL03-4	–	1	SPD	[illegible]	9/28/98	
	358	98-08-243	02C		W S [illegible]			
	359		03B					
	360		04C					
	361		05G (MW)					
	362		05G (MWD)					
	363		05G					
	364		01A (MW)		S			
	365		01A (MWD)					
	366		01A					
	367	LL03-4	–		SPD			
	368	98-08-257	01A		W			
GAS FID	369	5std CCC						18.7% Methane
	370	GBLKA						2.25 Methane
	371	9809102	-01E					
	372	9809110	-01D					
	373	9809110	-02D					
	374	9809110	-03D					Need 100X +5X
	375	9809110	-04D					

Comments:

3043

GAS CHROMATOGRAPH INJECTION LOG

Injector Temp.:	200	Instrument:	5890 (FPD/FID)
Detector Temp.:	250	Reviewed By:	[illegible]
Initial Temp.:	40	Review Date:	9/29/98
Initial Time:	2		
Ramp Rate:	250	Column (1):	DB-5
Final Temp.:	250	ID: length	0.53 mm 30 M
Injection Volume:	3 ul	Detector No.:	M

Quant. Method	Run Seq. File	Work Order No.	Dash No.	Dil. Fact.	Matrix	Anal. Init.	Date	Comments
GASFID	~~9809110~~ N11376	9809110	-040	2	H_2O	T.K.	9/28/98	
	377		-020	2				
	378		-030	5				
	379	~~CCC~~ LCS	–		STD			
	380	CCC	–					<1530
	381	9809110	-030	100	H_2O			
	382	9809117	-010					
	383		-020	1				
	384		-030	1				
	385		-020	5X				
	386		-040	1				
	387		-050	1				
	388		-040	2X				
	389		-010MS	1X				
	390		-010MSD	1X				
	391	CCV	–	1X	STD			<1530
LL03	N11392	INST. BLANK	–	–	–	KOC	9/29/98	
	393	LL03-1		1	STD			
	394	2						
	395	3						
	396	4						
	397	5						
	398	6						
	399	7						
	400	LL03-4						
	401	98-08-257	01A		S			
	402		02A					
	403		03A					
	404		04A					

Comments:

3044

GAS CHROMATOGRAPH INJECTION LOG

Injector Temp.:	200	Instrument:	5890 (FPD/FID)
Detector Temp.:	250	Reviewed By:	TT
Initial Temp.:	40	Review Date:	10/5/98
Initial Time:	2		
Ramp Rate:	250	Column (1):	DB-5
Final Temp.:	250	ID: length	0.53 mm 30 M
Injection Volume:	3ul	Detector No.:	M

Quant. Method	Run Seq. File	Work Order No.	Dash No.	Dil. Fact.	Matrix	Anal. Init.	Date	Comments
GAS FID	N11488	5Std CC		1X	H_2O	TK	10/1/98	
	489	GBIKA						
	490	5 STD CCC						Methane 17.9%
	491	GBIKA						
	492	GLCSA						
	493	9809129	-01A					
	494	9809129	-02A					
	495	9809149	-03A					
	496		-02A					
	497		-03A					
	498		-03A	~~10~~ 2x				
	499		-04A	1x				
	500		-05A					
	501	CCV						Methane 16.1%
	502							

Comments:

3047

APPENDIX B

PILOT-SCALE TREATABILITY STUDY RESULTS

APPENDIX B

TABLE OF CONTENTS

SUMMARY OF AS/SVE PILOT TEST FIELD EFFORT

SOIL VAPOR EXTRACTION PILOT TEST WORKSHEETS/FORMS – RADIUS OF INFLUENCE

- VAPOR EXTRACTION TEST – EW-01 ONLY
- VAPOR EXTRACTION TEST – EW-02 ONLY
- VAPOR EXTRACTION TEST – BOTH EW-01 AND EW-01

AIR SPARGING PILOT TEST WORKSHEETS/FORMS – RADIUS OF INFLUENCE

- AIR INJECTION TEST – IW-01 ONLY
- AIR INJECTION TEST – IW-02 ONLY
- AIR INJECTION TEST – BOTH IW-01 AND IW-02

Summary of AS/SVE Pilot Test Field Effort

Vapor Extraction

- Extraction Well EW01 - Two tests: 30 inches water column vacuum ("H_2O) @ 6.0 cfm and 70"H_2O @ 8.0 cfm

- Result: Closest monitoring well (26.7' away) no observed vacuum.
  Excessive moisture observed at high vacuum (70"H_2O).

- Extraction Well EW02 - Three tests: 30"H_2O @ 11.0 cfm , 40"H_2O @ 16.4 cfm, and 50"H_2O @ 17.4 cfm

- Result: Piezometer Well PZ02 (7.55'away) was 1.5 to 2.0"H_2O and PZ01 and PZ03 (13.2' and 15.4'away) were 0.5"H_2O.

- EW01 and EW02 - Two tests: 30"H_2O @ 4.1 cfm (EW01) and 16.3 (EW02)
  EW01: 64"H_2O @ 17.4 cfm and EW02: 45"H_2O @ 10.1 cfm

- Result: Vacuum observed at monitoring wells about same for both tests.
  Visible water removed at vacuums greater than 45"H_2O.

Air Injection

- IW01 (deep) - Four tests:

  Initial test: 39 psi @ 5.5 cfm (minimum pressure to cause flow through screen interval)
  - Results: Noticeable (approx. 4 inches) GW elevation increase observed at monitoring wells 50' away. Increase in organic vapors in shallow wells within 27' radius. D.O. readings inconclusive.

  Follow up tests: 40 psi @ 7.25 cfm (usin SYI in-well DO probe and ORP evaluation)
  - Results: Observed GW elevation rebound after 2.5 hours. Similar radius of influence as previous test. D.O. took initial drop (possible due to circulation of lower D.O. in deeper waters) then showed rebound. Minor increase in ORP levels were observed. 16-17S (250' from injection), only negative reading, went from -101mV baseline to -10 mV after 4 hours. Test repeated at 41 psi at 7.0 psi next morning with similar results, but less consistent ORP readings.

  Over night test: 40 psi @ 6.0 cfm start, 39 psi @ 7.5 cfm finish (thirteen hour test)
  - Results: Observed bubbles in wells:
    IW02 (5'away, screen 55' to 57') - slow/minimum bubbles.
    New intermediate well (7'11" away, screen 27' to 32') - aggressive bubbling to top well.
    16-12I (24'9" away, screen 71' to 81') - medium bubbles.
    16-5S (~25' away, screen 4' to 14') - no bubbles.
    System wells (within 25' away, screen at GW interface) - no bubbles.

  DO concentrations at various depths in 5S and IW02 became more uniform after 12 hours and IW02 increased (0.75 to 5.4 mg/l) D.O. concentrations, however 5S D.O. concentration did not increase. ORP and organic vapors were relatively consistent with previous tests, however some contradictions (anomalies) exist. Groundwater elevations were relatively consistent with previous tests.

- IW02 (shallow) - Two tests: 28 psi @ 5.5 cfm (minimum pressure to evacuated water in well)
  36 psi @ 10 cfm (higher pressure and flow test)

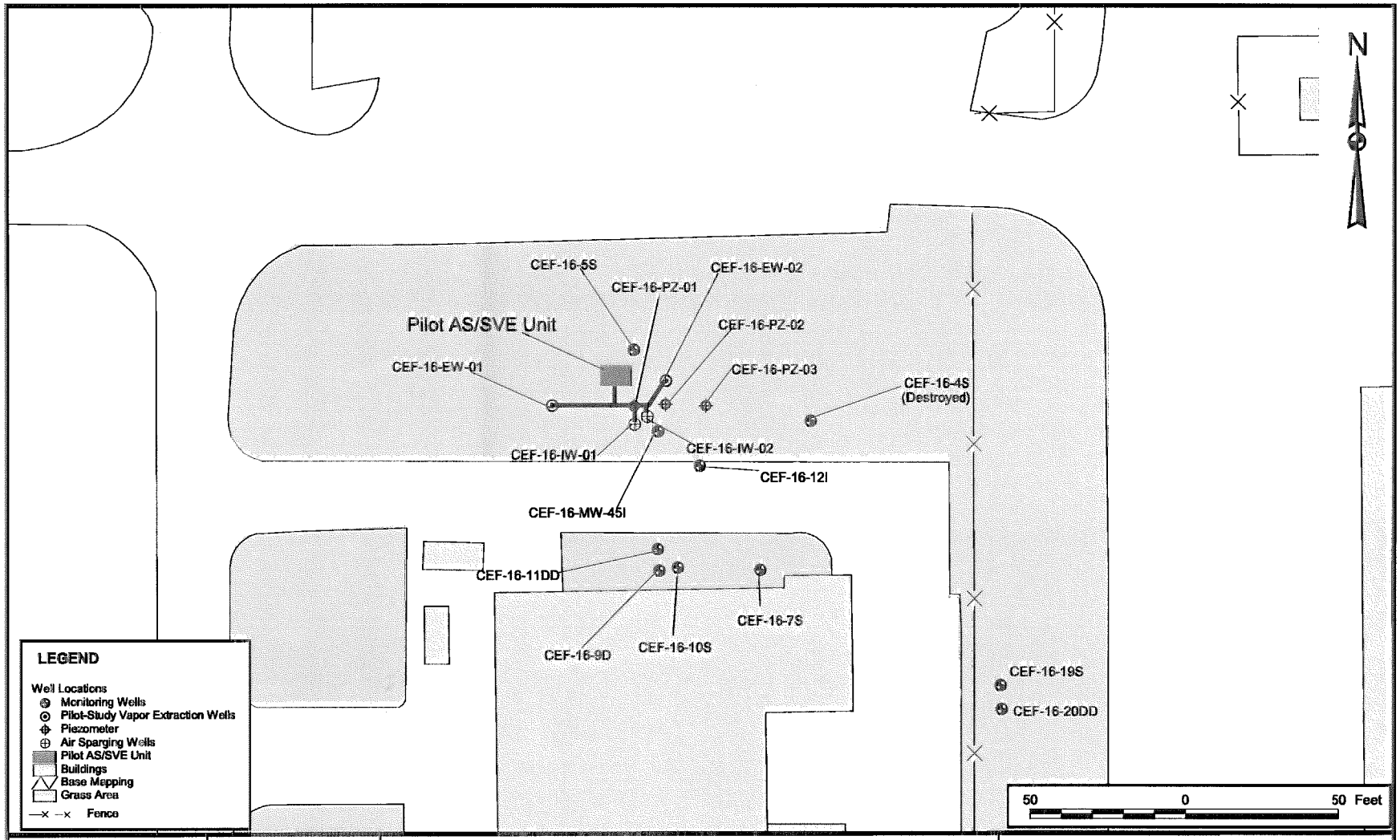
- Result: Noticeable groundwater elevation increase in monitoring wells 50' away. Organic vapors increased in all system wells except for EW01. D.O. provided inconclusive data. ORP not evaluated when this test was conducted.

- IW01 and IW02: Operation of the two injection wells at the same time provided similar results to those observed on the individual well operation tests.

Preliminary Evaluation:

Vapor Extraction:
A radius of influence of 15 to 20 feet can be expected out of an SVE unit which supplies approximately 45"H_2O to the extraction well heads . A vacuum of greater than 45 inches water extract an unacceptable amount of water from the subsurface. The geology appears to be uniform based on lithology data obtained during drilling, however the physical parameter varied between the extraction wells which indicates well performance may vary.

Air Injection:
The radius impacted by the injection wells is at least 50', however the area of actual direct contact with the injected air is less. Based on physical observation of air bubbles, the deep injection well (screened at 55 to 57 feet) is considered to have a similar radius of influence based on similar changes in the groundwater elevation and observed increase in organic vapors.



DRAWN BY	DATE
YLI	11/12/98
CHECKED BY	DATE
JPK	11/12/98
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

PILOT SCALE AS/SVE SYSTEM LAYOUT

OPERABLE UNIT 7, SITE 16

NAVAL AIR STATION CECIL FIELD

JACKSONVILLE, FLORIDA

CONTRACT NUMBER	
7792	
APPROVED BY	DATE
—	—
APPROVED BY	DATE
—	—
DRAWING NO. B-1	REV 0

P:\GIS\CECIL\SITE16.APR 4-MAR-99 CPG LAYOUT PILOT-STUDY WELLS

SOIL VAPOR EXTRACTION PILOT TEST WORKSHEETS/FORMS

RADIUS OF INFLUENCE

Vapor Extraction Test
EW-01 only

RADIUS OF INFLUENCE TESTING WORKSHEET
EXTRACTION WELL - EW01
SITE 16, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Test No.: 1
Start Time: 13:20
Target Flow Rate: Low Vac Test (1)
Initial Header Pressure/Vacuum: 200 ft/min @ 30" H_2O

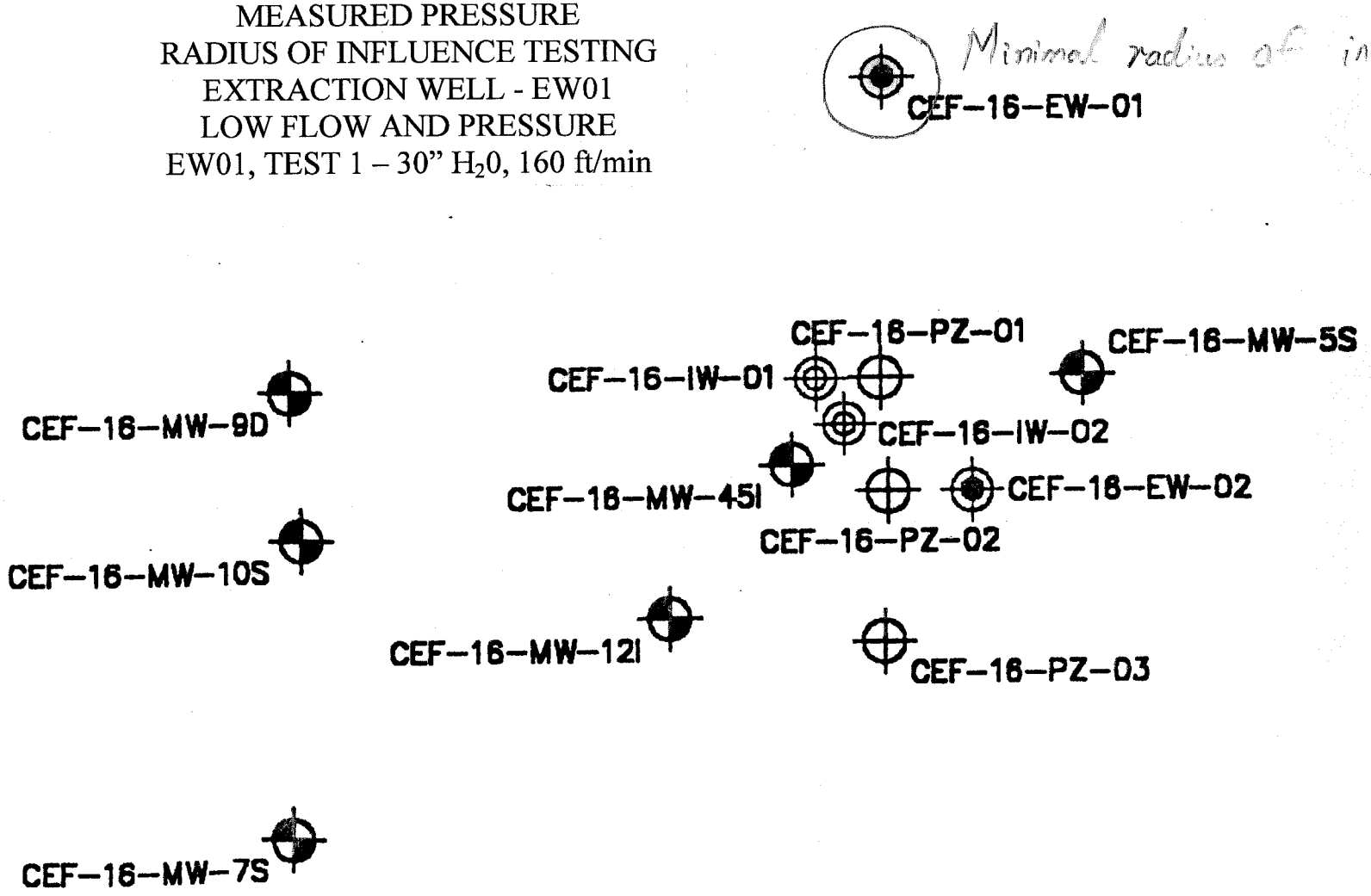
Date: 8/29/98
Well (s) Operating: EW-01

Time (hrs)	EW01 Flow Velocity	EW01 Flow Rate	EW01 Pressure (2)	EW02 Pressure	PW01 Pressure	PW02 Pressure	PW03 Pressure	Main Trunk @ Blower(4)		
	(ft/min)	(cfm)	(" H_20)	(" H_20)	(" H_20)	(" H_20)	(" H_20)	Flow Velocity (ft/min)	Flow Rate(2) (cfm)	Pressure (" H_20)
0.0	200	4.36	30	0.0	0.0	0.0	0.0	300	6.5	30
0.25	160	3.50	30	0.0	0.0	0.0	0.0	250	5.4	30
0..50	160	3.50	30	0.0	0.0	0.0	0.0	200	4.4	30
0.75	170	3.70	30	0.0	0.0	0.0	0.0	250	5.4	30
1.00	160	3.50	30	0.0	0.0	0.0	0.0	225	4.9	30

Time 0.0 hours is recorded prior to start of the test
The criteria for completing the test is to have three consecutive readings with less than a 10% difference for each of the wells
cfm – Calculated acfm based on flow velocity recorded in field
(1) Ball Valve in full open position
(2) Pressure reading recorded at well head

Start @ trunk line @ blower 300 feet per minute @ 30" H_2O

ISOCONTOURS OF THE CHANGE IN THE
MEASURED PRESSURE
RADIUS OF INFLUENCE TESTING
EXTRACTION WELL - EW01
LOW FLOW AND PRESSURE
EW01, TEST 1 – 30" H_20, 160 ft/min



RADIUS OF INFLUENCE TESTING WORKSHEET
EXTRACTION WELL - EW01
SITE 16, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

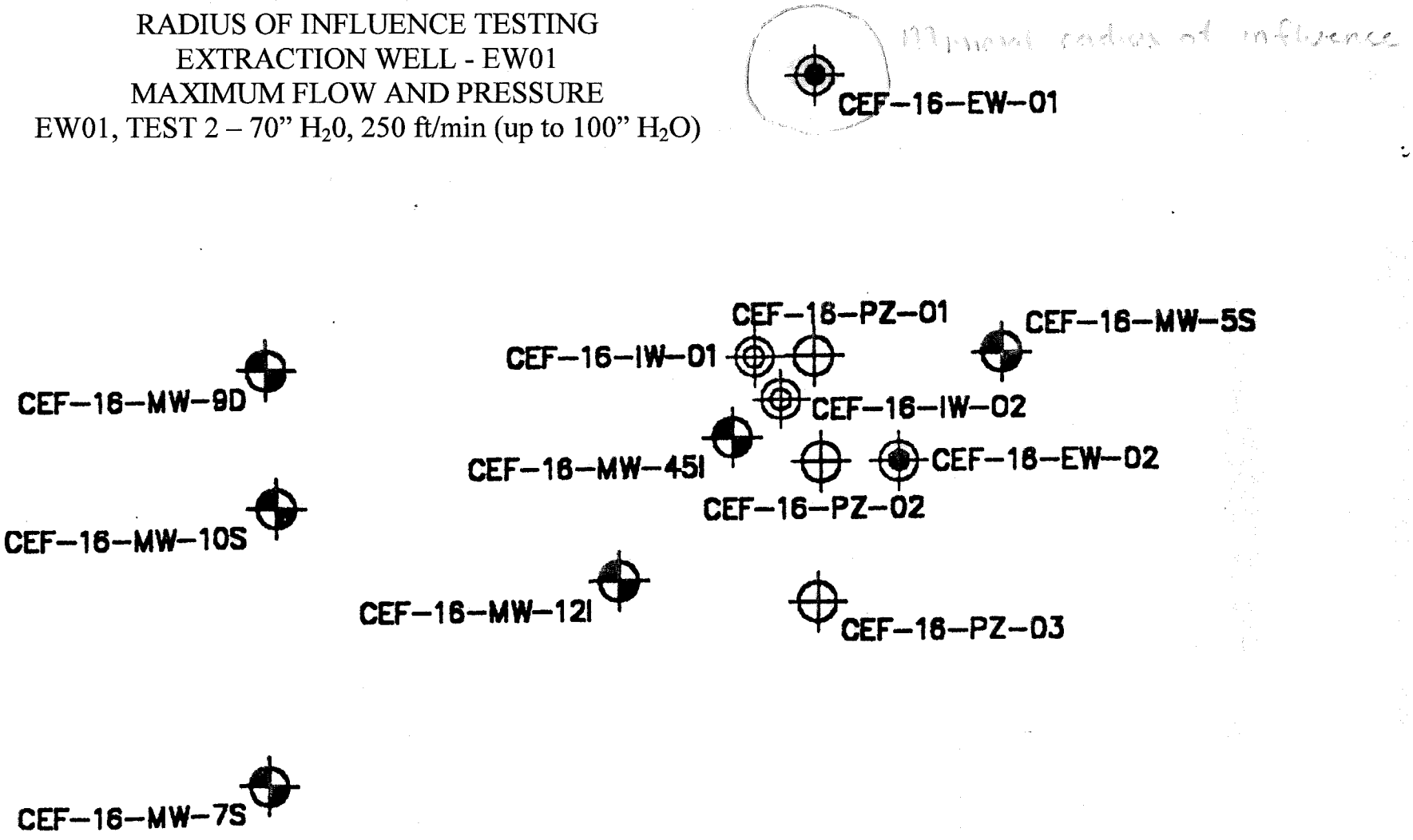
Test No.: 2
Start Time: 14:40
Target Flow Rate: Max [1]
Initial Header Pressure/Vacuum: 250 ft/min @ 70" H_2O

Date: 8/29/98
Well (s) Operating: EW-01

Time (hrs)	EW01 Flow Rate	EW01 Flow Rate	EW01 Pressure [2]	EW02 Pressure	PW01 Pressure	PW02 Pressure	PW03 Pressure	Main Trunk @ Blower		
	(ft/min)	(cfm)	(" H_2O)	(" H_2O)	(" H_2O)	(" H_2O)	(" H_2O)	Flow Velocity[2] (ft/min)	Flow Rate[2] (cfm)	Pressure (" H_2O)
0.0	250	5.45	70	0.0	0.0	0.0	0.0	375	8.20	70
0.25	NR [3]	NR	70	0.0	0.0	0.0	0.0	750*	16.40*	70
0.5	275	6.00	70	0.0	0.0	0.0	0.0	275	6.00	70
0.75	400	8.73	70	0.0	0.0	0.0	0.0	300	6.55	70
1.0	NR	NR	70	0.0	0.0	0.0	0.0	NR	NR	70

Time 0.0 hours is recorded prior to start of the test
The criteria for completing the test is to have three consecutive readings with less than a 10% difference for each of the wells
cfm – Calculated acfm based on flow velocity recorded in field
(1) Shut Ball Valve half closed to 75 psi, noticed too much water in line at EW-01 so opened valve to 1/8 to ¼ closed and vacuum of 70 psi. Much less water/moisture in line.
(2) Pressure reading recorded at well head
(3) NR – No reading. Instrument pegged due to moisture in line. False reading. Moisture, but no visible water in line. Equipment effected by moisture in line.
* Initial reading was >6000 ft/min/130 cfm gauge reading
EW-01 High test 100" H_2O no influence @ PW01. See logbook p. 12.

ISOCONTOURS OF THE CHANGE IN THE
MEASURED PRESSURE
RADIUS OF INFLUENCE TESTING
EXTRACTION WELL - EW01
MAXIMUM FLOW AND PRESSURE
EW01, TEST 2 – 70" H_20, 250 ft/min (up to 100" H_2O)



Vapor Extraction Test
EW-02 only

RADIUS OF INFLUENCE TESTING WORKSHEET
EXTRACTION WELL - EW02
SITE 16, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

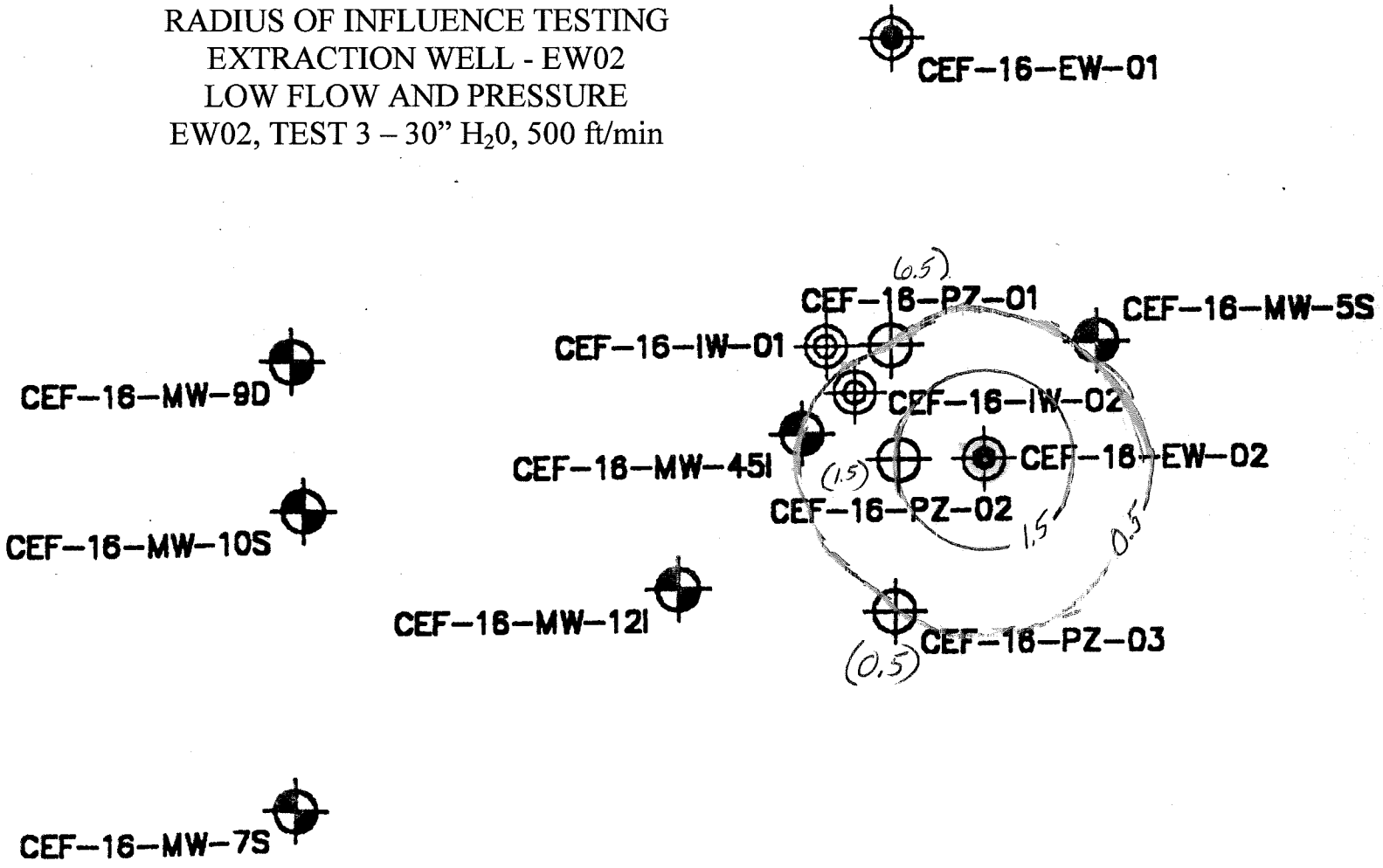
Test No.: 3
Start Time: 16:00
Target Flow Rate: Low, Ball Valve air make up completely open
Initial Header Pressure/Vacuum: 250 ft/min @ 70" H_2O

Date: 8/29/98
Well (s) Operating: EW-02

Time (hrs)	EW02 Flow Velocity	EW02 Flow Rate	EW02 Pressure (1)	EW01 Pressure	PW01 Pressure	PW02 Pressure	PW03 Pressure	Main Trunk @ Blower		
	(ft/min)	(cfm)	(" H_2O)	(" H_2O)	(" H_2O)	(" H_2O)	(" H_2O)	Flow velocity (ft/min)	Flow Rate (cfm)	Pressure (" H_2O)
0.0	500	10.90	30	0.0	0.5	1.6	0.5	500	10.90	28
0.25	500	10.90	28	0.0	0.4	1.4	0.4	500	10.90	28
0.5	550	12.00	28	0.0	0.5	1.5	0.5	510	11.10	30
0.75	510	11.10	29	0.0	0.5	1.5	0.5	500	10.90	29
1.0	500	10.90	29	0.0	0.5	1.5	0.5	500	10.90	29

Time 0.0 hours is recorded prior to start of the test
The criteria for completing the test is to have three consecutive readings with less than a 10% difference for each of the wells
cfm – Calculated acfm based on flow velocity recorded in field
(1) Pressure reading recorded at well head

ISOCONTOURS OF THE CHANGE IN THE
MEASURED PRESSURE
RADIUS OF INFLUENCE TESTING
EXTRACTION WELL - EW02
LOW FLOW AND PRESSURE
EW02, TEST 3 – 30" H_20, 500 ft/min



RADIUS OF INFLUENCE TESTING WORKSHEET
EXTRACTION WELL - EW02
SITE 16, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Test No.: 4
Start Time: 08:30
Target Flow Rate: Max
Initial Header Pressure/Vacuum: 50" H_2O @ 800 fpm [1]

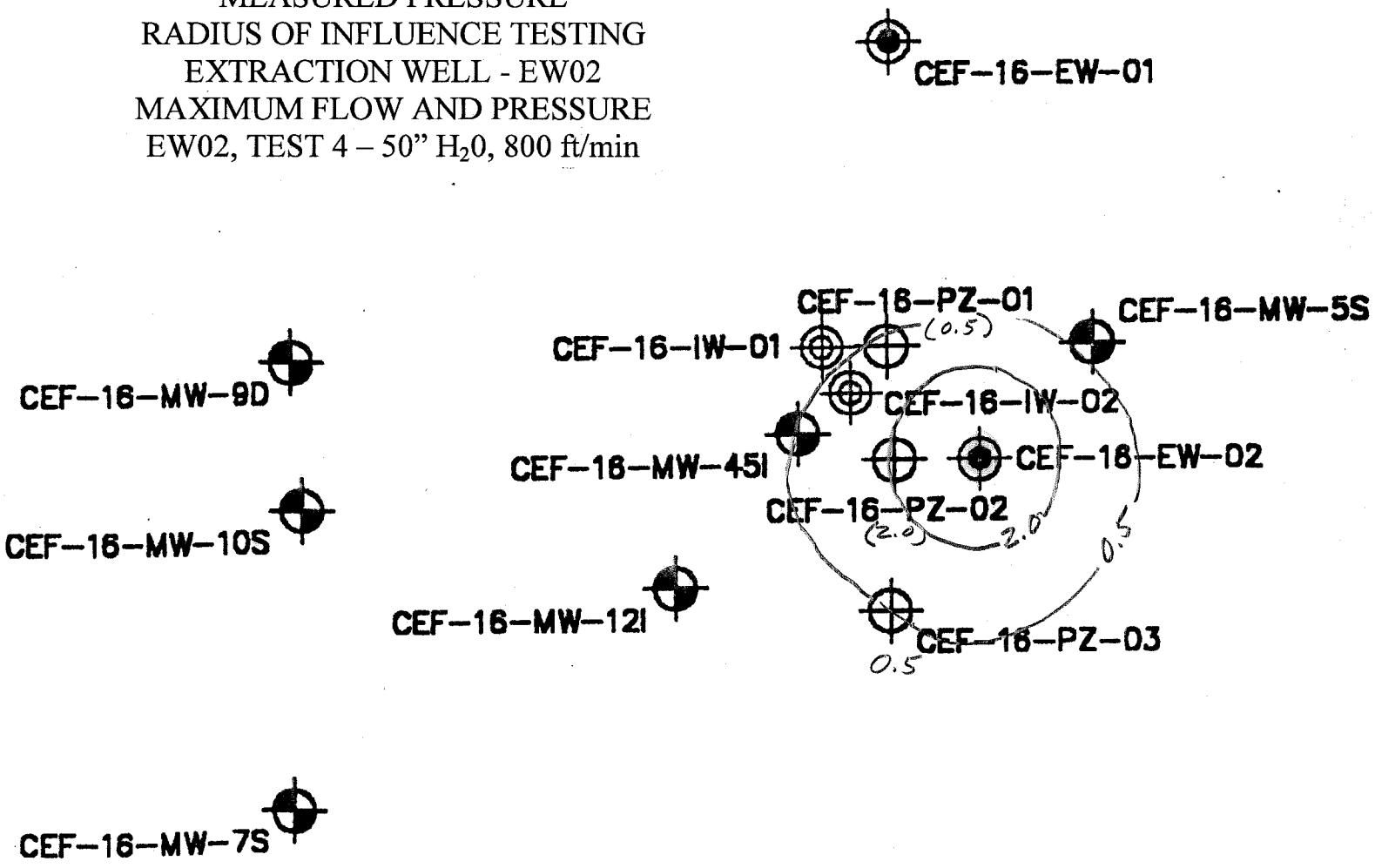
Date: 8/31/98
Well (s) Operating: EW-02

Time (hrs)	EW02 Flow Velocity	EW02 Flow Rate	EW02 Pressure [2]	EW01 Pressure	PW01 Pressure	PW02 Pressure	PW03 Pressure	Main Trunk @ Blower		
	(ft/min)	(cfm)	(" H_2O)	(" H_2O)	(" H_2O)	(" H_2O)	(" H_2O)	Flow velocity (ft/min)	Flow Rate (cfm)	Pressure (" H_2O)
0.0				0.0	0.0	0.0	0.0			
0.0	800	17.5	50	0.0	0.6	2.0	0.6	800	17.5	50
0.25	800	17.5	50	0.0	0.5	2.0	0.5	800	17.5	50
0.5	800	17.5	50	0.0	0.51	2.1	0.51	800	17.5	50
0.75	800	17.5	50	0.0	0.51	2.0	0.50	800	17.5	50

Time 0.0 hours is recorded prior to start of the test
The criteria for completing the test is to have three consecutive readings with less than a 10% difference for each of the wells
cfm – Calculated acfm based on flow velocity recorded in field
(1) Maximum flow/vacuum w/o taking up lots of water. Very heavy rains last night.
(2) Pressure reading recorded at well head

Prior to test drained ~ 10 gallons H_2O from moisture separator
Background PID 0.0 not responding – using FID
Drained tank empty at start

ISOCONTOURS OF THE CHANGE IN THE
MEASURED PRESSURE
RADIUS OF INFLUENCE TESTING
EXTRACTION WELL - EW02
MAXIMUM FLOW AND PRESSURE
EW02, TEST 4 – 50" H_20, 800 ft/min



RADIUS OF INFLUENCE TESTING WORKSHEET
EXTRACTION WELL - EW02
SITE 16, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Test No.: 8
Start Time: 15:30
Target Flow Rate: middle range – extra test
Initial Header Pressure/Vacuum: 40" H_2O

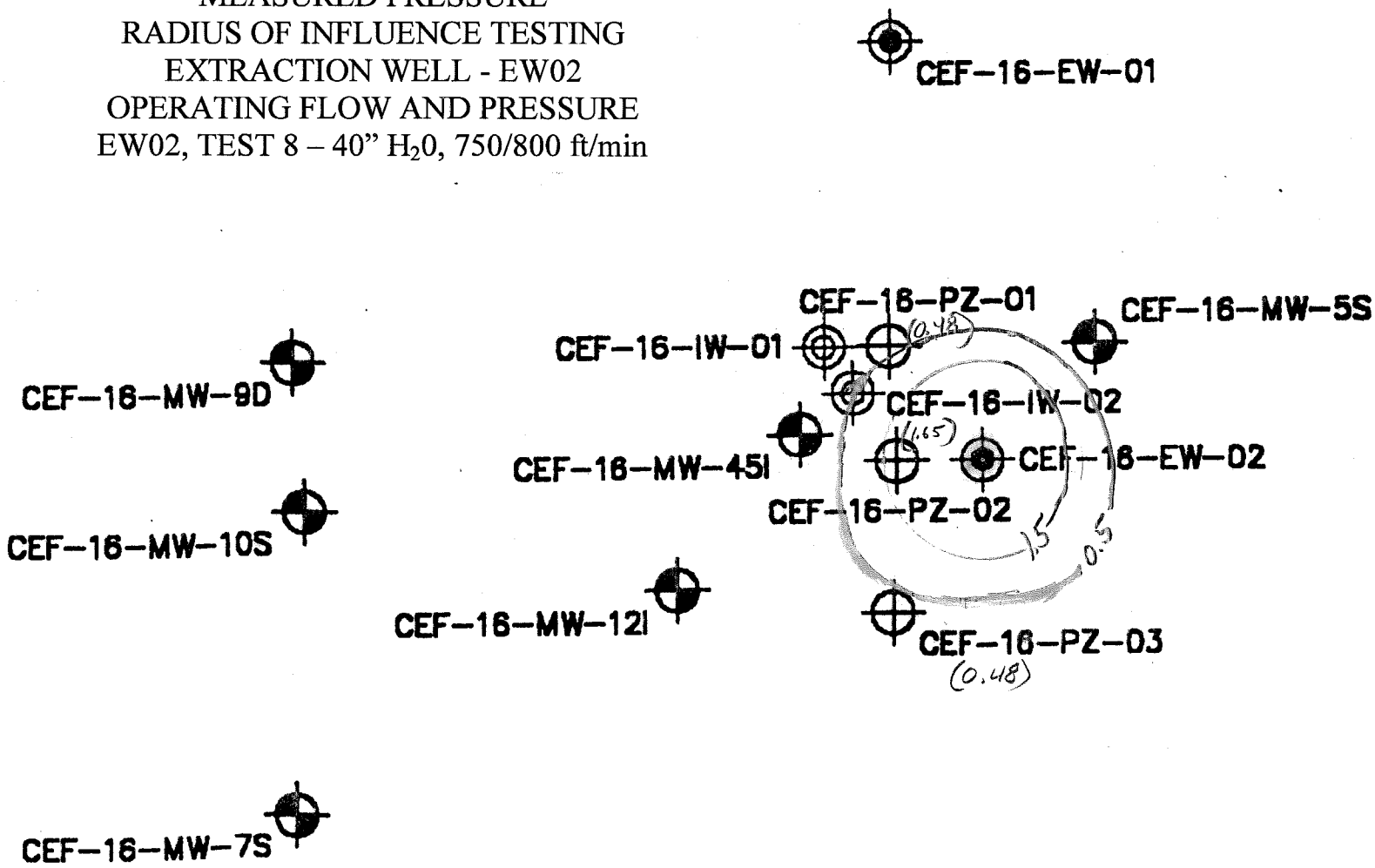
Date: 8/31/98
Well (s) Operating: EW-02
(well picks up water at ~55 to 60 " H_2O

Time (hrs)	EW02 Flow Velocity	EW02 Flow Rate	EW02 Pressure (1)	EW01 Pressure	PW01 Pressure	PW02 Pressure	PW03 Pressure	Main Trunk @ Blower		
	(ft/min)	(cfm)	(" H_2O)	(" H_2O)	(" H_2O)	(" H_2O)	(" H_2O)	Flow Velocity (ft/min)	Flow Rate (cfm)	Pressure (" H_2O)
0.0	900	19.6	40	0.0	0.51	1.50	0.50	850	18.5	40
0.25	750	16.4	40	0.0	0.50	1.60	0.51	740	16.1	39
0.5	800	17.4	40	0.0	0.48	1.68	0.48	750	16.4	39
0.75	800	17.4	38	0.0	0.48	1.65	0.48	750	16.4	38

Time 0.0 hours is recorded prior to start of the test
The criteria for completing the test is to have three consecutive readings with less than a 10% difference for each of the wells
cfm – Calculated acfm based on flow velocity recorded in field
(1) Pressure reading recorded at well head

No water extracted

ISOCONTOURS OF THE CHANGE IN THE
MEASURED PRESSURE
RADIUS OF INFLUENCE TESTING
EXTRACTION WELL - EW02
OPERATING FLOW AND PRESSURE
EW02, TEST 8 – 40" H_20, 750/800 ft/min



Vapor Extraction Test
Both EW-01 and EW-02

RADIUS OF INFLUENCE TESTING WORKSHEET
EXTRACTION WELL - EW01 + EW02
SITE 16, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

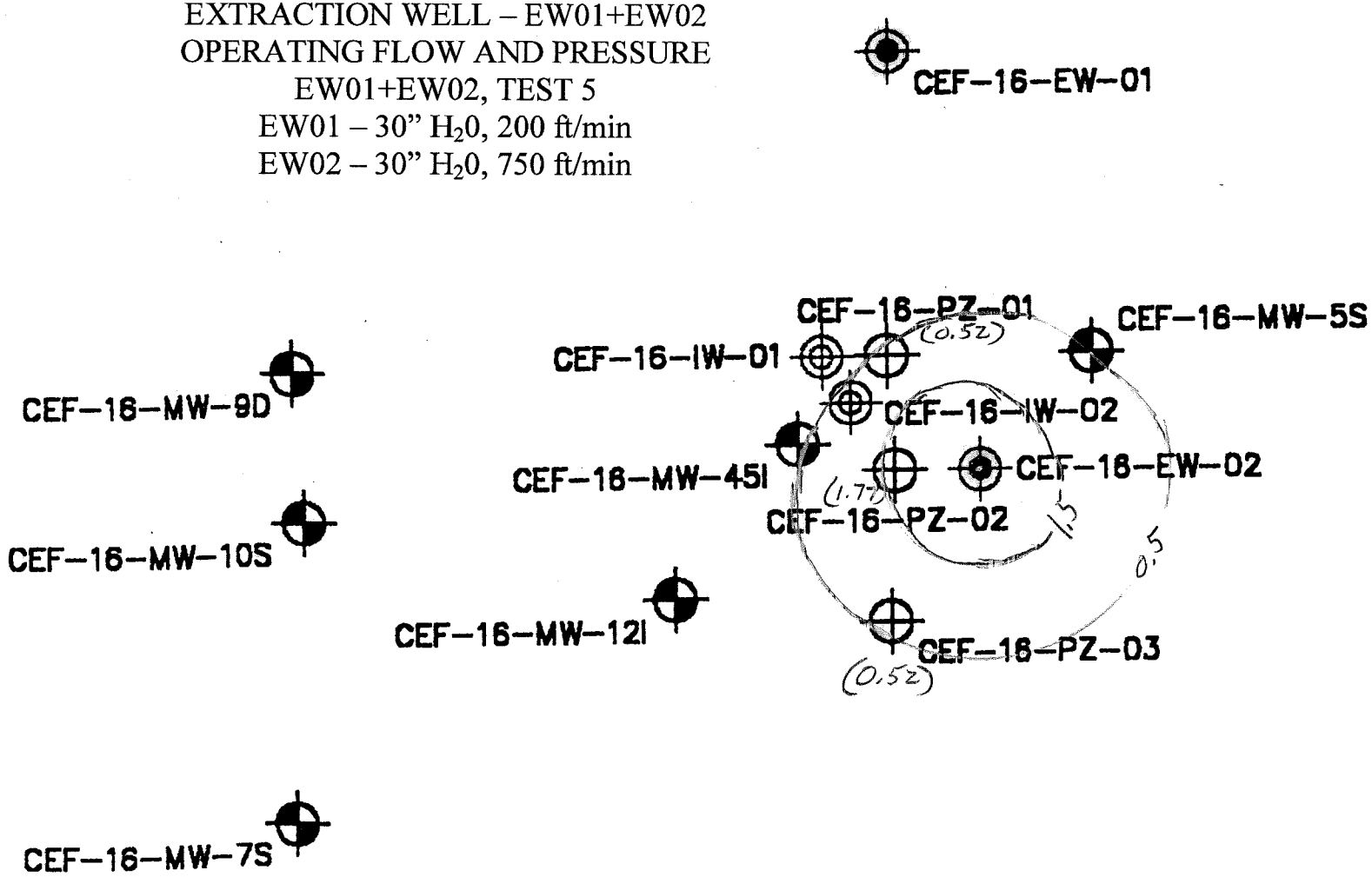
Test No.: 5
Start Time: 10:30
Target Flow Rate: Low Flow (1)
Initial Header Pressure/Vacuum:

Date: 8/31/98
Well (s) Operating: EW01 + EW02

Time (hrs)	EW01 Flow Velocity	EW01 Flow Rate	EW01 Pressure (3)	EW02 Flow velocity	EW02 Flow Rate	EW02 Pressure (2)	PW01 Pressure	PW02 Pressure	PW03 Pressure	Main Trunk @ Blower		
	(ft/min)	(cfm)	(" H_2O)	(ft/min)	(cfm)	(" H_2O)	(" H_2O)	(" H_2O)	(" H_2O)	Flow Velocity (ft/min)	Flow Rate (cfm)	Pressure (" H_2O)
0.0	200	4.36	30	750	16.4	30	0.20	1.0	0.25	850	18.5	30
0.25	180	3.92	30	750	16.4	30	0.50	1.75	0.50	800	17.4	30
0.5	190	4.14	30	750	16.4	30	0.50	1.75	0.50	950	20.7	30
0.75	180	3.92	30	750	16.4	30	0.52	1.77	0.52	800	17.4	30

Time 0.0 hours is recorded prior to start of the test
The criteria for completing the test is to have three consecutive readings with less than a 10% difference for each of the wells
cfm – Calculated acfm based on flow velocity recorded in field
(1) Ball valve full open (air make up full open)
(2) Pressure reading recorded at well head

ISOCONTOURS OF THE CHANGE IN THE
MEASURED PRESSURE
RADIUS OF INFLUENCE TESTING
EXTRACTION WELL – EW01+EW02
OPERATING FLOW AND PRESSURE
EW01+EW02, TEST 5
EW01 – 30" H_20, 200 ft/min
EW02 – 30" H_20, 750 ft/min



RADIUS OF INFLUENCE TESTING WORKSHEET
EXTRACTION WELL - EW01 and EW02
SITE 16, NAS CECIL FIELD
JACKSONVILLE, FLORIDA

Test No.: 6 and 7
Start Time: 11:30
Target Flow Rate: Wells Balanced and High Vacuum [1]
Initial Header Pressure/Vacuum:

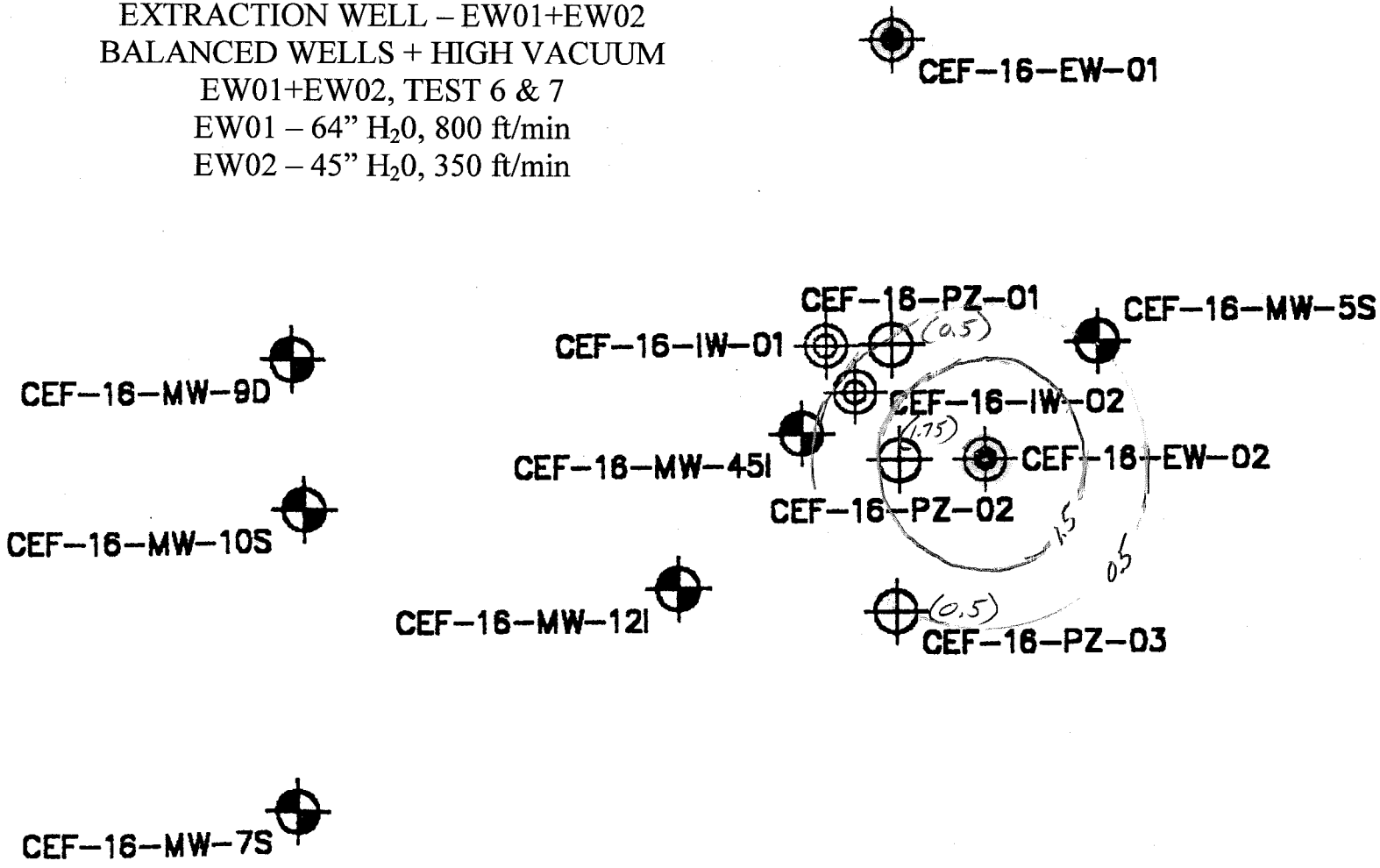
Date: 8/31/98
Well (s) Operating: EW01 and EW02

Time (hrs)	EW01 Flow Velocity	EW01 Flow Rate	EW01 Pressure [2]	EW02 Flow Velocity	EW02 Flow Rate	EW02 Pressure [2]	PW01 Pressure	PW02 Pressure	PW03 Pressure	Main Trunk @ Blower		
	(ft/min)	(cfm)	(" H_2O)	(ft/min)	(cfm)	(" H_2O)	(" H_2O)	(" H_2O)	(" H_2O)	Flow Velocity (ft/min)	Flow Rate (cfm)	Pressure (" H_2O)
0.0	NR[4]	NR	60	500	10.9	60	0.75	2.80	0.30	NR	NR	60
0.25	750	16.3	64	500	10.9	45	0.5	1.8	0.5	1100	25.3	64
0.5	800	17.4	64	300	6.5	45	0.5	1.75	0.5	1100	25.3	64
0.75	800	17.4	64	350	7.6	45	0.5	1.75	0.5	1100	25.3	64
0.0 [5]	-----	-----	65	-----	-----	65	0.65	2.4	0.63	-------	-------	70

Time 0.0 hours is recorded prior to start of the test
The criteria for completing the test is to have three consecutive readings with less than a 10% difference for each of the wells
cfm – Calculated acfm based on flow velocity recorded in field

(1) Heavy water in EW02 – closed valve ½ to ¾ closed until no water observed being extracted. Will run balanced like this than evaluate high vacuum just as pressure (because won't be able to get velocity due to extraction water). Air make up ¼ closed (3/4 open)
(2) Pressure reading recorded at well head
(3) High vacuum test (70 " H_2O). No flow rate taken due to extraction of water vapors – Filled tank – Stopped test
(4) NR – No reading

ISOCONTOURS OF THE CHANGE IN THE
MEASURED PRESSURE
RADIUS OF INFLUENCE TESTING
EXTRACTION WELL – EW01+EW02
BALANCED WELLS + HIGH VACUUM
EW01+EW02, TEST 6 & 7
EW01 – 64" H_20, 800 ft/min
EW02 – 45" H_20, 350 ft/min



AIR SPARGING PILOT TEST WORKSHEETS/FORMS

RADIUS OF INFLUENCE

Air Injection Test
IW-01 only

RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW01
SITE 16, NAS CECIL FIELD

Test No.: 1 Date: 9/9/98

Target Flow Rate: Operation 40 psi @ 7.25 cfm(gauge reading) Well (s) Operating: IW01

Water Level

Time (hrs)	IW01 Flow Rate (gauge reading)	IW01 Pressure (1)	PW01 Water Level	PW02 Water Level	PW03 Water Level	EW01 Water Level	EW02 Water Level	16-5S Water Level	16-12I Water Level	16-9D Water Level	16-7S Water Level	16-10S Water Level	16-17S Water Level	16-13S Water Level	IW-02 Water Level
0.0		40	8.26	8.15	7.77	8.30	8.45	6.65	6.45	6.44	6.67	6.60	5.37/5.40	5.33	9.31
0.25	7.25		7.84	7.90	7.70	8.28	8.24	6.27	6.12	5.94	6.57	6.41	5.37	5.33	9.29
0.5															
1.0			6.69	7.77	7.60	8.08	8.12	6.38	5.86	5.73	6.56	6.44	5.38	5.33	9.13
1.5															
2.0															
2.5	7.50	40	6.85	7.87	7.58	8.13	8.33	6.50	5.69	5.79	6.61	6.56	5.39	5.31	8.98
3.0															
3.5			6.92	7.92	7.49	8.18	8.29	6.50	5.49	5.78	6.61	6.52	5.35	5.30	8.95
4.0															

Redox (ORP) - select wells only

			PW01	PW02	PW-03			16-5S			16-7S		16-17S		16-13S
Initial			137	44	12			99			130		-101		185
4.0			136	110	123			123			112		-10		120

Note: Bailing for Eh measurement removed water which impacted water level measurement and D.O. in groundwater. Only conducted testing at beginning and end of test
Bucket of water D.O. = 5.90, Redox = 25 mV
Note: D.O. measurements taken 5.0 feet below the groundwater level

RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW01
SITE 16, NAS CECIL FIELD

Test Number 1
Page 2 of 3

Date: 9/9/98

Observed Volatilization FID

Time (hrs)	PW01	PW02	PW03	EW01	EW02	16-5S	16-12I	16-9D	16-7S	16-10S	16-17S	16-13S	IW-02
0.0	200	425	500	35	25	72	0.8	0.0	1.0	43.0	0.0	0.0	50
0.25	>1000	>1000	>1000	15	1.8	76	3.0	0.0	2.0	18.0	0.25	2.0	2.5
0.5	700	>1000	>1000	92	0.4	46	4.6	0.5	1.2	1.6	0.3	0.0	70
1.0													
1.5													
2.0													
2.5	----- (2)	----- (2)	----- (2)	----- (2)	----- (2)	----- (2)	----- (2)	----- (2)	----- (2)	----- (2)	----- (2)	----- (2)	----- (2)
3.0													
3.5	880	>1000	>1000	950	600 (1)	84	----- (2)	----- (2)	----- (2)	----- (2)	----- (2)	----- (2)	5.5

Note: Readings taking 1.0 hour to collect FID, D.O., and water level at 13 wells
(1) Variable reading. Concentration spikes.
(2) Possible FID reading errors due to high humidity.

RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW01
SITE 16, NAS CECIL FIELD

Test No.: 1 Date: 9/9/98

Dissolved Oxygen

Time (hrs)	IW02 D.O.	PW01 (1) D.O.	PW02 D.O.	PW03 D.O.	EW01 D.O.	EW02 D.O.	16-5S D.O.	16-12I D.O.	16-9D D.O.	16-7S D.O.	16-10S D.O.	16-17S D.O.	16-13S D.O.
0.0	3.25	1.03	1.08	1.20	2.60	2.75	0.75	0.90	2.00	4.80	1.05	2.70	1.05
0.5	2.95	6.80	0.55	0.80	2.45	0.75	0.45	0.75	0.90	4.50	0.50	0.45	1.25
1.0	3.30	7.40	0.60	0.85	2.50	0.85	0.55	0.65	1.70	4.55	0.45	0.70	1.50
1.5													
2.0													
2.5	3.20	6.75	0.60	0.60	2.25	1.05	0.45	0.50	1.25	4.30	0.45	0.50	1.00
3.0													
3.5	3.25	7.00	2.20	0.45	2.25	1.05	0.35	0.45	1.40	4.20	0.30	0.51	0.85
Trial 2			1.25		2.75	2.75	0.65	0.70	1.75	4.60			

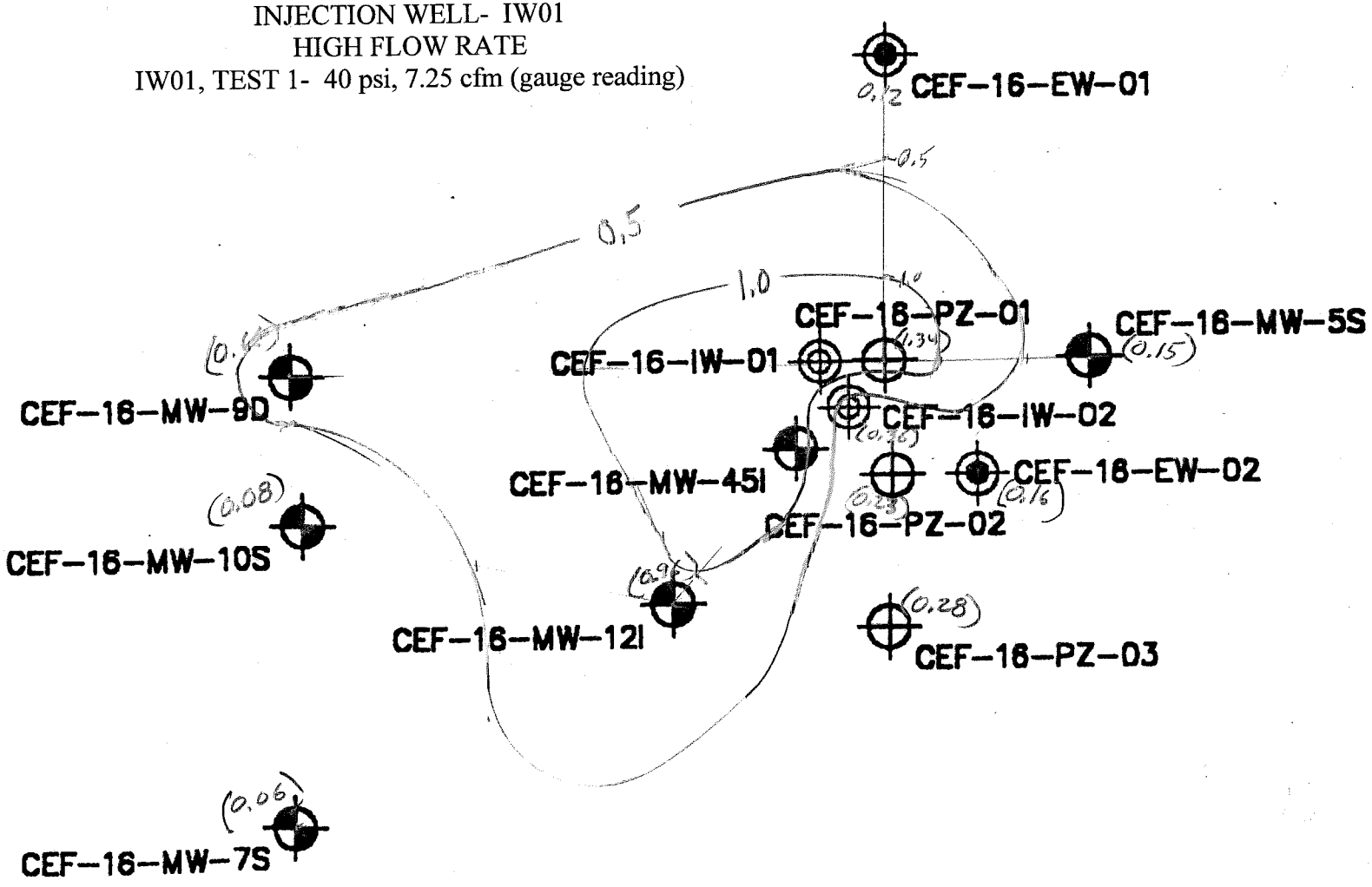
Note: Took redox bailer before last FID and D.O. reading
(1) PW01 - When pumping for redox noticed water was very silty and dark

Dissolved Oxygen At Various Depths

Depth below water surface (feet)	D.O. at 0.0 hours	D.O. at 2.0 hours
5	3.25/2.95 (1)	3.25
30	3.55	3.50
57 (bottom of well)	0.25	0.55

(1) On way back up

ISOCONTOURS OF CHANGE IN
WATER TABLE DEPTH
RADIUS OF INFLUENCE TESTING
INJECTION WELL- IW01
HIGH FLOW RATE
IW01, TEST 1- 40 psi, 7.25 cfm (gauge reading)



RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW01
SITE 16, NAS CECIL FIELD

Test No.: 2
Target Flow Rate: Operational
IW01 - Pressure: 41psi Flow Rate: 7.0 cfm(gauge reading)

Date: 9/10/98
Well (s) Operating: IW-01

Water Level

Time (hrs)	PW01 Water Level	PW02 Water Level	PW03 Water Level	EW01 Water Level	EW02 Water Level	16-5S Water Level	16-12I Water Level	16-9D Water Level	16-7S Water Level	16-10S Water Level	16-17S Water Level	16-13S Water Level	IW-02 Water Level
0.0	8.33	8.22	7.67	8.38	8.55	6.68	6.57	6.55	6.75	6.68	5.45	5.38	9.37
0.25	8.29	8.19	7.67	8.41	8.52	6.67	5.78	5.42	6.75	6.70	5.47	5.42	9.26
0.5													
1.0	8.28	8.17	7.65	8.41	8.51	6.67	5.39	5.25	6.74	6.68	5.44	5.40	9.10
1.5													
2.0													
2.5	8.28	8.15	7.62	8.38	8.48	6.67	4.88	5.37	6.77	6.62	5.39	5.36	8.73
3.0													
3.5													
4.0	8.23	8.11	7.58	8.34	8.45	6.58	4.81	5.52	6.63	6.58	5.34	5.32	8.58

Redox (ORP) - select well only

	PW01	PW02	PW03	EW-01	EW-02	16-5S	16-12I	16-9D	16-7S	16-10S	16-17S	16-13S	IW-02
Initial	125	136	130	120	121	128	130	128	134	130	-51	70	128
2.0													
4.0	92	108	109	123	107	120	143	148	147	128	-88	126	135/108

Readings taking ~4 hours to stabilize
PW02 – Initial Redox Readings 136 clear, 125 dark

Changes in Injection flow or Pressure:

Time	Well	Pressure	Flow Rate
1.0	IW-01	40 psi	7.5 cfm

11:15 turned on IW-01, Baseline 09:25

RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW01
SITE 16, NAS CECIL FIELD

Test Number 2 Date: 9/10/98

Dissolved Oxygen (D.O.)

Time (hrs)	PW01	PW02	PW03	EW01	EW02	16-5S	16-12I	16-9D	16-7S	16-10S	16-17S	16-13S	IW-02
0.0	3.65	1.75	1.25	2.10	2.30	0.50	2.00	2.65	3.95	0.50	0.65	2.00	1.30
0.25	3.25	1.20	1.15	1.80	2.70	0.45	1.10	1.05	3.95	0.35	0.45	0.80	0.80
1.0	3.55	0.75	0.80	1.70	1.55	0.35	0.90	1.10	3.95	0.30	0.35	0.75	1.05
2.5	4.20	1.00	1.00	1.85	1.70	0.45	1.05	1.05	4.05	0.35	0.35	0.70	1.00
4.0	2.80	0.95	0.80	1.90	1.30	0.35	3.25	1.10	3.95	0.30	0.85	1.25	0.75

Dissolved Oxygen at Various Depths – After System Ran 2 hours

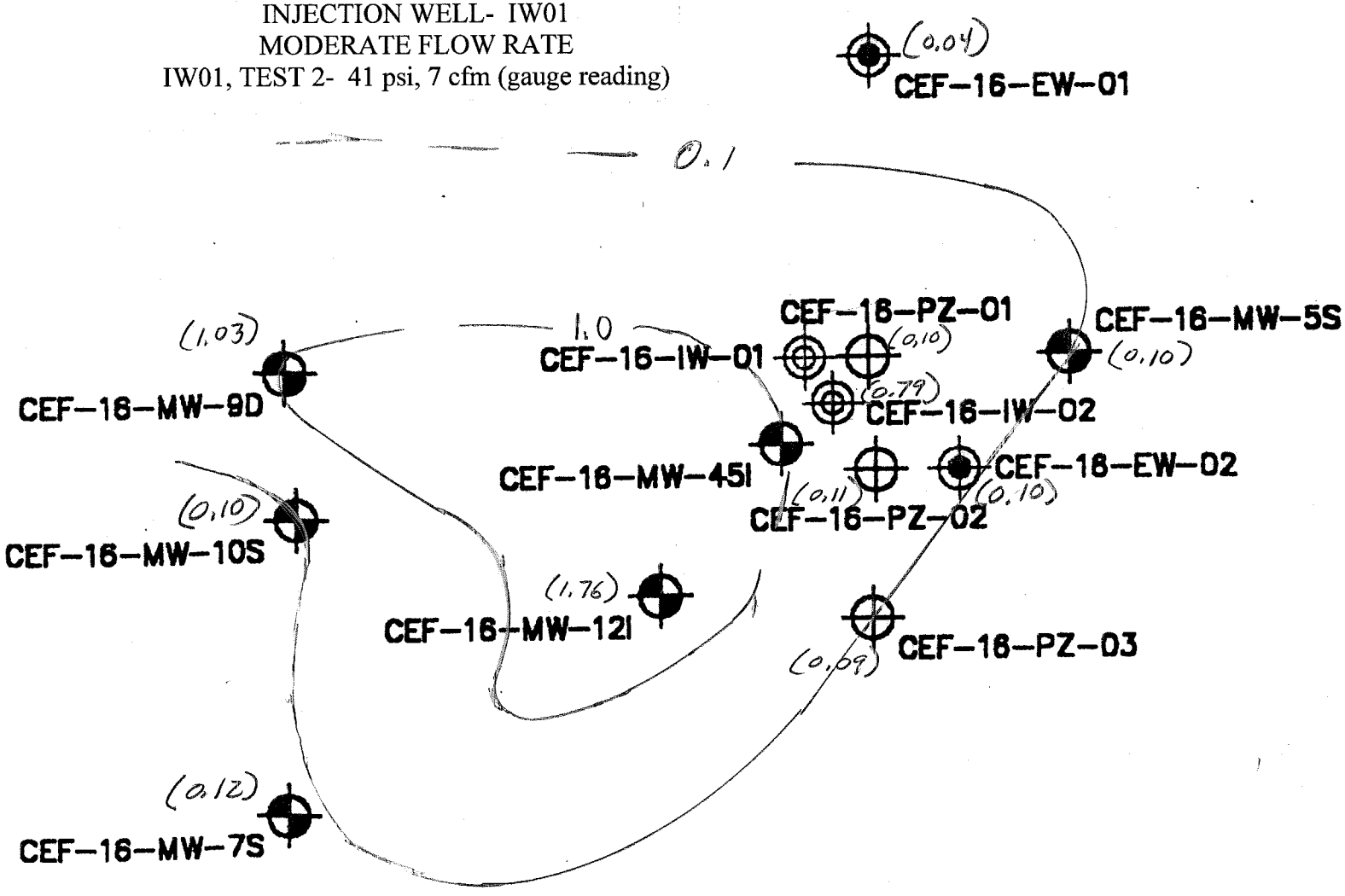
Depth below water surface (feet)	D.O. at 0.0 hours	D.O. at 16:45	D.O. at 08:15 next morning
Surface			5.25
5	1.05	0.75	5.40
30	3.05	2.75	7.50
57 (bottom of well)	0.60	3.50	10..5

Observed Volatilization (FID or PID)

Time (hrs)	PW01	PW02	PW03	EW01	EW02	16-5S	16-12I	16-9D	16-7S	16-10S	16-17S	16-13S	IW-02
0.0	30/>2000	48/>2000	120/>2000	0.5/0.6	11.2/130	1.8/900	48/1056	0.4/933	0.8/>2000	0.8/35.5	76/>2000	0.4/1590	1.6/30
0.25 (1)	6/334	33/442	46/373	13.0/1.5	44/57	3.4/107	5.4/80	1.4/13.0	1.8/135	2.8/4.5	3.4/*AWK (2)	3.2/430	3.5/75
4.5	>1000/ >2000	>1000/ >2000	>1000/ >2000	2.8/17.1	70/331/107	14/64	50/85	0.5/10.3	0.8/31	0.8/6.8	1.1/4.8	4.2/310	0.8/38

(1) System not on
(2) Need to reset PID several time, beeping with *AWK fault

ISOCONTOURS OF CHANGE IN
WATER TABLE DEPTH
RADIUS OF INFLUENCE TESTING
INJECTION WELL- IW01
MODERATE FLOW RATE
IW01, TEST 2- 41 psi, 7 cfm (gauge reading)



RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW01
SITE 16, NAS CECIL FIELD

Test No.: 3
Target Flow Rate: Low
Initial Header Pressure/Vacuum: 98" H_2O (39 psi)

Date: 9/2/98
Well (s) Operating: IW-01

Water Levels

Time (hrs)	IW01 Flow Rate (gauge reading)	IW01 Pressure (1)	PW01 Water Level	PW02 Water Level	PW03 Water Level	EW01 Water Level	EW02 Water Level	16-5S Water Level	16-12I Water Level	16-9D Water Level	16-7S Water Level	16-10S Water Level	16-17S Water Level
0.0	-----	-----	8.25	8.12	7.42	8.28	8.47	6.60	6.54	6.53	6.65	6.60	5.44
0.25	5.5	39	7.58	7.57	7.41	8.15	7.90	6.05	6.55	6.54	6.42	6.23	5.45
0.5	5.5	38	7.33	7.38	7.37	8.02	7.72	6.00	6.10	6.51	6.37	6.22	5.44
0.75	5.5	38	7.32	7.37	7.34	7.91	7.70	6.02	6.53	6.51	6.38	6.25	
1.0	5.5	38											
1.5			7.36	7.42	7.28	7.85	7.75	6.08	6.49	6.48	6.39	6.26	5.41
2.0			7.49	7.52	7.23	7.87	7.85	6.19	6.50	6.50	6.45	6.32	

Dissolved Oxygen - select wells only

			PW01		PW03		EW-02	16-5S				16-10S	
Initial			2.6				2.3	2.7				2.7	
Final			5.8				1.4	2.8/2.1				2.8	

Time 0.0 hours is recorded prior to the start of the test.
The criteria for completing the test is to have three consecutive reading with less than 10% difference for each of the wells
(1) Pressure reading recorded at the well head
(2) Water level measurements are from top of risers.
(3) Dissolved oxygen recorded prior to the start up of test and after test completed for selected wells only.

Rain and very humid. Problem with PID

RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW01
SITE 16, NAS CECIL FIELD

Test Number 3
Page 2 of 2

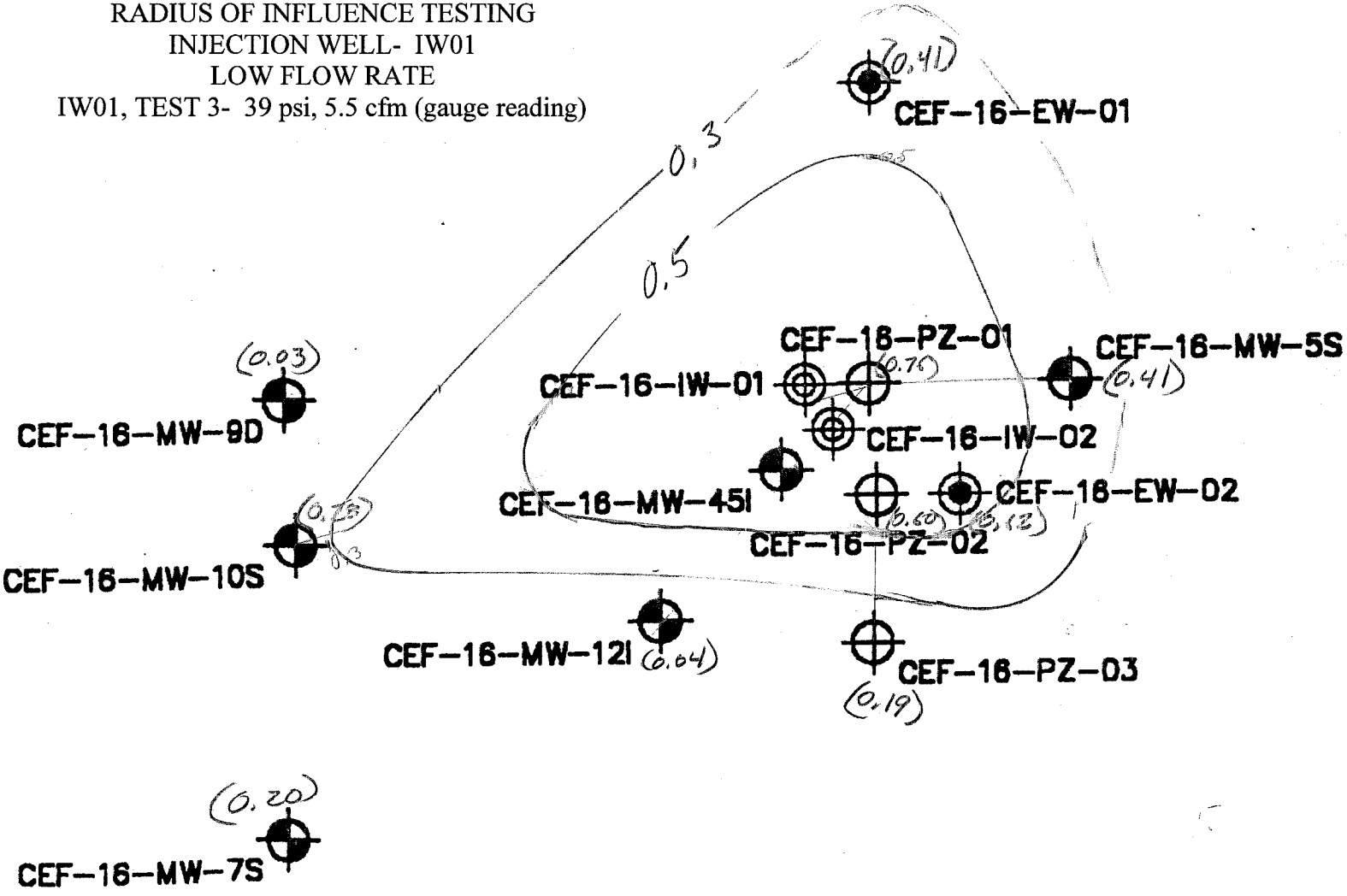
Date: 9/2/98

Observed Volatilization PID

Time (hrs)	PW01	PW02	PW03	EW01	EW02	16-5S	16-12I	16-9D	16-7S	16-10S	16-17S	16-19S
0.0	193	120	260	43	47	210						
0.25	232	140	271	84	238	53	22	0	16	0	-----(1)	-----(1)
0.5	294	101	315	252	30	20	85	61	66	30	-----(1)	~110 (1)
0.75	311	129	311	311	305	126	148	0	0	0	-----(1)	
1.0	311	108	311	0.0	234	25	0.0	0.0	1.3	0.0	-----(1)	8.3
1.5												
2.0	<2000	<2000	<2000	<2000	<2000	<2000	<2000	803	39	822	<2000	
2.5												
3.0												

Rain and very humid. Problems with PID
(1) PID poor response

ISOCONTOURS OF CHANGE IN
WATER TABLE DEPTH
RADIUS OF INFLUENCE TESTING
INJECTION WELL- IW01
LOW FLOW RATE
IW01, TEST 3- 39 psi, 5.5 cfm (gauge reading)



Air Injection Test
IW-02 only

RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW02
SITE 16, NAS CECIL FIELD

Test No.: 1
Target Flow Rate: Low, Clear Column

Date: 9/1/98
Well (s) Operating: IW-02

Water Level

Time (hrs)	IW02 Flow Rate (gauge reading)	IW02 Pressure (1)	PW01 Water Level	PW02 Water Level	PW03 Water Level	EW01 Water Level	EW02 Water Level	16-5S Water Level	16-12I Water Level	16-9D Water Level	16-7S Water Level	16-10S Water Level
0.0	5.5 cfm	28 psi	8.19	8.06	7.34	8.23	8.39	6.53	6.45	6.51	6.47	6.53
0.25	5.5 cfm	28 psi	8.00	7.88	7.34	8.17	8.23	6.29	6.04	6.15	6.33	6.35
0.5	5.5 cfm	28 psi	7.88	7.75	7.33	8.10	8.02	6.20	5.95	6.08	6.30	6.31
0.75	5.5 cfm	28 psi	7.83	7.68	7.29	8.08	8.02	6.19	5.93	6.04	6.28	6.29
1.0	5.5 cfm	28 psi	7.80	7.68	7.28	8.06	8.00	6.22	5.91	6.02	6.30	6.32
1.25	5.5 cfm	28 psi	7.79	7.67	7.26	8.04	7.99	6.24	5.90	6.01	6.30	6.33
1.5	5.5 cfm	28 psi	7.78	7.65	7.26	8.00	8.05	6.25	5.90	6.00	6.30	6.33

Dissolved oxygen - select wells only

			PW01				EW-02	16-5S				16-10S
Initial			1.5				2.2	2.3				2.6
Final			1.0				1.2	2.8				2.6

Time 0.0 hours is recorded prior to the start of the test.
The criteria for completing the test is to have three consecutive reading with less than 10% difference for each of the wells
(1) Pressure reading recorded at the well head
(2) Water level measurements are from top of risers.
(3) Dissolved oxygen recorded prior to the start up of test and after test completed for selected wells only.

Depth of water measured from top of well casing

RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW02
SITE 16, NAS CECIL FIELD

Test Number 1

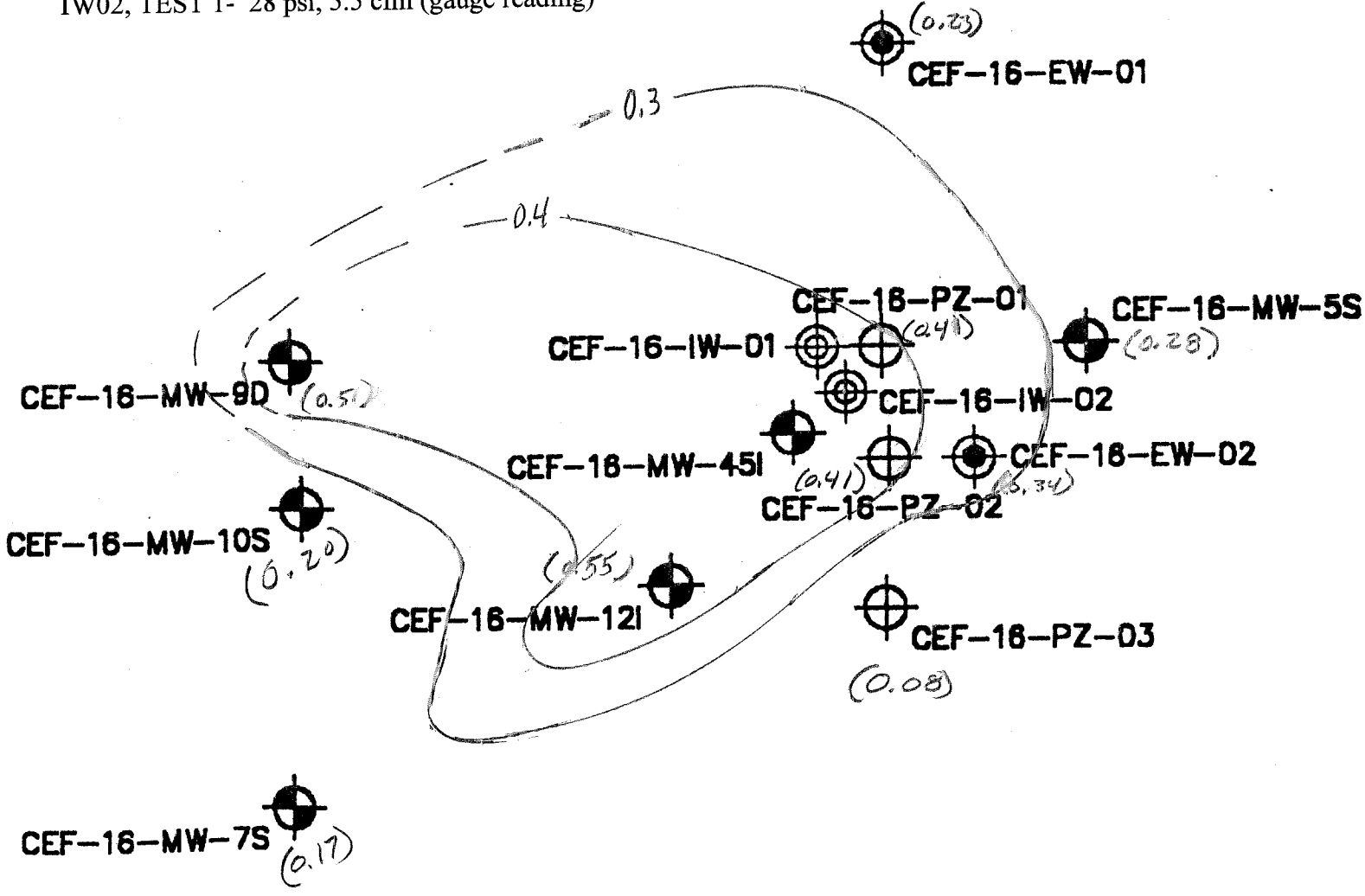
Date: 9/1/98

Observed Volatilization PID

Time (hrs)	PW01	PW02	PW03	EW01	EW02	16-5S
0.0/0.25	145	108	0	0	0	0
0.45	17	NR	0	0	324	0
0.5	15	105	0	0	>2000	0
1.0	162	11	75	39.3	>2000	37.4
1.25	344	46	85.5	7.6	>2000	51.1
1.5	330	23	84	10	765	60
End	497	25.6	73.6	81	1421	57.7

NR – No Reading

ISOCONTOURS OF CHANGE IN
WATER TABLE DEPTH
RADIUS OF INFLUENCE TESTING
INJECTION WELL- IW02
LOW FLOW RATE
IW02, TEST 1- 28 psi, 5.5 cfm (gauge reading)



RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW02
SITE 16, NAS CECIL FIELD

Test No.: 2 Date: 9/1/98

Target Flow Rate: High Flow Rate 10 cfm(gauge reading) @ 36 psi Well (s) Operating: IW-02

Water Level

Time (hrs)	IW02 Flow Rate (gauge reading)	IW02 Pressure (1)	PW01 Water Level	PW02 Water Level	PW03 Water Level	EW01 Water Level	EW02 Water Level	16-5S Water Level	16-12I Water Level	16-9D Water Level	16-7S Water Level	16-10S Water Level
0.0	10 cfm	36 psi	8.13	7.72	7.30	8.15	8.32	6.52	6.54	6.51	6.49	6.49
0.25	10 cfm	36 psi	7.87	7.70	7.27	8.05	8.10	6.08	5.80	6.02	6.27	6.22
0.5	10 cfm	36 psi	7.61	7.46	7.22	7.99	7.74	5.94	5.60	5.80	6.19	6.11
0.75	10 cfm	36 psi	7.49	7.34	7.20	7.93	7.68	5.90	5.53	5.73	6.15	6.08
1.0	10 cfm	36 psi	7.50	7.38	7.16	7.89	7.72	5.48	5.50	5.67	6.15	6.10
1.25	10 cfm	36 psi	7.55	7.43	7.10	7.86	7.76	6.07	5.47	5.65	6.18	6.15
1.5	10 cfm	36 psi	7.63	7.50	7.03	8.04	7.87	6.11	5.39	5.60	6.19	6.18

Dissolved oxygen - select wells only

			PW01				EW-02	16-5S				16-10S
Initial			1.6				1.4	2.4				2.2
Final			1.2				0.9	2.2				1.7

Time 0.0 hours is recorded prior to the start of the test.
The criteria for completing the test is to have three consecutive reading with less than 10% difference for each of the wells
(1) Pressure reading recorded at the well head
(2) Water level measurements are from top of risers.
(3) Dissolved oxygen recorded prior to the start up of test and after test completed for selected wells only.

RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW02
SITE 16, NAS CECIL FIELD

Test Number 2

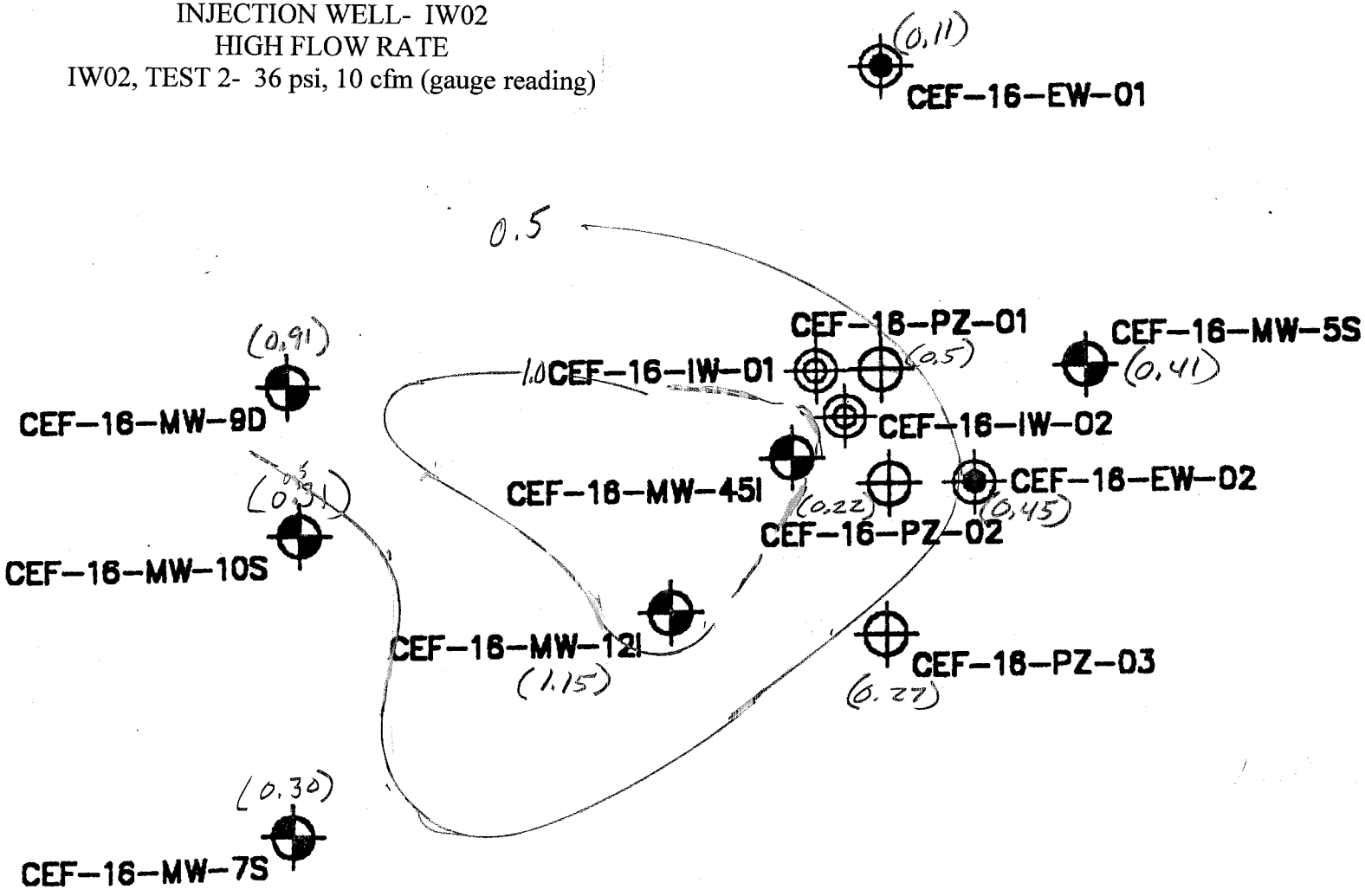
Date: 9/1/98

Observed Volatilization PID

Time (hrs)	PW01	PW02	PW03	EW01	EW02	16-5S	MW10S
0.0	NR	83.3	140	131	1935	142	0.0
0.25	354	80	210	0	0	215	
0.5	228	37	225	0	0	45	21
0.75	234	50	298	0	11.8	870	0.0
1.0	249	102	496	11.5	131	190	11
1.25	165	362	912	20	363	287	
1.5	1407	>2000	1643	0	619	611	

CEF 16-9D and -7S had PID readings of 0.0

ISOCONTOURS OF CHANGE IN
WATER TABLE DEPTH
RADIUS OF INFLUENCE TESTING
INJECTION WELL- IW02
HIGH FLOW RATE
IW02, TEST 2- 36 psi, 10 cfm (gauge reading)



Air Injection Test
Both IW-01 and IW-02

RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW01 and IW02
SITE 16, NAS CECIL FIELD

Test No.: 3 Date: 9/10+11/98

IW01 - Pressure: 40 psi_ Flow Rate: 6.0 cfm(gauge reading) on 9/10/98 @ 20:40 Well (s) Operating: IW01 and IW02

IW02 - Pressure: 39 psi_ Flow Rate: 7.5 cfm(gauge reading) on 9/11/98 @ 09:41

Water Level

Time (hrs)	PW01 Water Level	PW02 Water Level	PW03 Water Level	EW01 Water Level	EW02 Water Level	16-5S Water Level	16-12I Water Level	16-9D Water Level	16-7S Water Level	16-10S Water Level	16-17S Water Level	16-13S Water Level	IW-02 Water Level
0.0	8.23	8.11	7.58	8.34	8.45	6.58	4.81	5.52	6.63	6.58	5.34	5.32	8.58
11.0 / 08:00	8.00	7.94	7.35	8.15	8.27	6.39	5.28 (1)	4.97	6.42	6.38	5.29	5.29	7.54

Redox (ORP) - select well only

	PW01	PW02	PW03	EW01	EW02	16-5S	16-12I	16-9D	16-7S	16-10S	16-17S	16-13S	IW-02
Initial	92	108	109	123	107	120	143	148	147	128	-88	126	108
4.0	81	93	102	99	97	110	123	135	128	128	-70	114	116

Baseline identified/copied from test 2. Note system shutdown for ~2 hours until could replace cap on new well. Running only deep well as not to disturb the new well as much.
See note book for observed bubble 9/11/98
Outside site well data collected on 9/11/98 at 09:50

(1) Double checked, water is bubbling, may effect depth reading

Changes in Injection flow or Pressure:

Time	Well	Pressure	Flow Rate

RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW01 and IW02
SITE 16, NAS CECIL FIELD

Test Number 3
Page 2 of 2

Date: 9/10+11/98

Dissolved Oxygen

Time (hrs)	PW01	PW02	PW03	EW01	EW02	16-5S	16-12I	16-9D	16-7S	16-10S	16-17S	16-13S	IW-02
0.0 *	2.80	0.95	0.80	1.90	1.30	0.35	3.25	1.10	3.95	0.30	0.85	1.25	0.75
11.0	2.50	0.55	0.55	1.75	0.55	0.35	5.60	0.85	3.60	0.35	1.20	0.75	5.40

- Test conducted immediately after IW-01 test so no recovery time. Using last reading from test 2 as baseline.
- Note: Had to stop blowers for 20 minutes after IW-02 was started because new well cap was discharged and water was escaping.
- Started IW-01 @ 08:40 on 9/10/98. 11 hours @ 08:00 on 9/11/98.

WELL 16-5S

Dissolved Oxygen At Various Depths

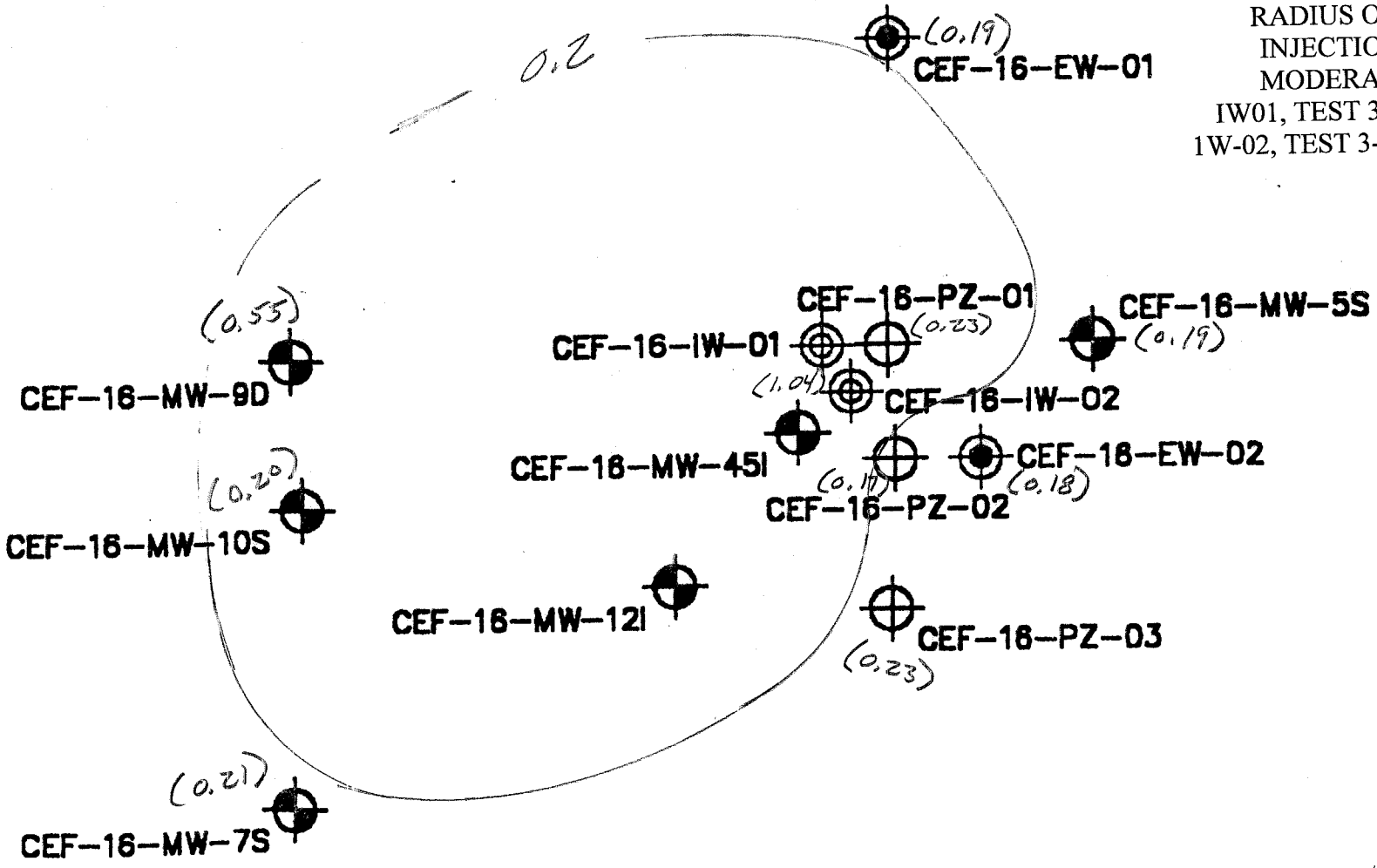
Depth below water surface (feet)	IW-02 only at 17:06 hours	D.O. at 08:24 on 9/11/98
Surface		
6	1.25	0.55
10	0.55	0.45
13.5	0.50	0.45

Started IW-01 @ 8:40 p.m. on 9/10, ran for 11 hrs (approx) up to 8:00 a.m. on 9/11.
Blowers shut down for approximately 1.5 hours to recap MW-45I.

Observed Volatilization (FID or PID)

Time (hrs)	PW01	PW02	PW03	EW01	EW02	16-5S	16-12I	16-9D	16-7S	16-10S	16-17S	16-13S	IW-02	New Well
0.0	>1000/ >2000	>1000/ >2000	>1000/ >2000	2.8/17.1	70/107	14/64	50/85	0.5/10.3	0.8/31	0.8/6.8	1.1/4.8	0.8/38	0.8/38	
11.0	78/780	>1000/ >2000	>1000/ >2000	0.4/93	>1000/>2000	0.0/93	3.0/1090	0.0/0.0	0.0/150	1.0/0.0	14/880	0.0/54.7	------/>2000	------/>2000

ISOCONTOURS OF CHANGE IN
WATER TABLE DEPTH
RADIUS OF INFLUENCE TESTING
INJECTION WELL- IW01 & IW02
MODERATE/HIGH FLOW RATES
IW01, TEST 3- 40 psi, 6 cfm(gauge reading)
1W-02, TEST 3- 39 psi, 7.5 cfm (gauge reading)



RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW01 and IW02
SITE 16, NAS CECIL FIELD

Test No.: 4 Date: 9/2/98

Target Flow Rate: Operating Pressure + Flow Well (s) Operating: IW-01 + IW-02

IW01 - Pressure: 41 psi Flow Rate: 7.5 cfm(gauge reading)

IW02 - Pressure: 31 psi Flow Rate: 7.5 cfm(gauge reading)

Water Level

ime (hrs)	IW01 Flow Rate	IW01 Pressure (1)	IW02 Flow Rate (gauge reading)	iW02 Pressure (1)	PW01 Water Level	PW02 Water Level	PW03 Water Level	EW01 Water Level	EW02 Water Level	16-5S Water Level	16-12I Water Level	16-9D Water Level	16-7S Water Level	16-10S Water Level	16-17S Water Level	16-19S Water Level
0.0	0	0	0	0	8.42	8.28	7.37	8.36	8.61	6.70	6.54	6.52	6.77	6.69	5.97	5.45
0.5	7.5	40	7.5	30	6.72	7.04	7.31	8.03	7.39	5.57	5.77	5.80	6.12	5.94	5.72	5.39
1.0	7.5	40	7.5	30	7.21	7.21	7.16	7.83	7.55	5.95	5.54	5.60	6.23	6.11	5.70	5.31
1.5	7.5	40	7.5	30	7.44	7.40	7.08	7.83	7.74	6.11	5.54	5.53	6.30	6.20	5.75	5.30
2.0	7.5	40	7.5	30	7.54	7.51	7.01	7.84	7.84	6.14	5.40	5.49	6.34	6.25		
2.5	7.5	40	7.5	30	7.35	7.46	7.05	7.89	7.80	6.20	5.30	5.45	6.37	6.28		

Dissolved oxygen - select well only

					PW01				EW-02	16-5S				16-10S		
Initial					4.5				1.6	1.7				2.5		
Final					5.7				1.4	3.4				2.0		

Time 0.0 hours is recorded prior to the start of the test.
The criteria for completing the test is to have three consecutive reading with less than 10% difference for each of the wells
(1) Pressure reading recorded at the well head
(2) Water level measurements are from top of risers.
(3) Dissolved oxygen recorded prior to the start up of test and after test completed for selected wells only.

Raining – using FID
0.0 time is baseline

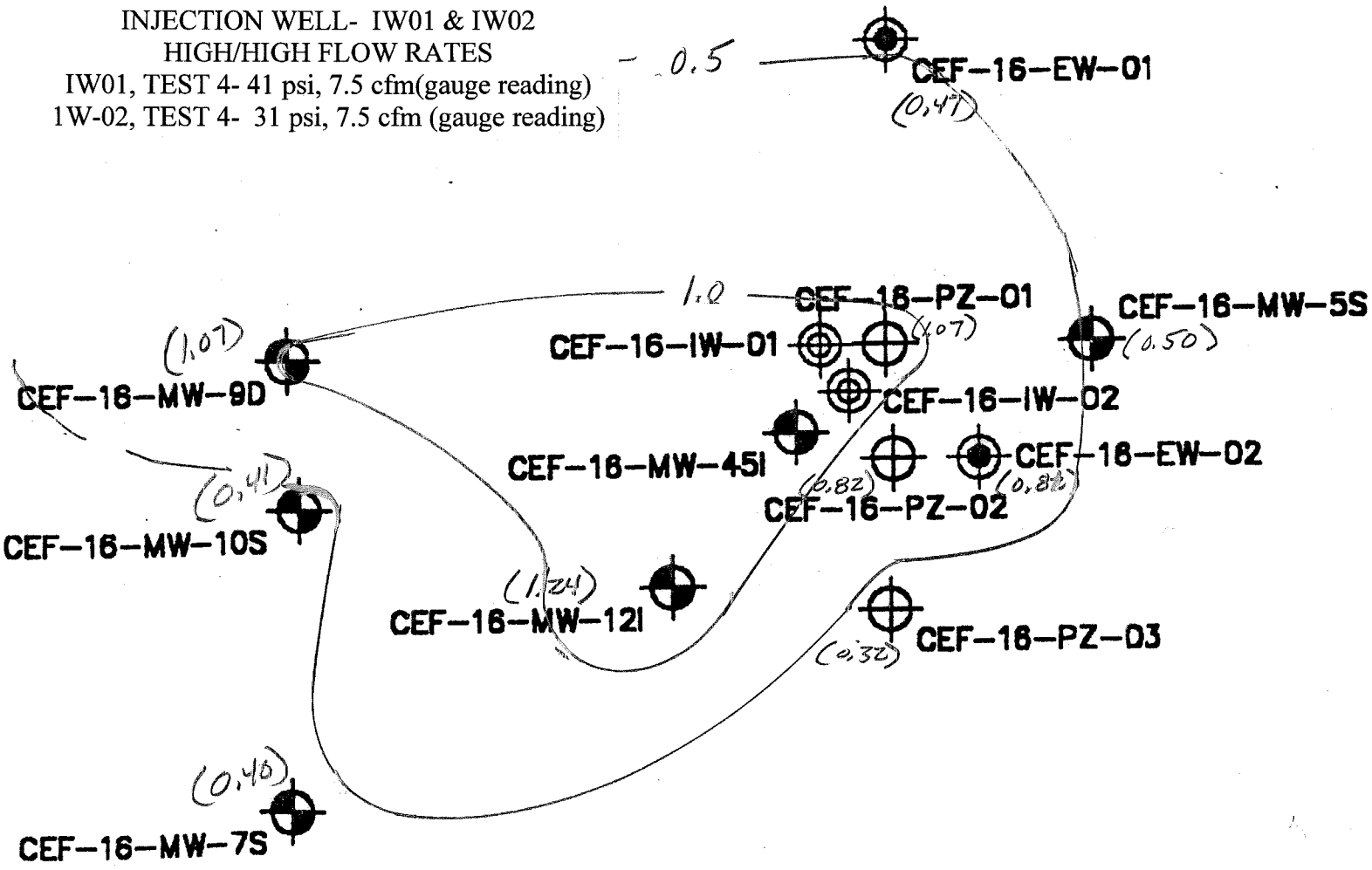
RADIUS OF INFLUENCE TESTING WORKSHEET
INJECTION WELL - IW01 and IW02
SITE 16, NAS CECIL FIELD

Test Number 4 Date: 9/2/98

Observed Volatilization FID

Time (hrs)	PW01	PW02	PW03	EW01	EW02	16-5S	16-12I	16-9D	16-7S	16-10S	16-17S	16-19S
0.0	4.6	22	46	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
0.5	>1000	>1000	>1000	330	>1000	68	2.5	0	0	7.2	1	
1.0	>1000	>1000	>1000	120	>1000	48	0	0	0	1	1	
1.5	>1000	>1000	>1000	>1000	>1000	580	0	0	0	0	0	
2.0	>1000	>1000	>1000	>1000	>1000	140	0	0	0	0	0	
2.5	900	>1000	>1000	>1000	>1000	210	0	0	0	0	0	0

ISOCONTOURS OF CHANGE IN
WATER TABLE DEPTH
RADIUS OF INFLUENCE TESTING
INJECTION WELL- IW01 & IW02
HIGH/HIGH FLOW RATES
IW01, TEST 4- 41 psi, 7.5 cfm(gauge reading)
1W-02, TEST 4- 31 psi, 7.5 cfm (gauge reading)



APPENDIX C

AIR SPARGING VAPOR EXTRACTION SYSTEM DESIGN CALCULATIONS

- OFF-GAS EMISSIONS ESTIMATION
- OFF-GAS TREATMENT TECHNOLOGIES EVALUATION
- AIR QUALITY IMPACT DISPERSION MODELING REPORT
- ASVE SYSTEM PRESSURE LOSS CALCULATIONS
- GAS-PHASE GAC ADSORPTION SYSTEM

OFF-GAS EMISSION ESTIMATION

NAS Cecil Field
OU 7, Site 16 ASVE Design

VOC Emission Rates
By:
Chkd by:

3/17/99

The following set of calculations estimate the contaminant loading (emission rate) for the full-scale (design) off-gas system based on data collected from the pilot-scale study and the attached calculations. The scale-up method is linear based on average concentrations. It is assumed that there will be one capture zone of emissions in the source area and two capture zones of emissions in the outer plume. The average concentration of the air emission therefore will include the air concentration measured from the pilot study to represent the source area and 2 times the estimated air emission concentrations calculated below for the outer plume as they are correlated to the measured air concentrations. At this time no other correlations for scale-up of pilot-scale ASVE systems are available.

The calculations below estimate the average off-gas concentration in the downgradient wells. The calculations estimate the downgradient off-gas based on the downgradient groundwater concentration and proportioning/correlating the groundwater concentrations to the off-gas emissions collected in the source area during the pilot study.

Estimate Average Concentrations of Parameters in Source Area and Outer Plume and calculate the Water to Air Emission Ratio in the Source Area. Use the Water to Air Emission Ratio to Calculate the Air Emission in the Outer Plume. The attached sketches of the well profiles with the sample locations and the attached site drawing define the samples/concentrations used in these calculations and the source area and outer plume area.
The Depth Weighted Average Concentration were estimated using the following formula:

(C1*d1+C2*d2+C3*d3...+Cn*dn)/(d1+d2+d3...+dn)

	Aquifer Thickness	TCE Conc (ug/L)	TCA Conc (ug/L)	1,1-DCE Conc (ug/L)	1,2-DCE Conc (ug/L)	VC Conc (ug/L)
Source Area						
	35	315000	1600	1000	780	14
	32.5	1400	33.5	26.3	9.8	1
	26.5	10600	7.9	3.5	14.2	0.8
Average GW concentration (Depth weighted)		120760	610	382	298	6
Measured Air Concentration in Pilot Study (ppmv)		1970	17.5	3.5	112	37.2
Water to Air Emission Ratio		61.30	34.83	109.26	2.66	0.16
Outer Plume						
	12.5	500	1300	231	270	32
	22.5	1	1	1	1	1
	32.5	700	16	13	5	1
	26.5	1	1	1	1	1
Average GW concentration (Depth weighted)		309	179	36	38	5
Estimated Air Emission (ppmv) (=Ave. GW Conc/Water to Air Emission Ratio)		5.04	5.14	0.33	14.35	32.94

Below is a check to see if the water to air emission ratio and therefore the air emission are in the ball park. A worst case scenario will be used in this check by applying the 1997 Marlowe Action Levels program which is used for Hazardous Waste Site Work for health and safety purposes. Also a check will be made using theoretical values from air stripping of contaminated water.

		TCE	TCA	1,1-DCE	1,2-DCE	VC
Marlowe Action Levels -	GW Conc (ug/L)	309	179	36	38	5
	Calc Air Conc (ppmv)	28	7	12	12	4.5
	Water to Air Ratio (worst case)	11.04	25.57	3.00	3.17	1.11

In the worst case scenario the air emission concentrations are less than the groundwater concentration. Water to Air Ratios greater that the Marlowe Action Levels indicate that not all of the contaminant is converting to the gas phase (air emission), that is it is not 100% efficient.

VOC Emission Rates
By:_____
Chkd by:_____

For the data at OU7, Site 16 above, the VC and 1,2-DCE Water to Air Emission ratio is less that the worst case (Marlowe Action Level) and does not seem appropriate. The 1,1-DCE Water to Air Ratio also does not seem appropriate, or the 1,1-DCE is very inefficient in converting to the gas phase.

Air Stripping - Assuming 100% removal	TCE	TCA	1,1-DCE	1,2-DCE	VC
GW conc (ug/L)	400,000	1500	1500	1000	4
Calc Air Conc (ppmv)	2441	9.1	12.5	8.3	0.052
Water to Air Ratio	164	165	120	120	77

In this case the air emission concentrations are less than the groundwater concentration. Water to Air Ratios are greater than the Marlowe Water to Air ratio a less than worst case situation.

Since there appears to be anomalies with the air concentrations obtained in the Pilot Study and the Water to Air Emission Ratio, the air emission from the outer plume will be calculated by correlating /proportioning the Henry's Law Constant of the other contaminants to TCE. These calculations assume that the Water to Air Emission Ratio for TCE is appropriate/correct.

For the Outer Plume Estimate Air Emission Concentration using Henry's Constant and the TCE water/air ratio obtained from the source area

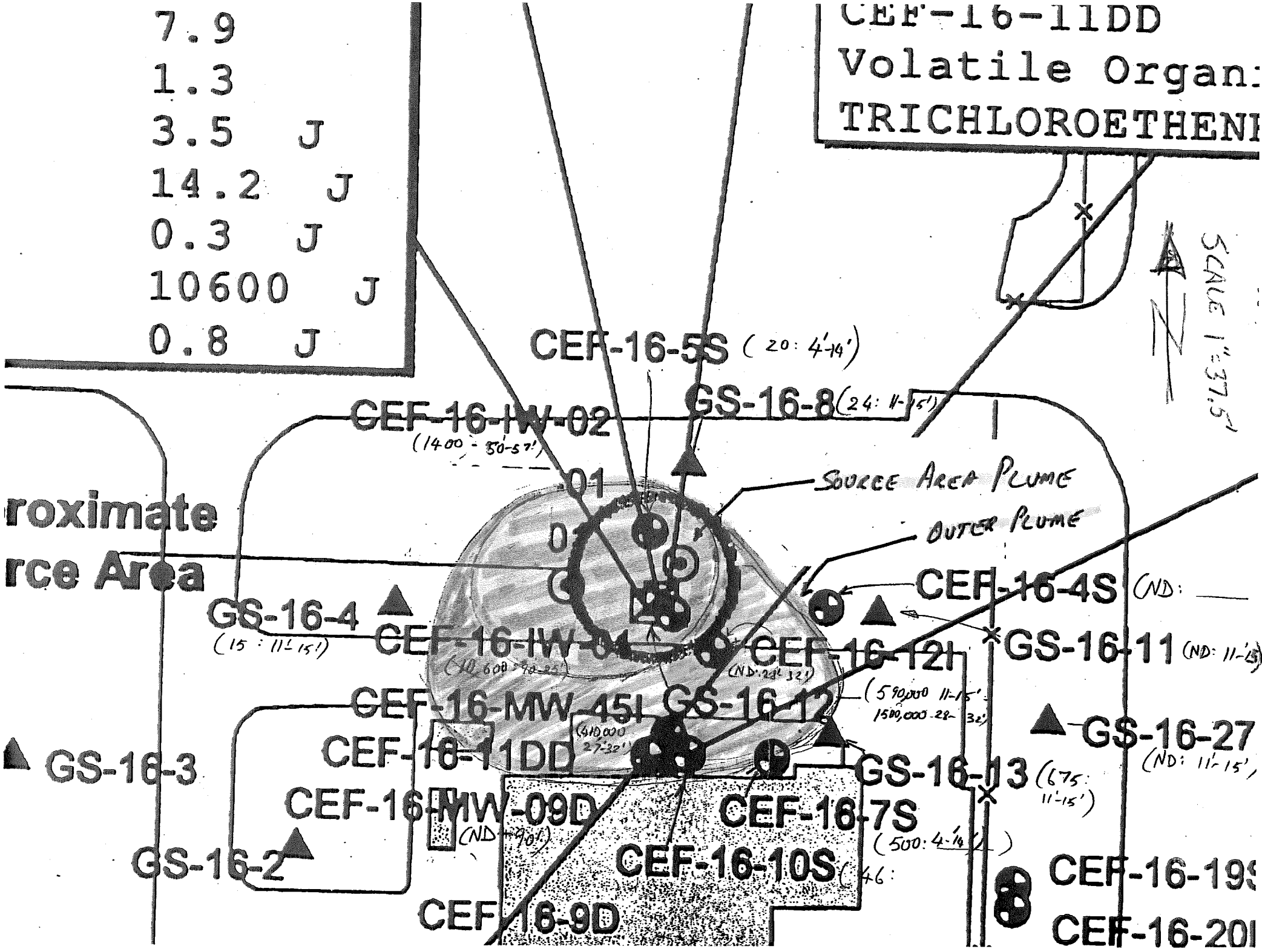
	TCE	TCA	1,1-DCE	1,2-DCE	VC
Henry's Constant (from EPA 625/R-94/006 Jan 95)	0.0091	0.0144	0.007	0.034	0.0819
Ratio Henry's Constant - TCE to Other	1.00	0.63	1.30	0.27	0.11
Projected Ratio (TCE water/air * Ratio Henry's Law)	61.30	38.74	79.69	16.41	6.81
Outer Plume Average GW Concentration	309	179	36	38	5
Calculated Air Emission for Outer Plume (ppmv) (Ave Conc Outer Plume/projected Ratio)	5.04	4.62	0.45	2.33	0.75
Measured Air Concentration - Source Area	1970	17.5	112	3.5	37.2
Final Projected Off Gas Air Emission (ppmv) (measure offgas +2 times Outer Plume)/3	660	9	1	39	13
Molecular Weight of Contaminates	131.5	98	97	97	62.5
Initial Emission Rate (lb/day)	60.7	0.6	0.1	2.6	0.6
Maximum Estimated Concentration * (ug/m3)	1564				14

* Based on Air Dispersion Modeling TCE factor = 2.37, VC factor = 1.12

Average Groundwater concentration 40459 ppb (ug/l)

7.9
1.3
3.5 J
14.2 J
0.3 J
10600 J
0.8 J

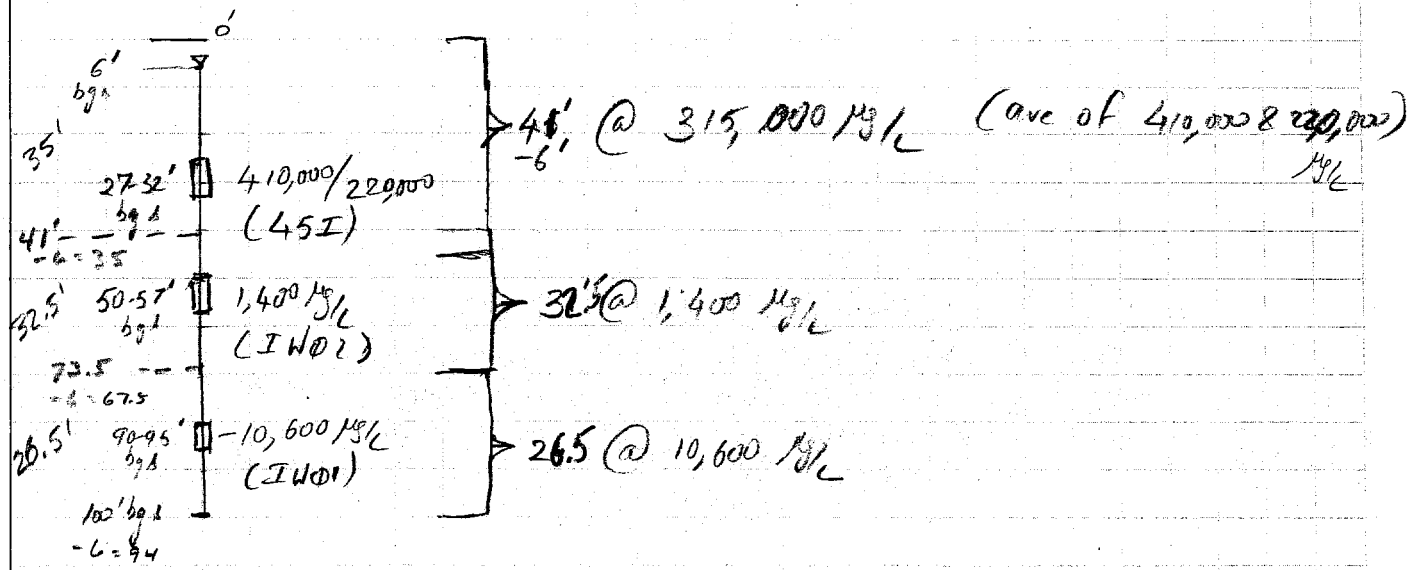
CEF-16-11DD
Volatile Organi
TRICHLOROETHENE



CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NAS, Cecil Field	JOB NUMBER: 7792
SUBJECT: Estimation of Design Avg TCE & VC Conc.	
BASED ON:	DRAWING NUMBER:
BY: J.P.K.	CHECKED BY:
APPROVED BY:	DATE: Feb 18, 99

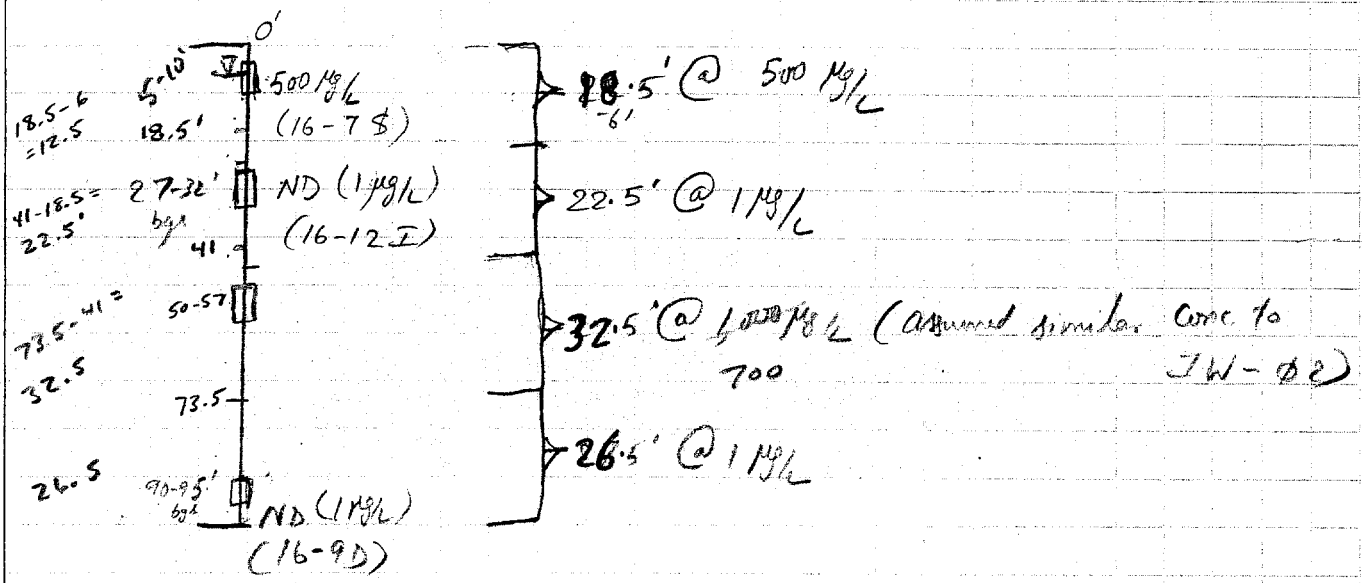
TCE Conc Profile (Source Area Plume)



CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE Feb 18, 99

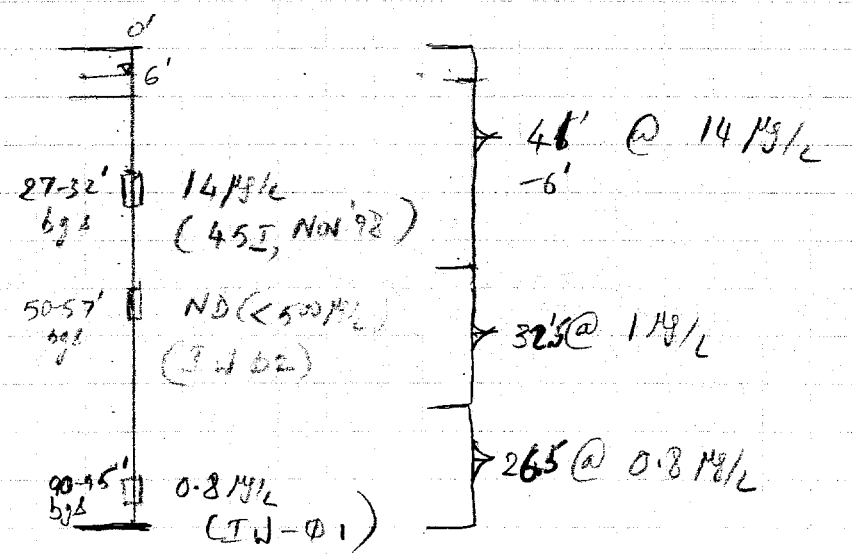
TCE Conc Profile In Outer Plume



CALCULATION WORKSHEET Order No. 19116 (01-91)

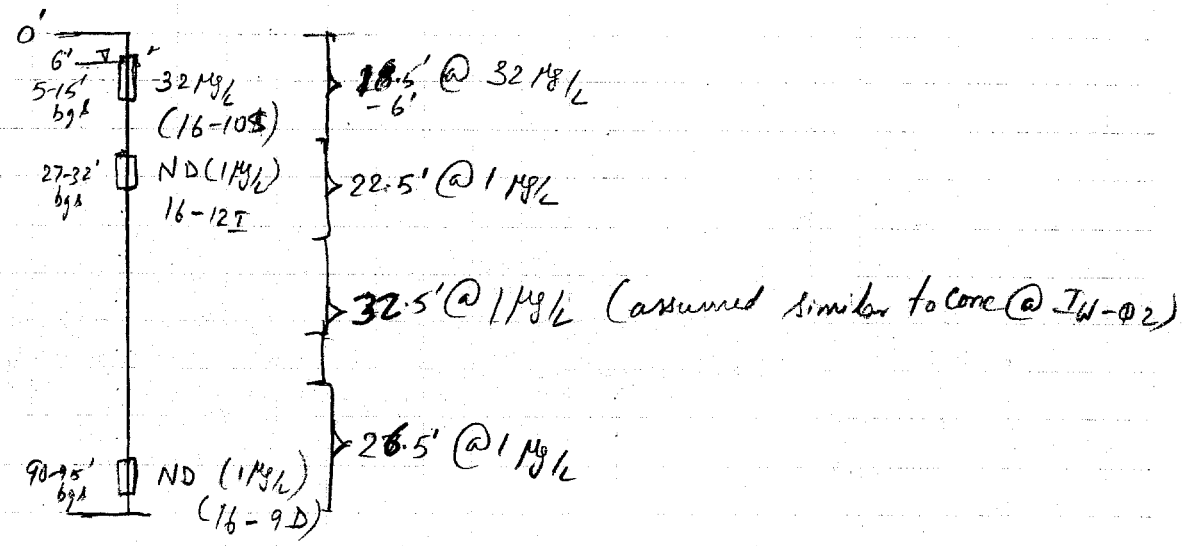
CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE Feb 18, '99

VC CONC PROFILE IN SOURCE AREA PLUME



CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE Feb 18, 99

VC Conc Profile in Outer Plume

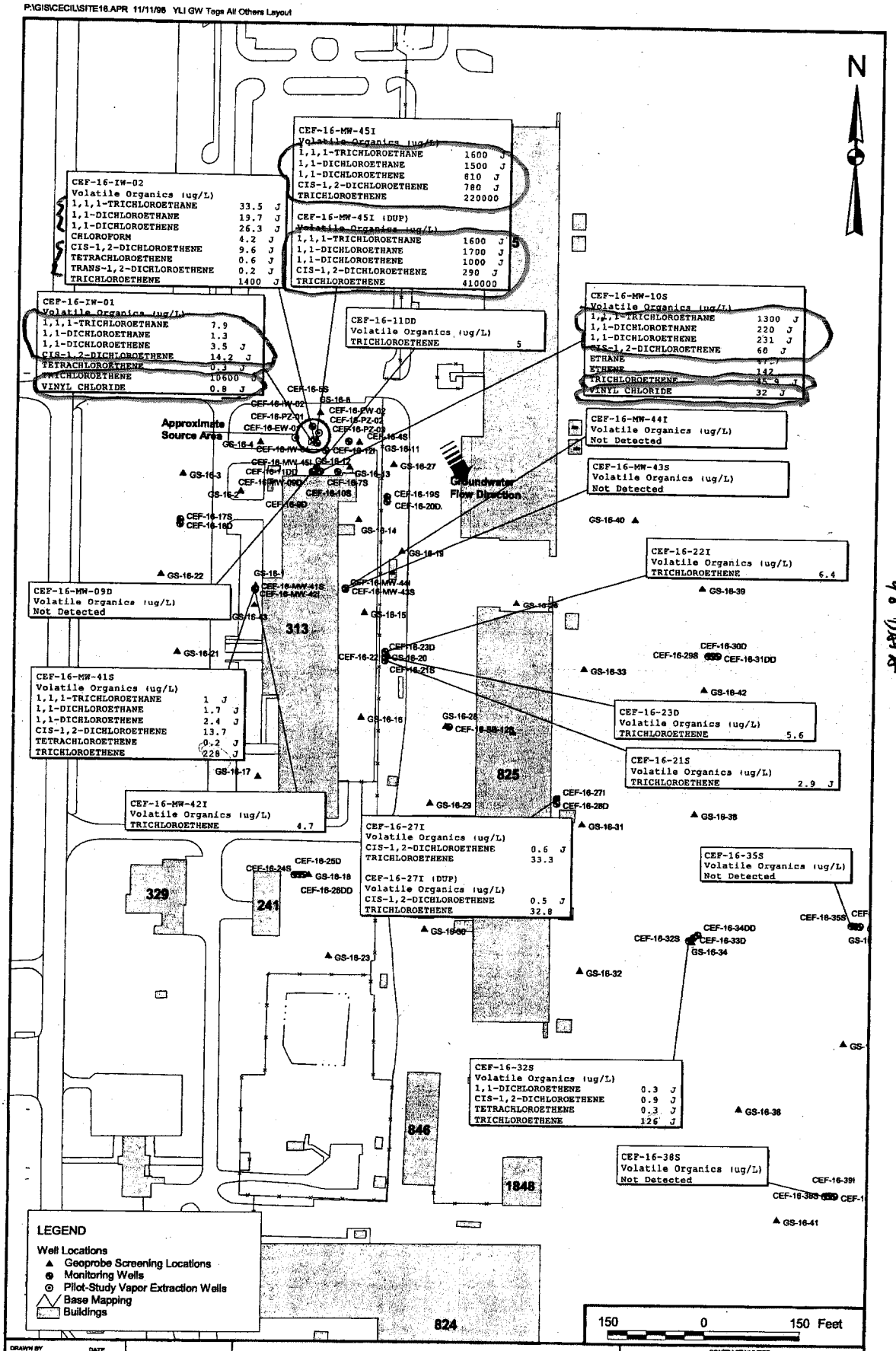


TETRA TECH NUS, INC. **CALCULATION WORKSHEET** PAGE _____ OF _____

CLIENT		JOB NUMBER	
SUBJECT			
BASED ON		DRAWING NUMBER	
BY	CHECKED BY	APPROVED BY	DATE

MONITORING WELL DATA

P:\GIS\CECIL\SITE16.APR 11/11/98 YLI GW Tags All Others Layout



DRAWN BY	DATE
YLI	11/13/98
CHECKED BY	DATE
JPK	11/11/98
COST/SCHEDULE-AREA	
SCALE	
AS NOTED	

CHLORINATED ALKANES/ALKENES AND NATURAL ATTENUATION DEGRADATION PRODUCTS FROM PILOT-STUDY SAMPLING EVENT (SOURCE AREA AND DOWNGRADIENT)

OPERABLE UNIT 7, SITE 16

NAVAL AIR STATION CECIL FIELD

JACKSONVILLE, FLORIDA

CONTRACT NUMBER	
7792	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 2-4	REV 0

DRAFT

'98 DATA

109815/P

OLD ('94) RI DATA

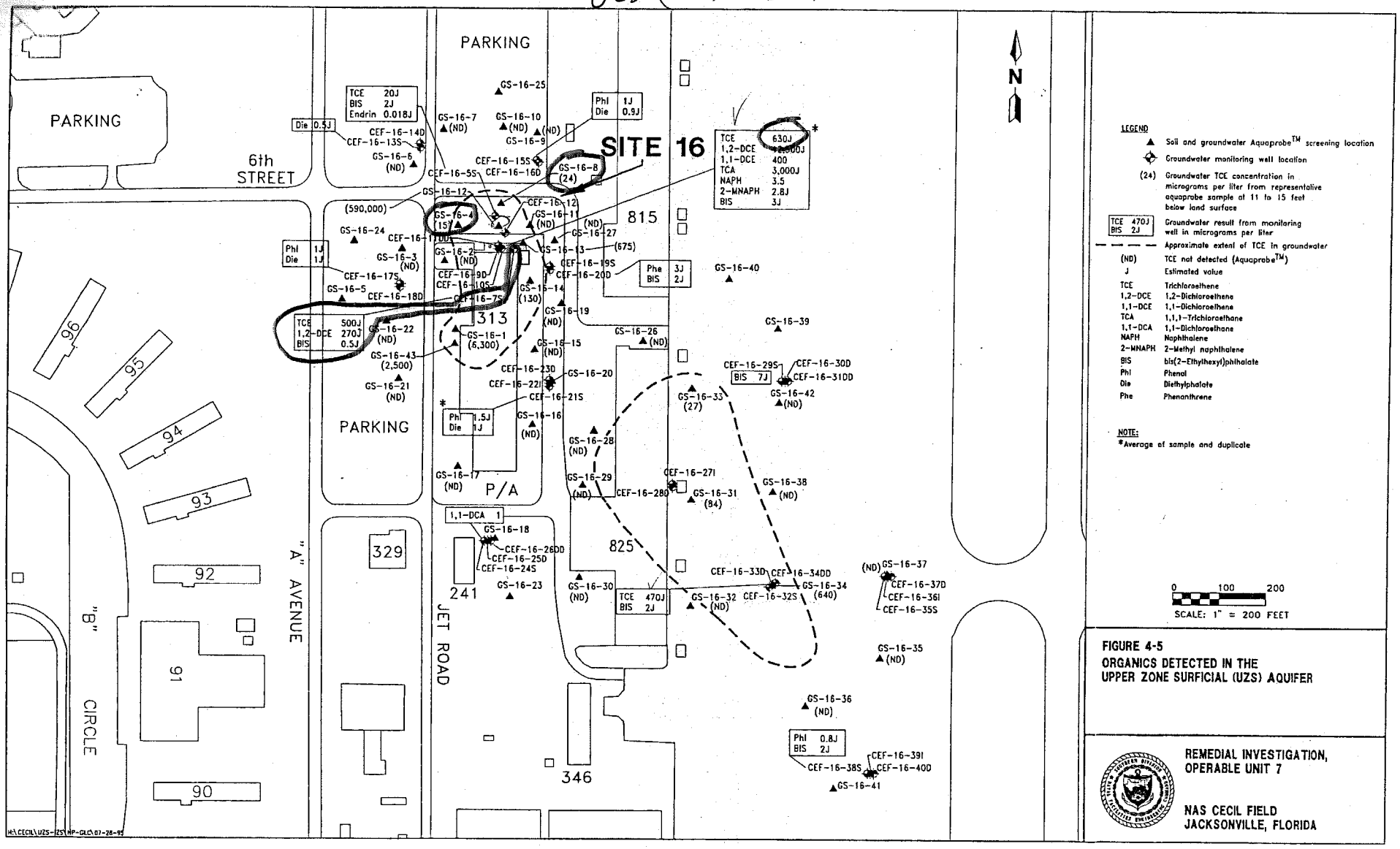


FIGURE 4-5
ORGANICS DETECTED IN THE UPPER ZONE SURFICIAL (UZS) AQUIFER

OLD ('94) RI DATA.

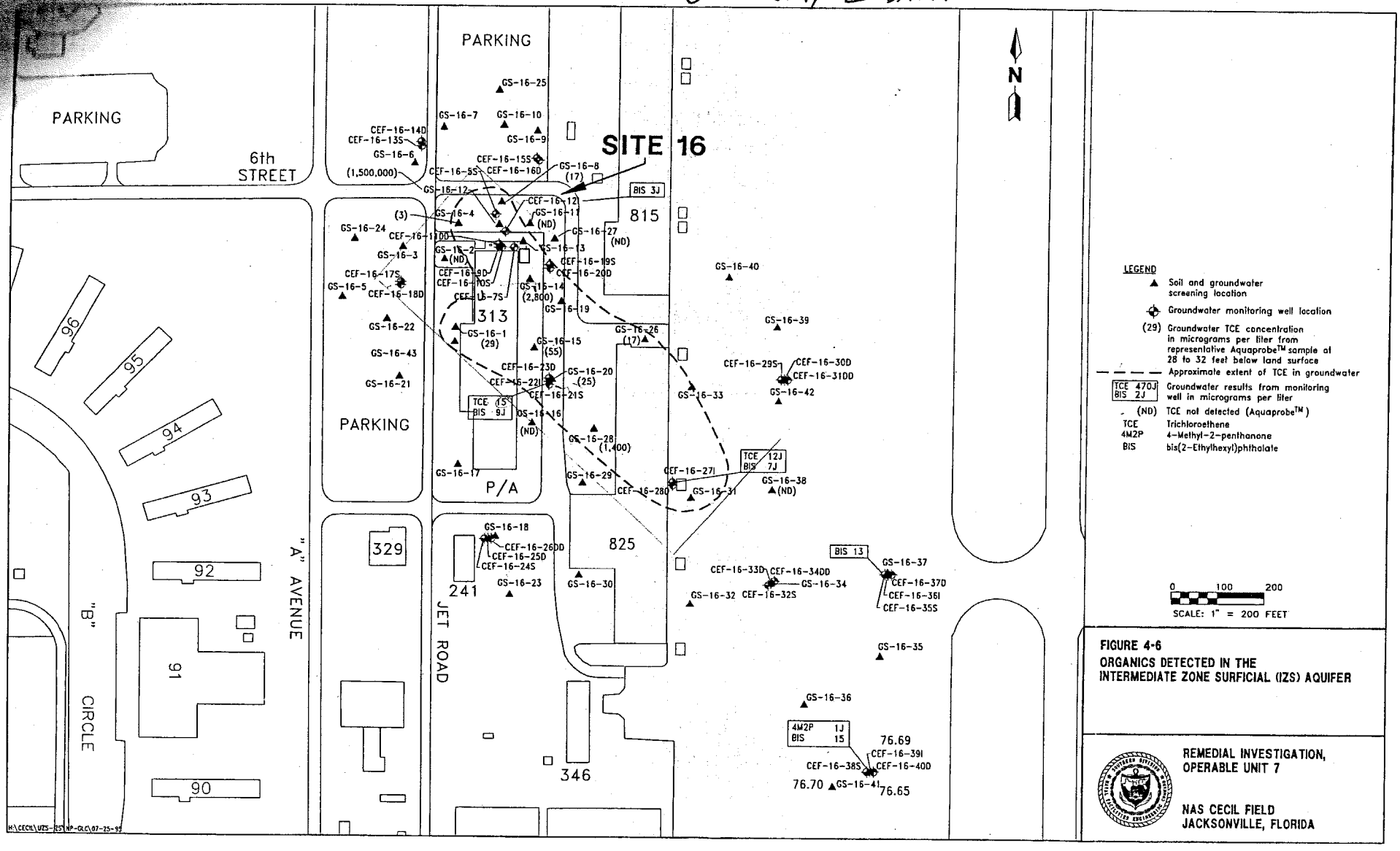


FIGURE 4-6
ORGANICS DETECTED IN THE INTERMEDIATE ZONE SURFICIAL (IZS) AQUIFER

REMEDIAL INVESTIGATION, OPERABLE UNIT 7

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

EVALUATION OF OFF-GAS TREATMENT TECHNOLOGIES

Evaluation of Off-gas Treatment Technologies

Site 16 Air Sparging/Vapor Extraction System Design

NAS, Cecil Field, Jacksonville, Florida

Purpose:
To evaluate the effectiveness, implementability concerns, and relative costs of potential off-gas treatment systems for the proposed air sparging/vapor extraction (ASVE) system at OU 7, Site 16 and recommend the most cost effective technology.

Objective and Scope:
Based on the ASVE system layout and the design air injection and extraction rates, the objective is to evaluate whether the estimated concentrations of VOCs in the off-gas exceed applicable or relevant and appropriate standards/criteria. The evaluation is limited in scope to data obtained from the pilot-scale treatability study report (TtNUS, August 1998).

Off-gas ARARs and Health/Modeling Guidance Values:
The following are the numerical standards/criteria on the mass emission limits or air concentration limits for the VOCs at this site:

VOC	Estimated Emission Rate (lb/day)	OSWER Directive	State of Florida ARC ($\mu g/m^3$)	Maximum Estimated Concentration * ($\mu g/m^3$)	Percentage Removal/ Destruction Required
TCE	61	None	639	1564	60%
Vinyl Chloride	0.6	None	31	14	0%
1,2-DCE	2.6	None	1888	174	NA
1,1-DCE	Minimal	None	47	3	NA
TCA	Minimal	None	4547	21	NA
Total VOCs	64.2	15 lb/day	None	NA	NA

*Based on air dispersion modelling (see Appendix C – Air Quality Impact Dispersion Modeling Report)

Evaluation of Off-gas Treatment Technologies:
Based on the estimated emission rates and off-gas concentrations, the following VOCs are expected to exceed the off-gas ARARs: TCE and vinyl chloride. Approximately 77 percent reduction/destruction efficiency in concentrations would be required to meet the criteria for TCE and 82 percent reduction/destruction of vinyl chloride concentrations. Because of uncertainities in the estimated emission rate for vinyl chloride, a conservative removal efficiency of approximately 95 percent reduction/destruction efficiency is assumed to be required to meet the criteria for vinyl chloride. The following potential technologies are being evaluated for achieving the required removal/destruction of VOCs: (1) Vapor-phase Granular Activated Carbon Adsorption, (2) Catalytic Oxidation, and (3) Solvent Recovery.

Vapor-phase Granular Activated Carbon Adsorption
Activated carbon adsorption of VOCs from the vapor-phase consists of forcing the off-gas stream containing the VOCs through a bed of activated carbon. The process of removal of the VOCs occurs because of adsorption while the gas passes through the interstices and pores of the activated carbon granules. The gas (essentially clean air) exits through the other end of the bed. The process continues until all the available adsorption sites in the activated carbon bed are saturated with the VOCs. Then the spent activated carbon must be disposed of or regenerated at an off-site facility. During regeneration, the VOCs are thermally oxidized to form relatively innocuous gases such as carbon dioxide, hydrogen chloride and water.

The technology is most effective when two carbon canisters (or tanks) are connected in series (lead/lag fashion) and the contaminated vapors are forced through the lead unit, followed by the lag unit. When the

lead unit is exhausted, as indicated by sampling from a port between the units, then it is sent off-site for regeneration while the lag unit connected in the lead position, and a regenerated unit is connected in the lag position.

Effectiveness:
Activated carbon adsorption would be effective for removal of TCE to the required levels. However, the process is not as effective for the removal of vinyl chloride compared to TCE. With two GAC units in series, it is anticipated that the first unit will remove the TCE and other contaminants and the second unit will "polish"/clean the vinyl chloride to concentrations that will meet the air quality standards. Because significant levels of vinyl chloride may be expected during the initial phase of remediation, vapor-phase activated carbon adsorption may not be effective by itself, and a polishing-stage treatment by a different process (such as a permanganate impregnated zeolite or alumina) may be required. It is anticipated that after air sparging has been applied for a sufficient duration for the contaminated zone of the aquifer to be rendered aerobic, the vinyl chloride production would cease and only TCE would be volatilized and removed.

Implementability:
Activated carbon adsorption would be easily implementable. The resources and materials required for the technology are widely available. Minimal operator attention would be required, limited to periodic checking of the treated gas for VOCs as a sign of lead unit exhaustion and checking hose connections and integrity as required. If the permanganate impregnated zeolite or alumina is needed to remove the vinyl chloride, the outlet pipe from the GAC units can be easily piped to the permanganate impregnated unit.

Cost:
Activated carbon capital costs are low, typically less than $5,000 for a unit capable of accommodating the estimated flow rate of 180 scfm. Costs of operating and maintenance would depend on the rate of exhaustion, which in turn would depend on the VOC loading. The estimated initial TCE loading of approximately 100 lb/day is expected to consume approximately 400 lb/day of GAC. The total cost per year may be as high as approximately $ 200,000, assuming that the high TCE recovery rate is sustained throughout the year. Typically, based on previous experience with ASVE, the sustained high removal rate does not last beyond 6 months, and an exponential decrease in removal rate may be expected. At that time, the GAC costs are likely to reduce by an order of magnitude or more. Because there may be the possibility of the presence of DNAPL (see Sections 3.1.3 and 4.3 of the report), a high GAC consumption rate may be sustained for an unknown duration but can not be estimated. The possible presence of DNAPL has not been included in this evaluation.

Catalytic Oxidation
Catalytic oxidation is a thermal destruction process in which the chlorinated organics are oxidized in a controlled fashion at temperatures that range from 600 °F to 1000 °F, with the use of a catalyst. Normally, (without the use of catalysts), higher temperatures exceeding 1500 °F would be required for oxidation of chlorinated organics. The products of catalytic oxidation of chlorinated organics are carbon dioxide, water and hydrogen chloride. Depending on the hydrogen chloride production rate and the emission limits, a scrubber may be required to remove the hydrogen chloride, prior to discharge of the oxidized gases. The heat required for raising the temperature of the gases to the required temperature is provided either by natural gas or electrical heaters.

Effectiveness:
Catalytic oxidation would be effective for the destruction of both TCE and vinyl chloride. A scrubber is likely to be required because of the high concentrations and emission rates of HCl expected.

Implementability:
Equipment and services are widely available. However, the system is likely to be maintenance intensive. Special training would be required for operation and maintenance. Caustic storage and usage would be required for the scrubber, which are additional responsibilities. Discharge of the brine from the scrubber

would be required. The local wastewater treatment system's permit requirements would have to be checked.

Cost:
Catalytic oxidation systems capable of treating 180 scfm of gas flow rate cost approximately $60,000 to $70,000. Scrubbers cost approximately $ 50,000 to $ 60,000. The electrical power usage is estimated to be approximately 35 to 40 kw, corresponding to approximately $ 30,000 to $ 35,000 per year. Caustic purchase costs and brine disposal costs would be additional at approximately $ 65,000. These costs would remain fairly constant over the remedial duration except for the reduction in caustic usage costs and brine disposal costs as concentrations of chlorinated VOCs reduce over time.

Rental: $ 7,000 to $ 10,000/month for the unit alone, for comparison to purchase. Electrical usage, caustic usage and brine disposal would be identical to that of the purchased unit.

Solvent Recovery
Solvent recovery is a condensation process where the off gases containing the VOCs are cooled to a temperature below the boiling points of the VOCs, but above the freezing point of moisture. The VOCs are recovered from the air stream as a liquid that can be recycled or incinerated off site.

The systems typically consist of three stages: (1) adsorption of the higher flow and lower concentration off gas, followed by (2) desorption under lower flow, higher concentrations, and finally, (3) cooling and condensation. The adsorption occurs by the use of activated carbon or a polymeric (hydrophobic adsorbent). The adsorber media is then warmed using an external heat source and a low-flow carrier gas is passed over the adsorber media. By desorbing the VOCs from the adsorber under low-flow conditions, a highly concentrated stream of gas is formed. This gas is then passed into a condenser where the temperatures are maintained above 32 °F, but below the boiling point of the VOCs, such as TCE. The VOCs are collected as a liquid and maintained under low temperature and pressure in an air-tight container until further processing.

Effectiveness:
Solvent recovery would be effective for the removal of TCE. However, because of the limited effectiveness of vinyl chloride adsorption on activated carbon or other media, the solvent recovery process would not be effective. Therefore, the use of this technology during the initial phase of the project when the highest concentrations of vinyl chloride may be expected, is highly questionable. The use of this technology during the later phases of the project is also questionable because the mass and concentrations of TCE removed would be very low and it would no longer be cost effective.

Implementability:
Solvent recovery is a technically complex process. Trained operators are required to operate and maintain the system. The system is also likely to be more maintenance intensive with a greater chance of breakdowns than simpler systems such as activated carbon. Also, relatively few manufacturers offer this system.

Cost:
One bid provides an estimate of $ 230,000 capital cost. The estimated power usage is 28 kw, which corresponds to an additional cost of approximately $ 25,000. Operating and maintenance costs would be additional. The cost of disposal of the recovered solvent, (approximately 35 lb/day of TCE) would be additional (to be determined).

Rental costs: $ 2,500/week, +$15,000/installation + shipment

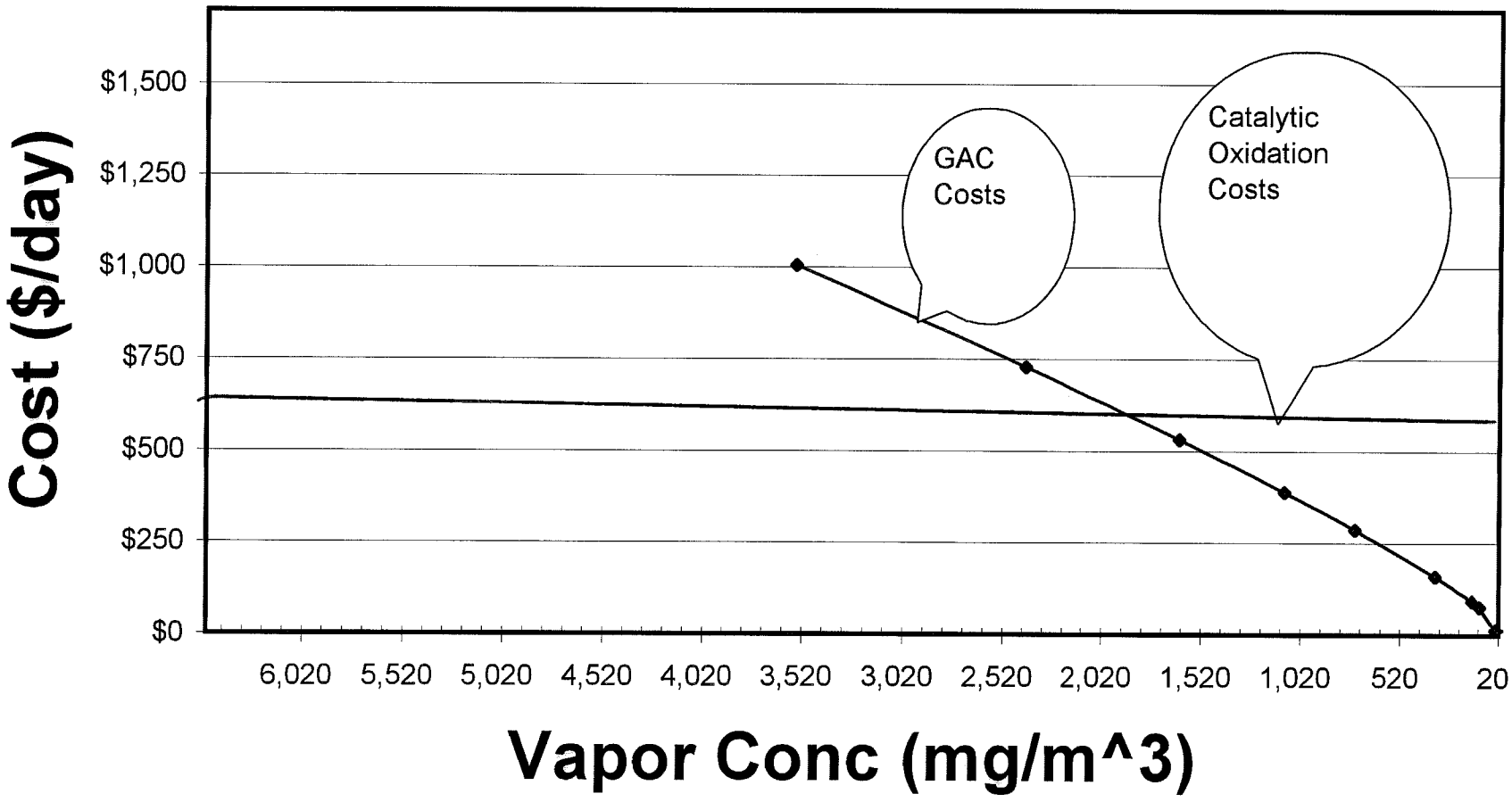
Summary and Conclusions:

Solvent recovery is unlikely to be effective during the initial phase of the ASVE operation because of vinyl chloride emission. However, GAC and catalytic oxidation are likely to be effective. The estimated costs for comparison between the technologies are as follows:

- GAC: $ 200,000/yr (assuming some vinyl chloride capture)
- Catalytic oxidation: $ 130,000 + $ 45,000/yr (destruction of all VOCs) + $65,000/yr for caustic purchase/brine disposal.
- Solvent recovery: $ 230,000 + $ 25,000/yr (assuming no vinyl chloride capture)+ cost of TCE disposal.

Solvent recovery would be capital and maintenance intensive and its operating costs would remain relatively constant irrespective of the TCE removal rate during remediation. Catalytic oxidation would be less expensive, and its costs of operation would remain relatively constant over the remedial duration, however, maintenance activities for catalytic oxidation are intensive and require special training. If significant amounts of DNAPL are not present (which is assumed to be the case), vapor-phase GAC costs would dramatically reduce over the remedial duration because TCE concentrations reduce over time. Estimates of costs versus concentrations of TCE in the vapor phase (see attached figure) show that vapor-phase GAC could be more cost effective during the remedial action. Note that the TCE concentrations in the air phase that would comply with emission standards would be approximately 1460 mg/m 3. Therefore, it is recommended on the basis of cost effectiveness that vapor-phase GAC be used for off-gas treatment.

Cost ($/day) for GAC vs. Catalytic Oxidation



NAS CECIL FIELD
SITE 16 AIR SPARGING/SOIL VAPOR EXTRACTION SYSTEM
AIR QUALITY IMPACT
DISPERSION MODELING REPORT

NAVAL AIR STATION (NAS) CECIL FIELD
SITE 16 AIR SPARGING/SOIL VAPOR EXTRACTION UNIT
AIR QUALITY IMPACT
AIR DISPERSION MODELING REPORT

1.0 STUDY OVERVIEW

The purpose of this study is to determine whether any adverse ambient air quality impact would result from the emissions from the Naval Air Station (NAS) Cecil Field, Site 16 air sparging/soil vapor extraction unit (AS/SVE), without off-gas treatment. The AS/SVE system evaluated in this screening dispersion modeling is assumed to operate with no emission controls. The contaminants of concern for this study are (TCE), (TCA), 1,2-DCE, 1,1-DCE, vinyl chloride, and PCE. A screening air quality dispersion model is used to calculate the maximum 24-hour ambient air quality impact of the AS/SVE unit. Maximum 24-hour ambient ground level concentrations are compared to 24-hour Ambient Reference Concentrations (ARCs) developed by the Florida Division of Air Resources Management (DARM) to evaluate the need for air emission controls for each contaminant.

2.0 DISPERSION MODELING PROTOCOL

The maximum 24-hour ambient air quality impact of emissions from the Site 16 AS/SVE system was estimated using a USEPA approved air quality dispersion model. Before the dispersion modeling analysis was conducted, a dispersion modeling protocol was developed to identify operating conditions, source parameters, contaminants of concern, and other components of the modeling methodology. The remaining portions of this section summarize the details of the modeling protocol.

2.1 Dispersion Model

The maximum ambient air quality impact of emissions from the Site 16 AS/SVE unit was estimated using the TSCREEN[1] (Version 1.0, dated 95250) dispersion model. The DARM recommends the use of TSCREEN when determining the need for emission controls or whether emission controls can be removed from a source of air emissions.

TSCREEN is a screening model designed to calculate ambient concentrations of toxic air pollutants for a variety of source types. TSCREEN requires the user to input various parameters regarding the source, receptors, and contaminant characteristics into the model. All modeling runs were conducted in the rural dispersion mode using the "Full" meteorology option.

All model calculations were based on a unit emission rate of 1 gram per second (g/sec). Resulting model calculations were then converted to contaminant specific air concentrations by multiplying the calculated 24-hour unit emission rate concentrations by the contaminant specific emission rates identified below in Section 2.3. A 24-hour concentration calculation spreadsheet is given in Appendix A.

Copies of all TSCREEN model unit emission rate output files are also provided in Appendix A.

2.2 Source Parameters

The TSCREEN dispersion model requires the user to input specific information regarding the source of pollutant emissions. The required input information for the Site 16 AS/SVE unit is shown in Table 1. The Site 16 AS/SVE system was evaluated as a point source using the source type designation "Superfund Release-SVE" in all TSCREEN modeling runs. The AS/SVE system was assumed to operate 24 hours per day.

There are three building structures near the proposed location of the Site 16 AS/SVE system. These are identified as Buildings 313, 815, and 825. Each building is within the distance of five times the largest dimension of each building (height, length, or projected width) from the Site 16 AS/SVE air emissions discharge stack. These building structures have the potential to cause the AS/SVE emissions plume to downwash on the leeward side of a structure. As a result, the downwash calculation option was used in the TSCREEN model to evaluate the downwash affect of each building.

2.3 Contaminant Emissions

The contaminants of concern for this study were (TCE), (TCA), 1,2-DCE, 1,1-DCE, vinyl chloride, and PCE. Estimates of contaminant emission rates and the total daily emissions of volatile organic compounds (VOCs) are shown in Table 2. Further information regarding the derivation of contaminant specific emission rates is discussed in Appendix D of this report.

2.4 Receptor Network

The receptor network used in this modeling study includes both automated and discrete distance flat terrain receptors. The distance to the outside property boundary of the NAS Cecil Field was assumed to be 1 meter. The TSCREEN model set automated distance receptors between 1 and 50,000 meters. Discrete distance receptors were set at 1, 5, 10, 15, 20, 25, 30, 35, 40 45, 50, 100, 200, 300, 400, 500, 750, 1000, 2000, 3000, 4000, and 5000 meters. The height of all receptors is 0.0 meters above ground level.

2.5 Evaluation Criteria

Maximum 24-hour ambient air concentrations calculated by the TSCREEN model were compared to 24-hour ARCs developed by the Florida DARM to evaluate the need for air emission controls for each contaminant. The 24-hour ARCs are derived from occupational exposure levels such as the permissible exposure limits (PEL) set by OSHA or Threshold Limit Values (TLVs) that are based on the American Conference of Governmental Industrial Hygienists (ACGIH).

The equation used to derive the 24-hour ARC values is: TLV/420 = 24-hour ARC. The 24-hour ARC concentrations for all contaminants evaluated in this study are shown in Table 2.

TABLE 1
SITE 16 AS/SVE SOURCE AND BUILDING PARAMETERS USED IN THE TSCREEN DISPERSION MODEL

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Source Parameters	**Site 16 AS/SVE System Discharge Stack**		
Source Type	Point		
Emission Rate (grams/second)	1.0		
Stack Height (meters)	3.66		
Stack Inside Diameter (meters)	0.051		
Stack Exit Velocity (meters/second)	41.56		
Stack Gas Exit Temperature (°K)	311		
Ambient Temperature (°K)	293		
Dispersion Option	Rural		
Building Parameters	**Building 313**	**Building 815**	**Building 825**
Height (meters)	9.1	9.1	9.1
Minimum Horizontal Dimension (meters)	38	46	61
Maximum Horizontal Dimension (meters)	145	198	198

TABLE 2
SITE 16 AS/SVE CONTAMINANT EMISSION RATES, TOTAL DAILY VOC EMISSIONS AND FLORIDA 24-HOUR ARCS*

NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTAMINANT	**EMISSION RATE (g/sec)**	**TOTAL DAILY EMISSIONS (lbs/day)**	**FLORIDA 24-HOUR ARC* ($\mu g/m^3$)**
TCE	5.40E-01	103.1	640
TCA	4.73E-03	0.9	4,548
1,2-DCE	3.36E-02	6.4	1,888
1,1-DCE	5.25E-04	0.1	48
Vinyl Chloride	3.41E-02	6.5	31
PCE	5.25E-05	0.01	405
		Total VOCs/day = 117.1 lbs	

* ARCS – Ambient Reference Concentrations

3.0 DISPERSION MODELING RESULTS

Maximum 24-hour ambient air concentrations associated with the operation of the Site 16 AS/SVE system (without off-gas treatment) are shown in Table 3 in comparison to Florida 24-hour ARCs. Results shown in Table 3 indicate that maximum 24-hour ground level concentrations of TCE and vinyl chloride, at a distance of 28 meters from the AS/SVE discharge stack, would exceed Florida 24-hour ARCs. Therefore, off-gas treatment would be required to achieve a 77 percent and 82 percent reduction in emissions to meet the Florida ARCs for TCE and vinyl chloride, respectively, also as shown in Table 3.

TABLE 3
A COMPARISON OF MAXIMUM* 24-HOUR VOC CONCENTRATIONS** FOR THE SITE 16 AIR SPARING SOIL VAPOR EXTRACTION SYSTEM TO FLORIDA AIR REFERENCE CONCENTRATIONS[1]

NAS CECIL FIELD
JACKSONVILLE, FLORIDA

EMISSION PARAMETER	MAXIMUM* 24-HOUR VOC CONCENTRATION** ($\mu g/m^3$)	FLORIDA 24-HOUR AIR REFERENCE CONCENTRATION ($\mu g/m^3$)	PERCENT REDUCTION IN EMISSIONS NEEDED TO MEET FLORIDA 24-HOUR AIR REFERENCE CONCENTRATION[1]
TCE	2802	640	77%
TCA	25	4,548	0%
1,2-DCE	174	1,888	0%
1,1-DCE	3	48	0%
Vinyl Chloride	177	31	82%
PCE	0.3	405	0%

* The maximum 24-hour concentration for all emission parameters occurs at a distance of 28 meters from the AS/SVE discharge stack. The meteorological condition responsible for these maximum concentrations is class E atmospheric stability and a 1.0 m/sec wind speed.

** The receptor height for all maximum concentrations is 0.0 meters.

[1] The Florida Air Reference Concentration (ARC) of a constituent is derived from occupational exposure levels such as PELs set by OSHA or Threshold Limit Values that are based on the American Conference of Government Industrial Hygienists (ACGIH). The equation for deriving 24-hour ARC values is: $ARC_{24\text{-hour}} = TLV/420$.

REFERENCES

1. User's Guide to TSCREEN, A Model for Screening Toxic Air Pollutant Concentrations (Revised), United States Environmental Protection Agency, EPA-454/B-94-023, July 1994.

APPENDIX A

TSCREEN DISPERSION MODEL OUTPUT FILES

MAXIMUM 24-HOUR CONCENTRATION SPREADSHEET CALCULATIONS

TSCREEN DISPERSION MODEL
OUTPUT FILES

□

11/19/98
17:36:30

```
 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 95250 ***

BUILDING 313 - UNIT EMISSION RATE

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE            =        POINT
   EMISSION RATE (G/S)    =      1.00000
   STACK HEIGHT (M)       =       3.6600
   STK INSIDE DIAM (M)    =        .0510
   STK EXIT VELOCITY (M/S)=      41.5600
   STK GAS EXIT TEMP (K)  =     311.0000
   AMBIENT AIR TEMP (K)   =     293.0000
   RECEPTOR HEIGHT (M)    =        .0000
   URBAN/RURAL OPTION     =        RURAL
   BUILDING HEIGHT (M)    =       9.1000
   MIN HORIZ BLDG DIM (M) =      38.0000
   MAX HORIZ BLDG DIM (M) =     145.0000


     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION      MAX CONC   DIST TO  TERRAIN
  PROCEDURE      (UG/M**3)   MAX (M)   HT (M)
--------------  -----------  -------  -------
SIMPLE TERRAIN    .1297E+05     28.       0.

BLDG. CAVITY-1    505.2         51.      --  (DIST = CAVITY LENGTH)
BLDG. CAVITY-2    1928.         33.      --  (DIST = CAVITY LENGTH)


***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************


BUOY. FLUX =     .015 M**4/S**3;  MOM. FLUX =    1.058 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***
```

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	0	.0	.0	.0	.00	.00	.00	NA
100.	3500.	6	1.0	1.0	10000.0	4.05	8.06	10.48	SS
200.	2247.	6	1.0	1.0	10000.0	4.05	11.55	11.53	SS
300.	1611.	6	1.0	1.0	10000.0	4.05	14.95	12.56	SS
400.	1231.	6	1.0	1.0	10000.0	4.05	18.27	13.54	SS
500.	996.1	6	1.0	1.0	10000.0	4.05	21.53	14.25	SS
600.	821.2	6	1.0	1.0	10000.0	4.05	24.75	15.11	SS
700.	692.5	6	1.0	1.0	10000.0	4.05	27.92	15.94	SS
800.	594.4	6	1.0	1.0	10000.0	4.05	31.06	16.74	SS
900.	517.6	6	1.0	1.0	10000.0	4.05	34.17	17.53	SS
1000.	456.0	6	1.0	1.0	10000.0	4.05	37.24	18.29	SS
1100.	405.7	6	1.0	1.0	10000.0	4.05	40.29	19.03	SS
1200.	364.1	6	1.0	1.0	10000.0	4.05	43.32	19.76	SS
1300.	329.1	6	1.0	1.0	10000.0	4.05	46.32	20.48	SS
1400.	299.4	6	1.0	1.0	10000.0	4.05	49.30	21.18	SS
1500.	283.0	6	1.0	1.0	10000.0	4.05	52.27	21.13	SS
1600.	260.0	6	1.0	1.0	10000.0	4.05	55.21	21.79	SS
1700.	240.8	6	1.0	1.0	10000.0	4.05	58.14	22.37	SS
1800.	223.8	6	1.0	1.0	10000.0	4.05	61.05	22.94	SS
1900.	208.8	6	1.0	1.0	10000.0	4.05	63.94	23.49	SS
2000.	195.4	6	1.0	1.0	10000.0	4.05	66.82	24.04	SS
2100.	183.4	6	1.0	1.0	10000.0	4.05	69.69	24.57	SS
2200.	172.6	6	1.0	1.0	10000.0	4.05	72.54	25.10	SS
2300.	162.8	6	1.0	1.0	10000.0	4.05	75.38	25.61	SS
2400.	154.0	6	1.0	1.0	10000.0	4.05	78.21	26.12	SS
2500.	145.9	6	1.0	1.0	10000.0	4.05	81.02	26.62	SS
2600.	141.9	6	1.0	1.0	10000.0	4.05	83.83	26.45	SS
2700.	134.9	6	1.0	1.0	10000.0	4.05	86.62	26.94	SS
2800.	128.7	6	1.0	1.0	10000.0	4.05	89.40	27.36	SS
2900.	123.0	6	1.0	1.0	10000.0	4.05	92.18	27.77	SS
3000.	117.8	6	1.0	1.0	10000.0	4.05	94.94	28.17	SS
3500.	96.54	6	1.0	1.0	10000.0	4.05	108.62	30.08	SS
4000.	81.16	6	1.0	1.0	10000.0	4.05	122.10	31.87	SS
4500.	69.59	6	1.0	1.0	10000.0	4.05	135.39	33.54	SS
5000.	60.61	6	1.0	1.0	10000.0	4.05	148.53	35.12	SS
5500.	53.48	6	1.0	1.0	10000.0	4.05	161.52	36.63	SS
6000.	47.68	6	1.0	1.0	10000.0	4.05	174.38	38.07	SS
6500.	42.90	6	1.0	1.0	10000.0	4.05	187.11	39.44	SS
7000.	39.23	6	1.0	1.0	10000.0	4.05	199.74	40.42	SS
7500.	35.90	6	1.0	1.0	10000.0	4.05	212.26	41.57	SS
8000.	33.05	6	1.0	1.0	10000.0	4.05	224.69	42.67	SS
8500.	30.57	6	1.0	1.0	10000.0	4.05	237.03	43.74	SS
9000.	28.41	6	1.0	1.0	10000.0	4.05	249.28	44.76	SS
9500.	26.50	6	1.0	1.0	10000.0	4.05	261.44	45.76	SS
10000.	24.81	6	1.0	1.0	10000.0	4.05	273.54	46.73	SS
15000.	14.80	6	1.0	1.0	10000.0	4.05	390.93	54.88	SS
20000.	10.46	6	1.0	1.0	10000.0	4.05	503.36	60.29	SS
25000.	8.003	6	1.0	1.0	10000.0	4.05	612.09	64.86	SS

30000.	6.430	6	1.0	1.0	10000.0	4.05	717.87	68.84	SS
40000.	4.626	6	1.0	1.0	10000.0	4.05	922.41	74.49	SS
50000.	3.586	6	1.0	1.0	10000.0	4.05	1119.54	79.19	SS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

28.	.1297E+05	5	1.0	1.0	10000.0	4.05	3.30	6.16	SS

DIST = DISTANCE FROM THE SOURCE
CONC = MAXIMUM GROUND LEVEL CONCENTRATION
STAB = ATMOSPHERIC STABILITY CLASS (1=A, 2=B, 3=C, 4=D, 5=E, 6=F)
U10M = WIND SPEED AT THE 10-M LEVEL
USTK = WIND SPEED AT STACK HEIGHT
MIX HT = MIXING HEIGHT
PLUME HT= PLUME CENTERLINE HEIGHT
SIGMA Y = LATERAL DISPERSION PARAMETER
SIGMA Z = VERTICAL DISPERSION PARAMETER
DWASH = BUILDING DOWNWASH:
DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SCREEN DISCRETE DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	0	.0	.0	.0	.00	.00	.00	NA
5.	.0000	0	.0	.0	.0	.00	.00	.00	NA
10.	.0000	0	.0	.0	.0	.00	.00	.00	NA
15.	.0000	0	.0	.0	.0	.00	.00	.00	NA
20.	.0000	0	.0	.0	.0	.00	.00	.00	NA
25.	.0000	0	.0	.0	.0	.00	.00	.00	NA
30.	.1230E+05	5	1.0	1.0	10000.0	4.05	3.37	6.22	SS
35.	.1086E+05	5	1.0	1.0	10000.0	4.05	3.70	6.54	SS
40.	9664.	5	1.0	1.0	10000.0	4.05	4.04	6.86	SS
45.	8658.	5	1.0	1.0	10000.0	4.05	4.37	7.17	SS
50.	7803.	5	1.0	1.0	10000.0	4.05	4.71	7.49	SS
100.	3500.	6	1.0	1.0	10000.0	4.05	8.06	10.48	SS
200.	2247.	6	1.0	1.0	10000.0	4.05	11.55	11.53	SS
300.	1611.	6	1.0	1.0	10000.0	4.05	14.95	12.56	SS
400.	1231.	6	1.0	1.0	10000.0	4.05	18.27	13.54	SS
500.	996.1	6	1.0	1.0	10000.0	4.05	21.53	14.25	SS
750.	640.3	6	1.0	1.0	10000.0	4.05	29.50	16.34	SS
1000.	456.0	6	1.0	1.0	10000.0	4.05	37.24	18.29	SS
2000.	195.4	6	1.0	1.0	10000.0	4.05	66.82	24.04	SS

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 3000.   117.8        6     1.0    1.0 10000.0    4.05   94.94   28.17    SS
 4000.   81.16        6     1.0    1.0 10000.0    4.05  122.10   31.87    SS
 5000.   60.61        6     1.0    1.0 10000.0    4.05  148.53   35.12    SS

DWASH=   MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** CAVITY CALCULATION - 1 ***        *** CAVITY CALCULATION - 2 ***
 CONC (UG/M**3)      =    505.2         CONC (UG/M**3)      =    1928.
 CRIT WS @10M (M/S) =      1.12         CRIT WS @10M (M/S) =      1.12
 CRIT WS @ HS (M/S) =      1.12         CRIT WS @ HS (M/S) =      1.12
 DILUTION WS (M/S)  =      1.00         DILUTION WS (M/S)  =      1.00
 CAVITY HT (M)      =      9.16         CAVITY HT (M)      =      9.10
 CAVITY LENGTH (M)  =     50.92         CAVITY LENGTH (M)  =     32.53
 ALONGWIND DIM (M)  =     38.00         ALONGWIND DIM (M)  =    145.00

*************************************
*** USER SPECIFIED AVERAGING TIMES ***
*************************************

ESTIMATED MAXIMUM CONCENTRATION FOR 24 HR AVERAGING TIME:
5188 (+/- 2594) UG/M**3
 □

**********************************
*** END OF SCREEN MODEL OUTPUT ***
**********************************
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□

11/19/98
17:41:42

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 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 95250 ***

BUILDING 815 - UNIT EMISSION RATE

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE            =        POINT
   EMISSION RATE (G/S)    =      1.00000
   STACK HEIGHT (M)       =       3.6600
   STK INSIDE DIAM (M)    =        .0510
   STK EXIT VELOCITY (M/S)=      41.5600
   STK GAS EXIT TEMP (K)  =     311.0000
   AMBIENT AIR TEMP (K)   =     293.0000
   RECEPTOR HEIGHT (M)    =        .0000
   URBAN/RURAL OPTION     =        RURAL
   BUILDING HEIGHT (M)    =       9.1000
   MIN HORIZ BLDG DIM (M) =      46.0000
   MAX HORIZ BLDG DIM (M) =     198.0000


     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION      MAX CONC   DIST TO  TERRAIN
  PROCEDURE      (UG/M**3)   MAX (M)   HT (M)
--------------  -----------  -------  -------
SIMPLE TERRAIN    .1297E+05      28.       0.

BLDG. CAVITY-1    370.0          54.      --  (DIST = CAVITY LENGTH)
BLDG. CAVITY-2    1593.          36.      --  (DIST = CAVITY LENGTH)


***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************


BUOY. FLUX =     .015 M**4/S**3;  MOM. FLUX =    1.058 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***
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DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	0	.0	.0	.0	.00	.00	.00	NA
100.	3500.	6	1.0	1.0	10000.0	4.05	8.06	10.48	SS
200.	2247.	6	1.0	1.0	10000.0	4.05	11.55	11.53	SS
300.	1611.	6	1.0	1.0	10000.0	4.05	14.95	12.56	SS
400.	1231.	6	1.0	1.0	10000.0	4.05	18.27	13.54	SS
500.	996.1	6	1.0	1.0	10000.0	4.05	21.53	14.25	SS
600.	821.2	6	1.0	1.0	10000.0	4.05	24.75	15.11	SS
700.	692.5	6	1.0	1.0	10000.0	4.05	27.92	15.94	SS
800.	594.4	6	1.0	1.0	10000.0	4.05	31.06	16.74	SS
900.	517.6	6	1.0	1.0	10000.0	4.05	34.17	17.53	SS
1000.	456.0	6	1.0	1.0	10000.0	4.05	37.24	18.29	SS
1100.	405.7	6	1.0	1.0	10000.0	4.05	40.29	19.03	SS
1200.	364.1	6	1.0	1.0	10000.0	4.05	43.32	19.76	SS
1300.	329.1	6	1.0	1.0	10000.0	4.05	46.32	20.48	SS
1400.	299.4	6	1.0	1.0	10000.0	4.05	49.30	21.18	SS
1500.	283.0	6	1.0	1.0	10000.0	4.05	52.27	21.13	SS
1600.	260.0	6	1.0	1.0	10000.0	4.05	55.21	21.79	SS
1700.	240.8	6	1.0	1.0	10000.0	4.05	58.14	22.37	SS
1800.	223.8	6	1.0	1.0	10000.0	4.05	61.05	22.94	SS
1900.	208.8	6	1.0	1.0	10000.0	4.05	63.94	23.49	SS
2000.	195.4	6	1.0	1.0	10000.0	4.05	66.82	24.04	SS
2100.	183.4	6	1.0	1.0	10000.0	4.05	69.69	24.57	SS
2200.	172.6	6	1.0	1.0	10000.0	4.05	72.54	25.10	SS
2300.	162.8	6	1.0	1.0	10000.0	4.05	75.38	25.61	SS
2400.	154.0	6	1.0	1.0	10000.0	4.05	78.21	26.12	SS
2500.	145.9	6	1.0	1.0	10000.0	4.05	81.02	26.62	SS
2600.	141.9	6	1.0	1.0	10000.0	4.05	83.83	26.45	SS
2700.	134.9	6	1.0	1.0	10000.0	4.05	86.62	26.94	SS
2800.	128.7	6	1.0	1.0	10000.0	4.05	89.40	27.36	SS
2900.	123.0	6	1.0	1.0	10000.0	4.05	92.18	27.77	SS
3000.	117.8	6	1.0	1.0	10000.0	4.05	94.94	28.17	SS
3500.	96.54	6	1.0	1.0	10000.0	4.05	108.62	30.08	SS
4000.	81.16	6	1.0	1.0	10000.0	4.05	122.10	31.87	SS
4500.	69.59	6	1.0	1.0	10000.0	4.05	135.39	33.54	SS
5000.	60.61	6	1.0	1.0	10000.0	4.05	148.53	35.12	SS
5500.	53.48	6	1.0	1.0	10000.0	4.05	161.52	36.63	SS
6000.	47.68	6	1.0	1.0	10000.0	4.05	174.38	38.07	SS
6500.	42.90	6	1.0	1.0	10000.0	4.05	187.11	39.44	SS
7000.	39.23	6	1.0	1.0	10000.0	4.05	199.74	40.42	SS
7500.	35.90	6	1.0	1.0	10000.0	4.05	212.26	41.57	SS
8000.	33.05	6	1.0	1.0	10000.0	4.05	224.69	42.67	SS
8500.	30.57	6	1.0	1.0	10000.0	4.05	237.03	43.74	SS
9000.	28.41	6	1.0	1.0	10000.0	4.05	249.28	44.76	SS
9500.	26.50	6	1.0	1.0	10000.0	4.05	261.44	45.76	SS
10000.	24.81	6	1.0	1.0	10000.0	4.05	273.54	46.73	SS
15000.	14.80	6	1.0	1.0	10000.0	4.05	390.93	54.88	SS
20000.	10.46	6	1.0	1.0	10000.0	4.05	503.36	60.29	SS
25000.	8.003	6	1.0	1.0	10000.0	4.05	612.09	64.86	SS

30000.	6.430	6	1.0	1.0	10000.0	4.05	717.87	68.84	SS
40000.	4.626	6	1.0	1.0	10000.0	4.05	922.41	74.49	SS
50000.	3.586	6	1.0	1.0	10000.0	4.05	1119.54	79.19	SS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

28.	.1297E+05	5	1.0	1.0	10000.0	4.05	3.30	6.16	SS

DIST = DISTANCE FROM THE SOURCE
CONC = MAXIMUM GROUND LEVEL CONCENTRATION
STAB = ATMOSPHERIC STABILITY CLASS (1=A, 2=B, 3=C, 4=D, 5=E, 6=F)
U10M = WIND SPEED AT THE 10-M LEVEL
USTK = WIND SPEED AT STACK HEIGHT
MIX HT = MIXING HEIGHT
PLUME HT= PLUME CENTERLINE HEIGHT
SIGMA Y = LATERAL DISPERSION PARAMETER
SIGMA Z = VERTICAL DISPERSION PARAMETER
DWASH = BUILDING DOWNWASH:
DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SCREEN DISCRETE DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	0	.0	.0	.0	.00	.00	.00	NA
5.	.0000	0	.0	.0	.0	.00	.00	.00	NA
10.	.0000	0	.0	.0	.0	.00	.00	.00	NA
15.	.0000	0	.0	.0	.0	.00	.00	.00	NA
20.	.0000	0	.0	.0	.0	.00	.00	.00	NA
25.	.0000	0	.0	.0	.0	.00	.00	.00	NA
30.	.1230E+05	5	1.0	1.0	10000.0	4.05	3.37	6.22	SS
35.	.1086E+05	5	1.0	1.0	10000.0	4.05	3.70	6.54	SS
40.	9664.	5	1.0	1.0	10000.0	4.05	4.04	6.86	SS
45.	8658.	5	1.0	1.0	10000.0	4.05	4.37	7.17	SS
50.	7803.	5	1.0	1.0	10000.0	4.05	4.71	7.49	SS
100.	3500.	6	1.0	1.0	10000.0	4.05	8.06	10.48	SS
200.	2247.	6	1.0	1.0	10000.0	4.05	11.55	11.53	SS
300.	1611.	6	1.0	1.0	10000.0	4.05	14.95	12.56	SS
400.	1231.	6	1.0	1.0	10000.0	4.05	18.27	13.54	SS
500.	996.1	6	1.0	1.0	10000.0	4.05	21.53	14.25	SS
750.	640.3	6	1.0	1.0	10000.0	4.05	29.50	16.34	SS
1000.	456.0	6	1.0	1.0	10000.0	4.05	37.24	18.29	SS
2000.	195.4	6	1.0	1.0	10000.0	4.05	66.82	24.04	SS

```
 3000.   117.8        6     1.0    1.0 10000.0    4.05   94.94   28.17    SS
 4000.   81.16        6     1.0    1.0 10000.0    4.05  122.10   31.87    SS
 5000.   60.61        6     1.0    1.0 10000.0    4.05  148.53   35.12    SS

DWASH=   MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** CAVITY CALCULATION - 1 ***       *** CAVITY CALCULATION - 2 ***
 CONC (UG/M**3)      =    370.0        CONC (UG/M**3)      =    1593.
 CRIT WS @10M (M/S) =      1.12        CRIT WS @10M (M/S) =      1.12
 CRIT WS @ HS (M/S) =      1.12        CRIT WS @ HS (M/S) =      1.12
 DILUTION WS (M/S)  =      1.00        DILUTION WS (M/S)  =      1.00
 CAVITY HT (M)      =      9.10        CAVITY HT (M)      =      9.10
 CAVITY LENGTH (M)  =     53.81        CAVITY LENGTH (M)  =     35.56
 ALONGWIND DIM (M)  =     46.00        ALONGWIND DIM (M)  =    198.00

*************************************
*** USER SPECIFIED AVERAGING TIMES ***
*************************************

ESTIMATED MAXIMUM CONCENTRATION FOR 24 HR AVERAGING TIME:
5188 (+/- 2594) UG/M**3
 □

**********************************
*** END OF SCREEN MODEL OUTPUT ***
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□

11/19/98
17:43:10

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 ***  SCREEN3 MODEL RUN  ***
 *** VERSION DATED 95250 ***

BUILDING 825 - UNIT EMISSION RATE

SIMPLE TERRAIN INPUTS:
   SOURCE TYPE            =        POINT
   EMISSION RATE (G/S)    =      1.00000
   STACK HEIGHT (M)       =       3.6600
   STK INSIDE DIAM (M)    =        .0510
   STK EXIT VELOCITY (M/S)=      41.5600
   STK GAS EXIT TEMP (K)  =     311.0000
   AMBIENT AIR TEMP (K)   =     293.0000
   RECEPTOR HEIGHT (M)    =        .0000
   URBAN/RURAL OPTION     =        RURAL
   BUILDING HEIGHT (M)    =       9.1000
   MIN HORIZ BLDG DIM (M) =      61.0000
   MAX HORIZ BLDG DIM (M) =     198.0000


     ***************************************
     *** SUMMARY OF SCREEN MODEL RESULTS ***
     ***************************************

 CALCULATION      MAX CONC   DIST TO  TERRAIN
  PROCEDURE      (UG/M**3)   MAX (M)   HT (M)
--------------  -----------  -------  -------
SIMPLE TERRAIN    .1297E+05      28.       0.

BLDG. CAVITY-1    370.0          54.      --  (DIST = CAVITY LENGTH)
BLDG. CAVITY-2    1201.          40.      --  (DIST = CAVITY LENGTH)


***************************************************
** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
***************************************************


BUOY. FLUX =     .015 M**4/S**3;  MOM. FLUX =    1.058 M**4/S**2.

*** FULL METEOROLOGY ***

**********************************
*** SCREEN AUTOMATED DISTANCES ***
**********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***
```

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	0	.0	.0	.0	.00	.00	.00	NA
100.	3500.	6	1.0	1.0	10000.0	4.05	8.06	10.48	SS
200.	2247.	6	1.0	1.0	10000.0	4.05	11.55	11.53	SS
300.	1611.	6	1.0	1.0	10000.0	4.05	14.95	12.56	SS
400.	1231.	6	1.0	1.0	10000.0	4.05	18.27	13.54	SS
500.	996.1	6	1.0	1.0	10000.0	4.05	21.53	14.25	SS
600.	821.2	6	1.0	1.0	10000.0	4.05	24.75	15.11	SS
700.	692.5	6	1.0	1.0	10000.0	4.05	27.92	15.94	SS
800.	594.4	6	1.0	1.0	10000.0	4.05	31.06	16.74	SS
900.	517.6	6	1.0	1.0	10000.0	4.05	34.17	17.53	SS
1000.	456.0	6	1.0	1.0	10000.0	4.05	37.24	18.29	SS
1100.	405.7	6	1.0	1.0	10000.0	4.05	40.29	19.03	SS
1200.	364.1	6	1.0	1.0	10000.0	4.05	43.32	19.76	SS
1300.	329.1	6	1.0	1.0	10000.0	4.05	46.32	20.48	SS
1400.	299.4	6	1.0	1.0	10000.0	4.05	49.30	21.18	SS
1500.	283.0	6	1.0	1.0	10000.0	4.05	52.27	21.13	SS
1600.	260.0	6	1.0	1.0	10000.0	4.05	55.21	21.79	SS
1700.	240.8	6	1.0	1.0	10000.0	4.05	58.14	22.37	SS
1800.	223.8	6	1.0	1.0	10000.0	4.05	61.05	22.94	SS
1900.	208.8	6	1.0	1.0	10000.0	4.05	63.94	23.49	SS
2000.	195.4	6	1.0	1.0	10000.0	4.05	66.82	24.04	SS
2100.	183.4	6	1.0	1.0	10000.0	4.05	69.69	24.57	SS
2200.	172.6	6	1.0	1.0	10000.0	4.05	72.54	25.10	SS
2300.	162.8	6	1.0	1.0	10000.0	4.05	75.38	25.61	SS
2400.	154.0	6	1.0	1.0	10000.0	4.05	78.21	26.12	SS
2500.	145.9	6	1.0	1.0	10000.0	4.05	81.02	26.62	SS
2600.	141.9	6	1.0	1.0	10000.0	4.05	83.83	26.45	SS
2700.	134.9	6	1.0	1.0	10000.0	4.05	86.62	26.94	SS
2800.	128.7	6	1.0	1.0	10000.0	4.05	89.40	27.36	SS
2900.	123.0	6	1.0	1.0	10000.0	4.05	92.18	27.77	SS
3000.	117.8	6	1.0	1.0	10000.0	4.05	94.94	28.17	SS
3500.	96.54	6	1.0	1.0	10000.0	4.05	108.62	30.08	SS
4000.	81.16	6	1.0	1.0	10000.0	4.05	122.10	31.87	SS
4500.	69.59	6	1.0	1.0	10000.0	4.05	135.39	33.54	SS
5000.	60.61	6	1.0	1.0	10000.0	4.05	148.53	35.12	SS
5500.	53.48	6	1.0	1.0	10000.0	4.05	161.52	36.63	SS
6000.	47.68	6	1.0	1.0	10000.0	4.05	174.38	38.07	SS
6500.	42.90	6	1.0	1.0	10000.0	4.05	187.11	39.44	SS
7000.	39.23	6	1.0	1.0	10000.0	4.05	199.74	40.42	SS
7500.	35.90	6	1.0	1.0	10000.0	4.05	212.26	41.57	SS
8000.	33.05	6	1.0	1.0	10000.0	4.05	224.69	42.67	SS
8500.	30.57	6	1.0	1.0	10000.0	4.05	237.03	43.74	SS
9000.	28.41	6	1.0	1.0	10000.0	4.05	249.28	44.76	SS
9500.	26.50	6	1.0	1.0	10000.0	4.05	261.44	45.76	SS
10000.	24.81	6	1.0	1.0	10000.0	4.05	273.54	46.73	SS
15000.	14.80	6	1.0	1.0	10000.0	4.05	390.93	54.88	SS
20000.	10.46	6	1.0	1.0	10000.0	4.05	503.36	60.29	SS
25000.	8.003	6	1.0	1.0	10000.0	4.05	612.09	64.86	SS

30000.	6.430	6	1.0	1.0	10000.0	4.05	717.87	68.84	SS
40000.	4.626	6	1.0	1.0	10000.0	4.05	922.41	74.49	SS
50000.	3.586	6	1.0	1.0	10000.0	4.05	1119.54	79.19	SS

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND 1. M:

28.	.1297E+05	5	1.0	1.0	10000.0	4.05	3.30	6.16	SS

DIST = DISTANCE FROM THE SOURCE
CONC = MAXIMUM GROUND LEVEL CONCENTRATION
STAB = ATMOSPHERIC STABILITY CLASS (1=A, 2=B, 3=C, 4=D, 5=E, 6=F)
U10M = WIND SPEED AT THE 10-M LEVEL
USTK = WIND SPEED AT STACK HEIGHT
MIX HT = MIXING HEIGHT
PLUME HT= PLUME CENTERLINE HEIGHT
SIGMA Y = LATERAL DISPERSION PARAMETER
SIGMA Z = VERTICAL DISPERSION PARAMETER
DWASH = BUILDING DOWNWASH:
DWASH= MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

****
*** SCREEN DISCRETE DISTANCES ***
****

*** TERRAIN HEIGHT OF 0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

DIST (M)	CONC (UG/M**3)	STAB	U10M (M/S)	USTK (M/S)	MIX HT (M)	PLUME HT (M)	SIGMA Y (M)	SIGMA Z (M)	DWASH
1.	.0000	0	.0	.0	.0	.00	.00	.00	NA
5.	.0000	0	.0	.0	.0	.00	.00	.00	NA
10.	.0000	0	.0	.0	.0	.00	.00	.00	NA
15.	.0000	0	.0	.0	.0	.00	.00	.00	NA
20.	.0000	0	.0	.0	.0	.00	.00	.00	NA
25.	.0000	0	.0	.0	.0	.00	.00	.00	NA
30.	.1230E+05	5	1.0	1.0	10000.0	4.05	3.37	6.22	SS
35.	.1086E+05	5	1.0	1.0	10000.0	4.05	3.70	6.54	SS
40.	9664.	5	1.0	1.0	10000.0	4.05	4.04	6.86	SS
45.	8658.	5	1.0	1.0	10000.0	4.05	4.37	7.17	SS
50.	7803.	5	1.0	1.0	10000.0	4.05	4.71	7.49	SS
100.	3500.	6	1.0	1.0	10000.0	4.05	8.06	10.48	SS
200.	2247.	6	1.0	1.0	10000.0	4.05	11.55	11.53	SS
300.	1611.	6	1.0	1.0	10000.0	4.05	14.95	12.56	SS
400.	1231.	6	1.0	1.0	10000.0	4.05	18.27	13.54	SS
500.	996.1	6	1.0	1.0	10000.0	4.05	21.53	14.25	SS
750.	640.3	6	1.0	1.0	10000.0	4.05	29.50	16.34	SS
1000.	456.0	6	1.0	1.0	10000.0	4.05	37.24	18.29	SS
2000.	195.4	6	1.0	1.0	10000.0	4.05	66.82	24.04	SS

```
 3000.   117.8        6     1.0    1.0 10000.0    4.05   94.94   28.17    SS
 4000.   81.16        6     1.0    1.0 10000.0    4.05  122.10   31.87    SS
 5000.   60.61        6     1.0    1.0 10000.0    4.05  148.53   35.12    SS

DWASH=   MEANS NO CALC MADE (CONC = 0.0)
DWASH=NO MEANS NO BUILDING DOWNWASH USED
DWASH=HS MEANS HUBER-SNYDER DOWNWASH USED
DWASH=SS MEANS SCHULMAN-SCIRE DOWNWASH USED
DWASH=NA MEANS DOWNWASH NOT APPLICABLE, X<3*LB

*** CAVITY CALCULATION - 1 ***       *** CAVITY CALCULATION - 2 ***
 CONC (UG/M**3)      =    370.0        CONC (UG/M**3)      =    1201.
 CRIT WS @10M (M/S) =      1.12        CRIT WS @10M (M/S) =      1.12
 CRIT WS @ HS (M/S) =      1.12        CRIT WS @ HS (M/S) =      1.12
 DILUTION WS (M/S)  =      1.00        DILUTION WS (M/S)  =      1.00
 CAVITY HT (M)      =      9.10        CAVITY HT (M)      =      9.10
 CAVITY LENGTH (M)  =     53.81        CAVITY LENGTH (M)  =     39.89
 ALONGWIND DIM (M)  =     61.00        ALONGWIND DIM (M)  =    198.00

*************************************
*** USER SPECIFIED AVERAGING TIMES ***
*************************************

ESTIMATED MAXIMUM CONCENTRATION FOR 24 HR AVERAGING TIME:
5188 (+/- 2594) UG/M**3
 □

**********************************
*** END OF SCREEN MODEL OUTPUT ***
**********************************
```

MAXIMUM 24-HOUR CONCENTRATION SPREADSHEET CALCULATIONS

NAS CECIL

SITE 16 AS/SVE

EMISSION RATES, DISPERSION FACTORS, AND MAXIMUM 24 HOUR CONCENTRATION CALCULATIONS

11/20/98

NAS CECIL FIELD					
SITE 16 AIR SPARGING/SOIL VAPOR EXTRACTION SYSTEM					
UNIT EMISSION RATE 24-HOUR CONCENTRATION DISPERSION FACTORS (UG/M^3-G/SEC)					
BUILDING 313	5188				
BUILDING 815	5188				
BUILDING 825	5188				
		MAXIMUM 24-HOUR			
	EMISSION RATE	**CONCENTRATION***			
CONTAMINANT	**(G/SEC)**	**(UG/M3)**			
TCE	0.54	2801.52			
TCA	4.73E-03	24.54			
1,2-DCE	3.36E-02	174.32			
1,1-DCE	5.25E-04	2.72			
VINYL CHLORIDE	3.41E-02	176.91			
PCE	5.25E-05	0.27			
* MAXIMUM 24-HOUR CONCENTRATION = (DF) x (ER)					
WHERE	DF= MAXIMUM 24-HOUR UNIT EMISSION RATE DISPERSION FACTOR (UG/M^3-G/SEC) = 5188				
	ER = CONTAMINANT SPECIFIC EMISSION RATE (G/SEC)				

ASVE PRESSURE LOSS CALCULATIONS

AIR SPARGING COMPRESSOR SIZING

VACUUM EXTRACTION PUMP SIZING

NAS Cecil Field
Site 16 ASVE Design
Vapor Extraction System

Pressure Loss/Vacuum Extraction Pump Sizing

By:

Checked by:

11/18/98

Pressure loss calculation: Vapor Extraction System

Start with a maximum allowable vacuum of 45 inches w.g. to prevent excessive moisture uptake
Take the longest run of the three vapor extraction header pipes: CEF-16-EW-07 to plant inlet
Calculate pressure loss due to pipe length and fittings
For each section of pipe estimate a pressure loss due to additional flow rate

Within the plant, include pressure loss due to fittings, the moisture separator and air filter on the vacuum side of the vacuum extraction pump. Include pressure loss due to fittings only.
Catalytic oxidation system comes equipped with blower to meet heat exchanger, oxidizer, quench and scrubber pressure losses (Strey, John of Catalytic Combustion Corporation, Nov. 10, 98)
For all line losses, the Krupp Wiputte Corp nomographic wheel is used (see attached copy)
For all fitting losses, the Crane manual (1957) is used (see attached copy)
Well laterals are all 2" I.d. PVC and headers are 4" I.d. PVC

CEF-16-EW-07 to junction EW-08 (22.5 ft)

Applied vacuum		45	inches w.g.=	1.6	psig
2xElbow (L/D)=	100	0.000	inches w.g.=	0.0	psig
Flow meter				0.2	psig assumed
Ball valve (L/D)=	150	0.00375	inches w.g.=	0.0	psig
Pressure gauge=				0	assumed
Branch "T" (L/D)=	60	0	inches w.g.=	0.0	psig
Entrance loss				0	assumed due to 2"x4" expander
Line loss=	22.5	0.0034	inches w.g.=	0.0	psig
	(calculated @	0.00015	"w.g./ft		
	for 4"I.d.pipe carrying 10 scfm in the -2" to -4" Hg range)				

EW-08 to EW-09 (16 ft) ignoring EW-06

Line loss=	16	0.0032	inches w.g.=	0.0	psig
	(calculated @	0.0002	"w.g./ft		
	for 4"I.d.pipe carrying 20 scfm in the -2" to -4" Hg range)				

NAS Cecil Field
Site 16 ASVE Design
Vapor Extraction System

Pressure Loss/Vacuum Extraction Pump Sizing

By:

Checked by:

11/18/98

EW-09 to EW-10 (17.5 ft)

	17.5	0.014	inches w.g.=	0.0 psig
(calculated @	0.00078	"w.g./ft		
for 4"I.d.pipe carrying 40 scfm in the -2" to -4" Hg range)				

EW-10 to EW-11 (10 ft)

	10	0.02	inches w.g.=	0.0 psig
(calculated @	0.002	"w.g./ft		
for 4"I.d.pipe carrying 60 scfm in the -2" to -4" Hg range)				

EW-11 to VE-02 and VE-04 junction (37.5 ft)

	37.5	0.075	inches w.g.=	0.0 psig
(calculated @	0.002	"w.g./ft		
for 4"I.d.pipe carrying 60 scfm in the -2" to -4" Hg range)				

Junction of VE-02 and VE-04 to Junction of VE-04 and VE-01 (25 ft)

	25	0.2	inches w.g.=	0.0 psig
2xFlow through "T"	120	0.96	inches w.g.=	0.0 psig
(calculated @	0.008	"w.g./ft		
for 4"I.d.pipe carrying 130 scfm in the -2" to -4" Hg range)				

Junction of VE-04 and VE-01 to Plant Inlet (105 ft)

	105	2.1	inches w.g.=	0.1 psig
(calculated @	0.02	"w.g./ft		
for 4"I.d.pipe carrying 180 scfm in the -2" to -4" Hg range)				

Ignore mitre bends-should be determined during detailed design

NAS Cecil Field
Site 16 ASVE Design
Vapor Extraction System

Pressure Loss/Vacuum Extraction Pump Sizing

By:

Checked by:

11/18/98

Inside Treatment Plant

(50 ft of 4" I.d., carrying 180 scfm)

Line loss=	50	0.85	inches w.g.=	0.0 psig

(calculated @ 0.017 "w.g./ft
for 4"I.d.pipe carrying 20 scfm in the -2" to -4" Hg range)
note: the pressure drop is conservative for 180 scfm flow rate of up to 3 psig at 150 oF, assuming a temperature increase on the discharge end of the vacuum extraction pump)

Flow meter				0.2 psig (assumed)
Moisture separator ent/exit loss		5	inches w.g.=	0.2 psig

(From GAST brochure, 1/95)

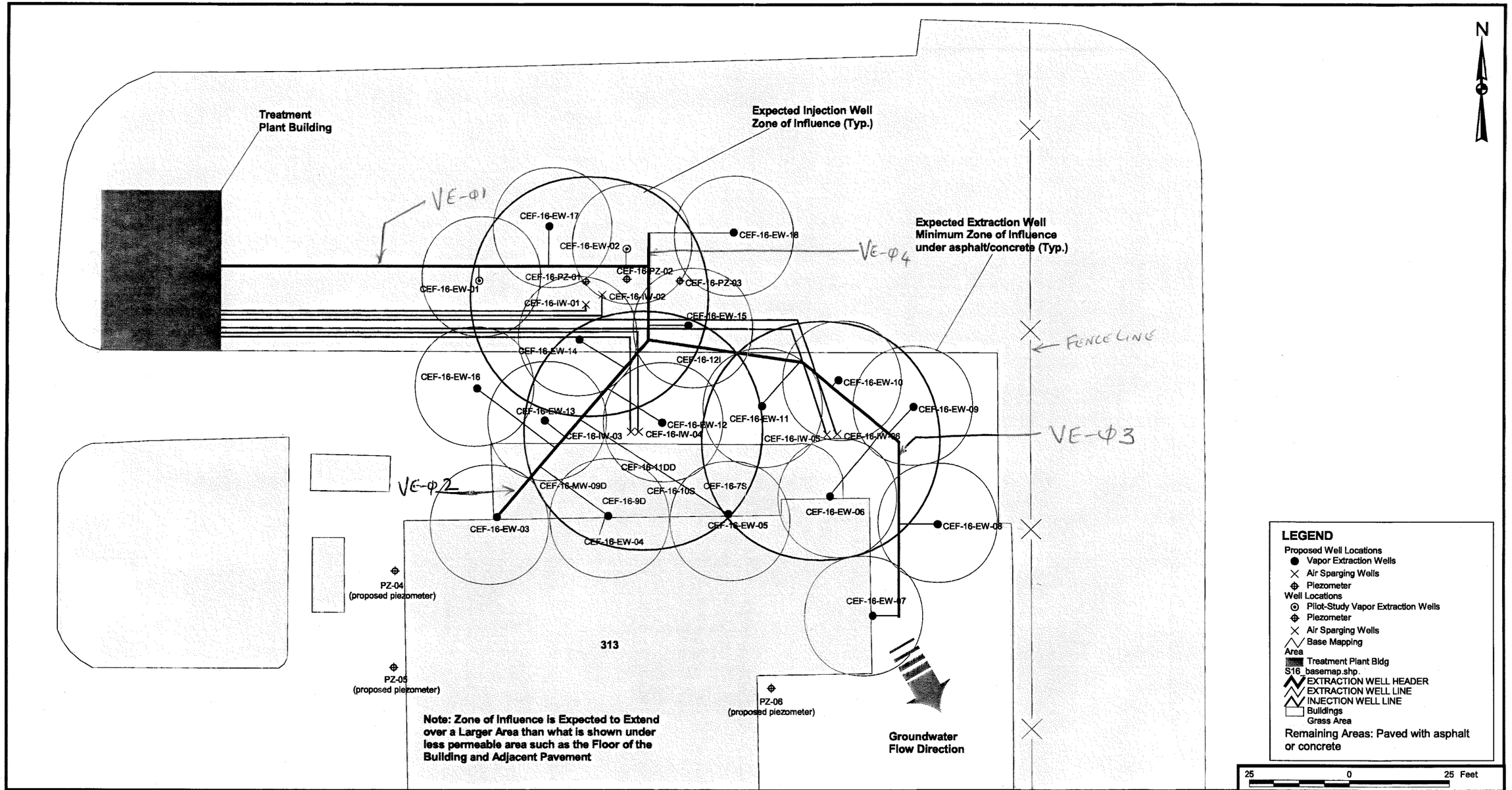
Gate valves (L/D)	39	0.4	inches w.g.=	0.0 psig
(3 total)				
Air filter				0.5 psig (assumed)
Pressure gauge				0 psig (assumed)
Butterfly valves				0 psig for fully open
			TOTAL=	**2.9 psig**

Vacuum Extraction Pump sizing:

Flow rate=	180 scfm
Pressure loss=	2.9 psig
Vacuum side=	2.9 psig
Pressure side=	0 psig
Inlet temperature=	60 oF

Blower-size required: wRT/550ne[(Pi/Po)^n -1](Metcalf&Eddy,1991)
w= air flow in lb/s using density of air= 0.078 lb/ft^3
R gas constant=53.5
n=Polytropic gas exponent=0.283 for air
T= inlet temp in Rankine
e= efficiency= 50% (assumed)
Po; Pi= absolute outlet and inlet pressures
= 4.3 H.P.
Standard motor size would be 5.0 H.P.

P:\GIS\CECIL\SITE16.APR 26-OTC-98 YLI LAYOUT WELL LOCATIONS CLOSE-UP



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY YLI	DATE 10/26/98
CHECKED BY JPK	DATE 10/30/98
COST/SCHED-AREA	
SCALE AS NOTED	

AIR SPARGING / VAPOR EXTRACTION SYSTEM LAYOUT
OPERABLE UNIT 7, SITE 16
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 7792	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 3-1	REV. 0

Schedule (Thickness) of Steel Pipe Used in Obtaining Resistance Of Valves and Fittings of Various Pressure Classes by Test*

Valve or Fitting ASA Pressure Classification (Steam Rating)		Schedule No. of Pipe (Thickness)
250-Pound and Lower		Schedule 40
300-Pound to 600-Pound		Schedule 80
900-Pound		Schedule 120
1500-Pound		Schedule 160
2500-Pound	Sizes ½ to 6-inch	xx (Double Extra Strong)
	Sizes 8-inch and larger	Schedule 160

*These schedule numbers have been arbitrarily selected only for the purpose of identifying the various pressure classes of valves and fittings with specific pipe dimensions for the interpretation of flow test data; they should not be construed as a recommendation for installation purposes.

Representative Equivalent Length‡ in Pipe Diameters (L/D) Of Various Valves and Fittings

Description of Product				Equivalent Length In Pipe Diameters (L/D)
Globe Valves	Conventional	With no obstruction in flat, bevel, or plug type seat	Fully open	340
		With wing or pin guided disc	Fully open	450
	Y-Pattern	(No obstruction in flat, bevel, or plug type seat)		
		– With stem 60 degrees from run of pipe line	Fully open	175
		– With stem 45 degrees from run of pipe line	Fully open	145
Angle Valves	Conventional	With no obstruction in flat, bevel, or plug type seat	Fully open	145
		With wing or pin guided disc	Fully open	200
Gate Valves	Conventional Wedge Disc, Double Disc, or Plug Disc		Fully open	13
			Three-quarters open	35
			One-half open	160
			One-quarter open	900
	Pulp Stock		Fully open	17
			Three-quarters open	50
			One-half open	260
			One-quarter open	1200
	Conduit Pipe Line		Fully open	3**
Check Valves	Conventional Swing	0.5†	Fully open	135
	Clearway Swing	0.5†	Fully open	50
	Globe Lift or Stop	2.0†	Fully open	Same as Globe
	Angle Lift or Stop	2.0†	Fully open	Same as Angle
	In-Line Ball	2.5 vertical and 0.25 horizontal†	Fully open	150
Foot Valves with Strainer		With poppet lift-type disc 0.3†	Fully open	420
		With leather-hinged disc 0.4†	Fully open	75
Butterfly Valves (6-inch and larger)			Fully open	20
Cocks	Straight-Through	Rectangular plug port area equal to 100% of pipe area	Fully open	18
	Three-Way	Rectangular plug port area equal to 80% of pipe area (fully open)	Flow straight through	44
			Flow through branch	140
Fittings	90 Degree Standard Elbow			30
	45 Degree Standard Elbow			16
	90 Degree Long Radius Elbow			20
	90 Degree Street Elbow			50
	45 Degree Street Elbow			26
	Square Corner Elbow			57
	Standard Tee	With flow through run		20
		With flow through branch		60
	Close Pattern Return Bend			50
Pipe	Smooth Bend Pipe Bends			See Page A-27
	Miter Bends			See Page A-27
	Sudden Enlargements and Contractions			See Page A-26
	Entrance and Exit Losses			See Page A-26

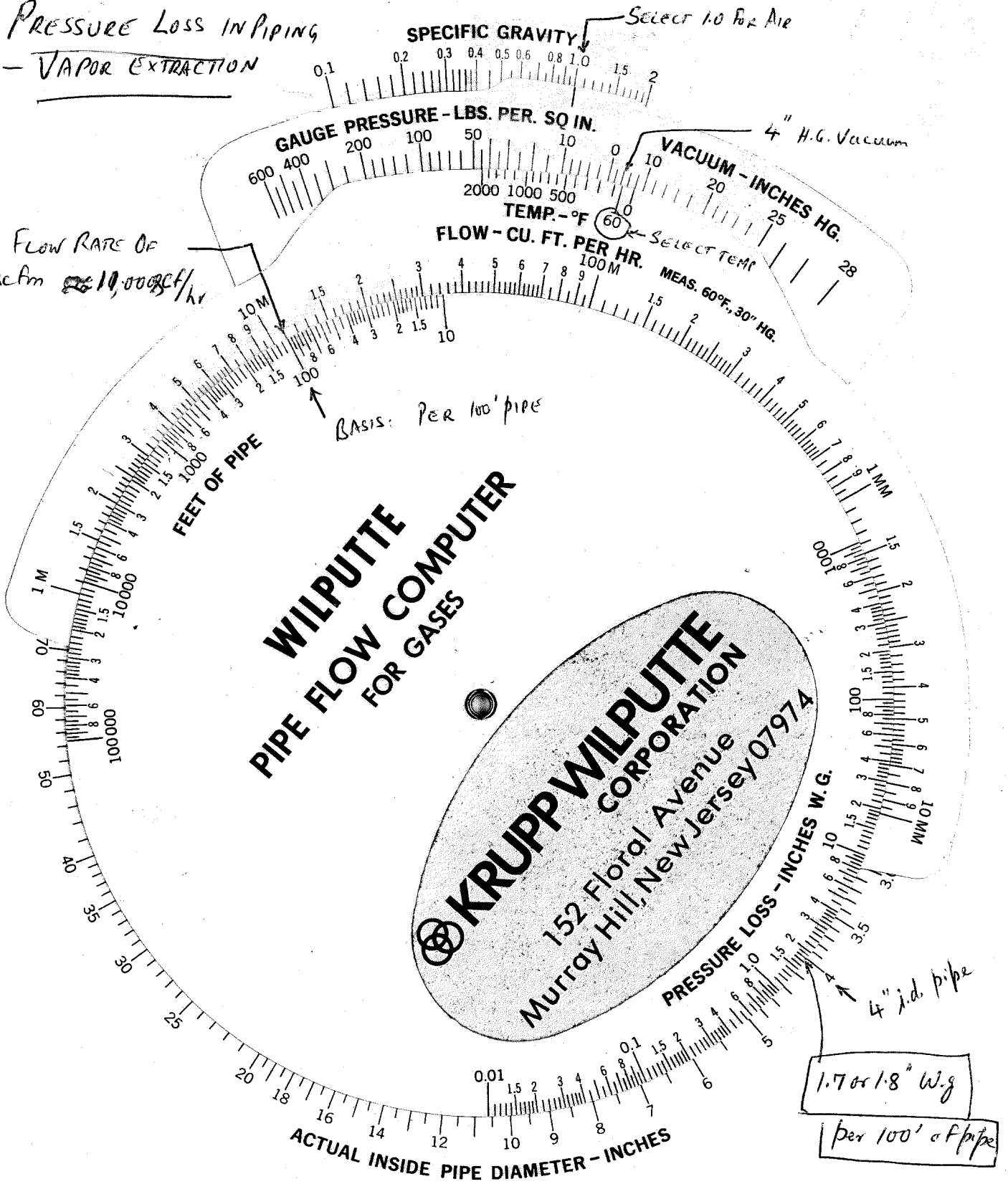
**Exact equivalent length is equal to the length between flange faces or welding ends.

†Minimum calculated pressure drop (psi) across valve to provide sufficient flow to lift disc fully.

‡For limitations, see page 2-11. For effect of end connections, see page 2-10.

For resistance factor "K", equivalent length in feet of pipe, and equivalent flow coefficient "C_v", see pages A-31 and A-32.

PRESSURE LOSS IN PIPING
– VAPOR EXTRACTION



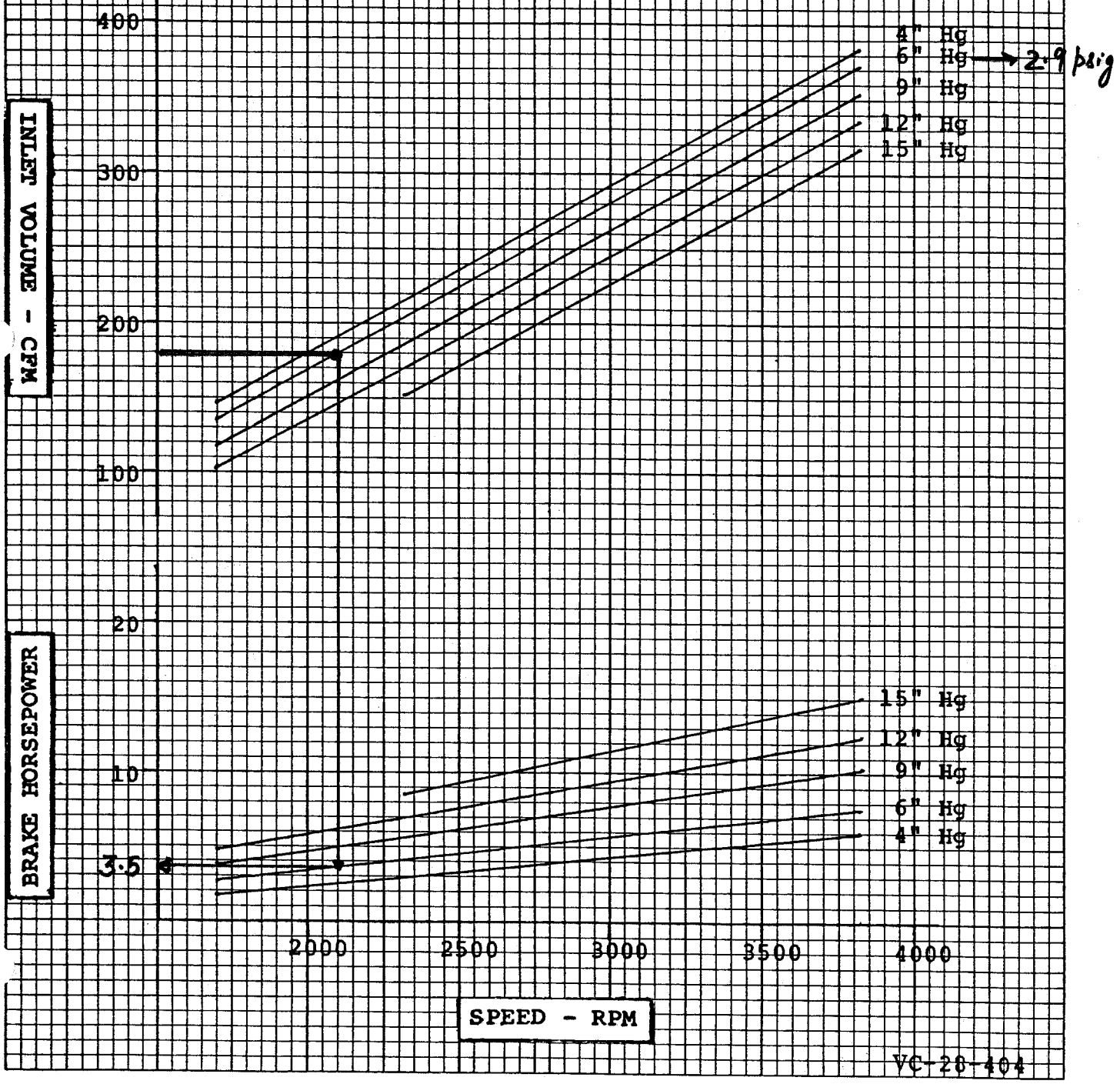
The Computer is based on the flow of gas which leaves no deposit in the pipe. For reasonably clean lines multiply the computed pressure losses by the following factors which allow for normal deposits:

Natural gas	1.00
Air	1.00
Clean blast furnace gas	1.10
Coke oven gas	1.30
Carburetted water gas	1.30

ROOTS DIVISION
DRESSER INDUSTRIES, INC.
CONNERSVILLE, INDIANA 47331
PRINTED IN U.S.A.

PERFORMANCE BASED ON.
INLET AIR = 68° F
DISCHARGE PRESSURE = 30" HG. ABS.
SEPTEMBER 1986

PERFORMANCE
FRAME 404 RCS BLOWER
MAXIMUM VACUUM = 15 IN. HG.
MAXIMUM SPEED = 3820 RPM



VC-28-404

NAS Cecil Field
Site 16 ASVE Design
Vapor Extraction System

Pressure Loss/Vacuum Extraction Pump Sizing
By:
Checked by:

11/18/98

Pressure Loss Calculation: Air Sparging System:

Start with the pressure required to force out/evacuate the water column in the deeper air sparging well
Calculate fitting and line losses from farthest air sparging well location to the treatment plant
Within the treatment plant, include fittings and line losses

All piping outside the plant is Schedule 80 PVC
All piping inside the plant is Schedule 80 galvanized steel
For the purposes of pressure loss, both are assumed identical

For all line losses, the Krupp Wiputte Corp nomographic wheel is used (see attached copy)
For all fitting losses, the Crane manual (1957) is used (see attached copy)

Hydrostatic Head CEF-16-IW-05/IW-06 (deeper of the pair)					
Depth to bottom of screen=		100	ft bgs		
Depth to water table=		6	ft bgs		
Pressure required=		94	ft=	41	psig
Pressure loss through well screen=				3	psig (professional judgement)
Assume a pressure of 40 to 45 psig, for a flow rate of 10 scfm@ 70 oF					
Pressure loss gradient=		0.05	inches w.g./ft		
Pressure loss through well riser=					
	100	5	inches w.g.	0.2	psig
IW-05/06 to plant inlet (=		172	ft)		
Branch "T"(L/D)=	60	0.5	inches w.g.=	0.02	psig
Flow meter				0.2	psig (assumed)
90 elbow	50	0.42	inches w.g.=	0.02	psig
Piping =		8.6	inches w.g.=	0.31	psig

NAS Cecil Field
Site 16 ASVE Design
Vapor Extraction System

Pressure Loss/Vacuum Extraction Pump Sizing

By:

Checked by:

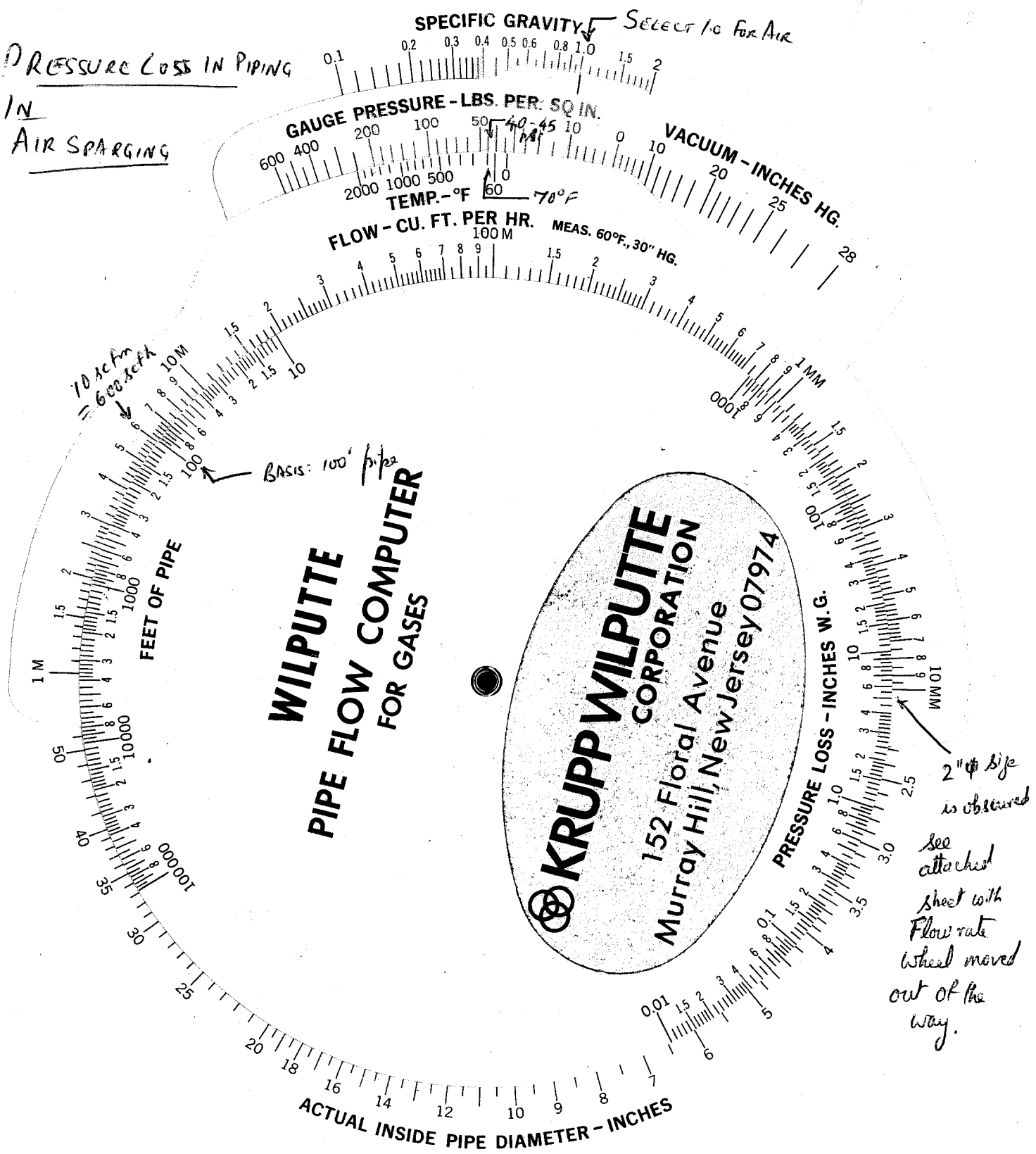
11/18/98

<u>Inside plant</u>			
Elbows (L/D)x2	100	0.83 inches w.g.=	0.03 psig
Flow "T" (L/D)	60	0.50 inches w.g.=	0.02 psig
Flow meter			0.2 psig (assumed)

High pressure lines (50 psi before pressure regulators and >100 psi at compressor outlet) despite the higher flow rates have minimal pressure loss because of shortness of pipe length.

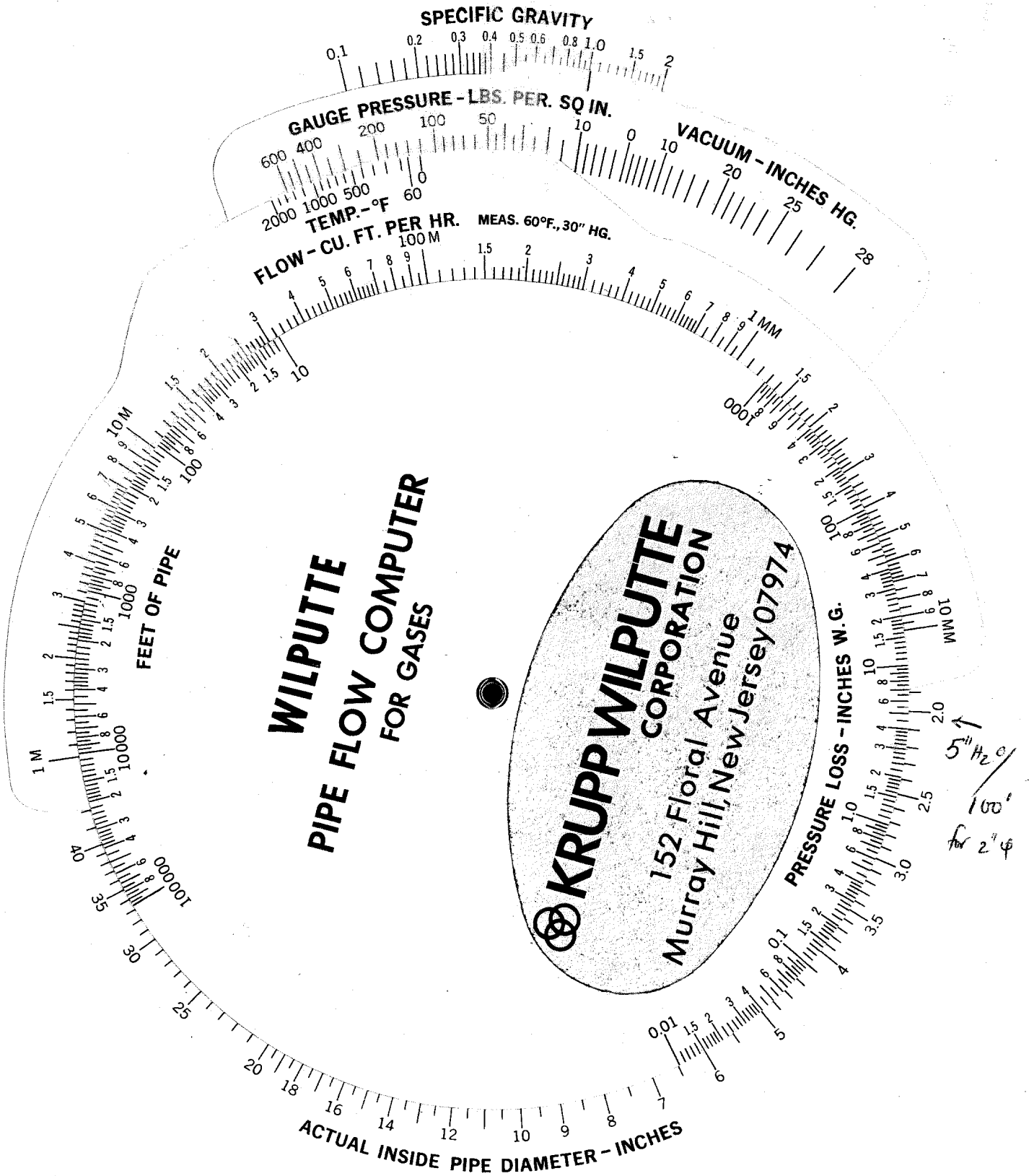
Total pressure loss in the air sparging side= 45 psig

PRESSURE LOSS IN PIPING
IN
AIR SPARGING



The Computer is based on the flow of gas which leaves no deposit in the pipe. For reasonably clean lines multiply the computed pressure losses by the following factors which allow for normal deposits:

Natural gas	1.00
Air	1.00
Clean blast furnace gas	1.10
Coke oven gas	1.30
Carburetted water gas	1.30



The Computer is based on the flow of gas which leaves no deposit in the pipe. For reasonably clean lines multiply the computed pressure losses by the following factors which allow for normal deposits:

Natural gas	1.00
Air	1.00
Clean blast furnace gas	1.10
Coke oven gas	1.30
Carburetted water gas	1.30

GAS-PHASE GAC ADSORPTION SYSTEM

ESTIMATE GAC USAGE

By:
Checked:

The following set of calculations estimate the GAC usage for the full-scale Vapor Extraction system based on the air emission calculations. The calculations estimate the concentration of the TCE off-gas at several times over the first year by using the Air Sparging Model for Predicting Groundwater Cleanup Rate and using a ratio of groudwater concentration to air emission concentration to calculate the approximate TCE air emissions at several times over the first year. The initial off-gas concentration is estimated using the Pilot study data and the off-gas emisson calculations.

The air emissions are converted to lbs/day using a flow rate of 190 scfm and information from GAC manufacturers and distributors are used to estimate the quantity of GAC used for the first year of operation.

Estimate Groundwater cleanup Rate using the Air Sparging Model (Sellers and Schrieber, CDM, Inc., 1992)

$$C(t) = C(o) * e^{-Bt}$$

C(t) = Groundwater concentration at time t
C(o) = Groundwater concentration at present = 41 mg/L (average TCE concentration in the source area - See Appendix E calculations)
B = 1.56 yr^{-1} (See Appendix E calculations)
t = time in years - for these calculations will determine C(t) at 1, 3, 6, and 12 months

Time (mo)	Time (yr)	C(t) (mg/L)
0	0	41
1	0.08	36.00
3	0.25	27.76
6	0.50	18.79
12	1.00	8.62

Using the ratio of average TCE concentration at present (41 mg/L) to the estimated TCE off-gas emission concentration (660 ppm) and total off-gas emission concentration (750 ppm) (from the Pilot Study and off-gas emisson calculations) with the groundwater concentrations above to estimate the TCE off-gas concentrations at the same time intervals.

Time (mo)	C(t) (mg/L)	TCE Only Off-Gas Emisson (ppmv)	Total VOC Off-Gas Emisson (ppmv)
0	41	660	750
1	36.00	580	659
3	27.76	447	508
6	18.79	303	344
12	8.62	139	158

ESTIMATE GAC USAGE

By: _____
Checked: _____

Using the attached table for Theoretical Ventsorb Capacties the lbs of contaminant per 200 lbs of GAC are estimated for the off-gas emission concentrations estimate above. Since the Ventsorb capacity table includes DCE, the total off-gas lb sorbed/200 lb of GAC using both TCE and DCE. For the total off-gas concentration, a weighted lbs of contaminant sorbed per 200 lb of GAC is estimated, using the DCE to Total off-gas ratio of approximately 0.06 (45/750) or 6%, .

The lb off-gas sorbed to 200 lb GAC were determined by interpolating from the attached table
An example of the calculation for TCE at a concentration of 660 ppm is shown below. The 660 was replaced with the estimated/calculated emission concentrations

lb sorbed/200 lb carbon =[{(95-65)/(1000-100)} * (660-100)] + 65

For DCE the 95 was replaced with 29 and the 65 was replaced with 16 and change 1000 to 100 and 100 to 10

Calculated from Ventsorb Table

Time (mo)	TCE Only Off-Gas Emisson (ppmv)	Total VOC Off-Gas Emisson (ppmv)	DCE Concentration (ppmv)	TCE portion of Total Off-Gas Emission (ppmv)	TCE Off-Gas lb sorbed/200 lb GAC	Total Off-Gas lb sorbed /200 lb GAC
0	660	750	45	705	84	106
1	580	659	40	619	81	103
3	447	508	30	477	77	97
6	303	344	21	323	72	90
12	139	158	9	148	66	83

Use both calculated values of lb sorbed to 200 lb GAC to get a range of carbon useage for the first year

Estimate the lbs of total off-gas generated by the vapor extraction system using a flow rate of 190 scfm
lb/day = gas emission* molecular weight (131.5) * flow rate *1440*0.002205/24.45/35.3/1000

Time (mo)	TCE Only Off-Gas Emisson (ppmv)	TCE Only lbs of off-gas per day	Total VOC Off-Gas Emisson (ppmv)	Total VOC lbs of off-gas per day
0	660	60.7	750	68.9
1	580	53.3	659	60.5
3	447	41.1	508	46.7
6	303	27.8	344	31.6
12	139	12.7	158	14.5

NAS Cecil Field
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ESTIMATE GAC USAGE

3/16/99

By:
Checked:

Estimate the lbs of GAC used for each time period assuming 30 days per month and calculating the lbs of GAC used by the averaging method.

TCE Only

Time (mo)	TCE Only lbs of off-gas per day	Average lb per day	TCE Off-Gas lb sorbed/200 lb GAC	Average
0	60.7		84	
1	53.3	57.0	81.0	82.3
3	41.1	47.2	76.6	78.8
6	27.8	34.4	71.8	74.2
12	12.7	20.3	66.3	69.0

Total VOCs

Time (mo)	Total VOC lbs of off-gas per day	Average lb per day	Total Off-Gas lb sorbed /200 lb GAC	Average
0	68.9		84	
1	60.5	64.7	81.0	82.3
3	46.7	53.6	76.6	78.8
6	31.6	39.1	71.8	74.2
12	14.5	23.0	66.3	69.0

GAC Used = 200/lb sorbed * lb off-gas per day * time period

Time (mo)		TCE Only GAC used per time period	**Total VOCs** GAC used per time period
0			
1		4152	4718
3		7186	8166
6		8360	9500
12		10577	12019
Total GAC used in a 1 year period		**30275**	**34403**

Number of 2000 lb GAC Units	**15.1**	**17.2**

THEORETICAL VENTSORB CAPACITIES

			Theoretical VentSorb Capacity Lb Adsorbed/VentSorb*		
	BOILING POINT/°C	MOLECULAR WEIGHT	10 PPM	100 PPM	1,000 PPM
Acrylonitrile	77.3	53.1	9	18	37
Benzene	80.1	78.1	27	39	55
n-Butane	-0.5	58.1	5	9	17
Carbon Tetrachloride	76.8	153.8	46	66	97
Dichloroethylene	37.0	97.0	16	29	53
Methylene Chloride	40.2	84.9	6	13	30
Freon 115	-37.7	154.5	6	11	21
n-Hexane	68.7	86.2	23	31	43
Styrene	145.2	104.1	56	68	82
Toluene	110.6	92.1	44	56	70
Trichloroethylene	87.2	131.4	45	65	95

*Theoretical capacity based on 70 degrees F., atmospheric pressure, less than 50 percent humidity and 200 pounds of carbon using isotherm data for Type BPL carbon.

HOW TO ESTIMATE VENTSORB CARBON LIFE

This table lists the theoretical adsorption capacities for several compounds. The adsorption capacity for nonpolar organics increases with the boiling point, molecular weight and concentration of the air contaminant. Estimate the life of a VentSorb canister for other organic compounds by matching them with compounds of similar boiling point and molecular weight in this table. Low molecular weight (less than 50) and/or highly polar compounds such as formaldehyde, methane, ethanol, etc., will not be readily adsorbed at low concentrations.

Note: The standard VentSorb canister contains 200 pounds of BPL carbon. When removing hydrogen sulfide and mercaptans from moist air streams, you will achieve the greatest efficiency by using a VentSorb canister which contains specially impregnated Type IVP carbon. A VentSorb containing IVP carbon can remove up to 40 pounds of hydrogen sulfide and 15 pounds of methyl mercaptan. When ordering VentSorb canisters, please specify if they should contain Type IVP carbon.

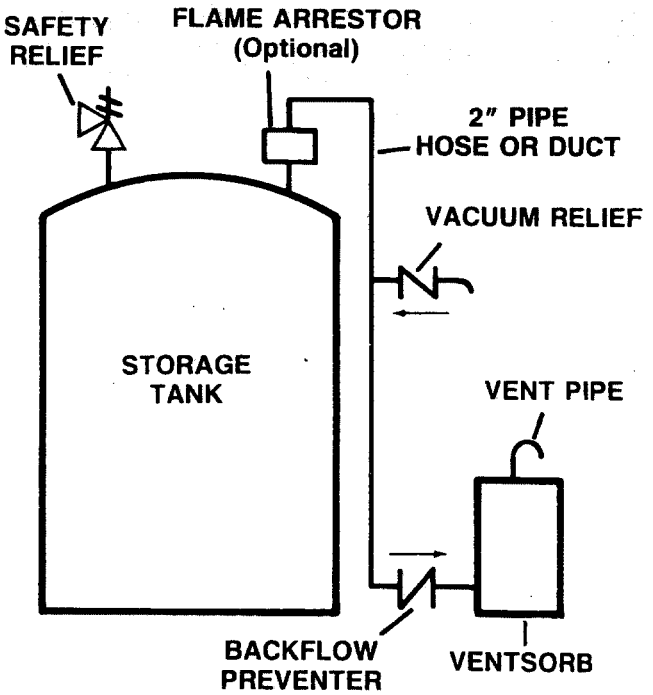
VENTSORB SAFETY CONSIDERATIONS

While complying with recommended installation instructions, plant operators should also be aware of these additional heat-related safety considerations:

1. When contacting with activated carbon, some chemical compounds, such as methyl ethyl ketone or cyclohexanone, may oxidize, decompose or polymerize—resulting in heat generation. **These systems should not be used in ketone applications.** Furthermore, if the reaction on activated carbon is not known, appropriate tests should be performed before putting a system in service.

2. Type IVP carbon can liberate heat by reacting chemically with oxygen. To prevent heat within a vessel, the carbon must not be confined without adequate air flow to dissipate the heat. In situations where there is insufficient or disrupted air flow through the vessel, the chemical reaction can be prevented by sealing the inlet and outlet connections to the vessel.

NOTE: CONTACT YOUR LOCAL CALGON CARBON TECHNICAL SALES REPRESENTATIVE FOR CLARIFICATION OR TO ANSWER ANY QUESTIONS.



Typical VentSorb Installation at Storage Tank

TIGG #
395 lb/DAY
(VC @ 13 ppm)

Calgon
~300 lb/DAY
(VC @ 13 ppm)

Design Air Emissions

Parameter	Mol wt (g/gmol)	Conc (ppmv)	Conc (mg/m^3)
TCE	131.5	660	3549.7
TCA	98	6	24
1,2-DCE	97	38	150.8
1,1-DCE	97	2	7.9
Vinyl Chlo	62.5	45	33.2
PCE	166	0	0

Extraction rate= 18 wells at 10 scfm/well
= 180 scfm

80% RH, 60 F — 1235 lbs/day — 5.2% loading

50% RH, 60 F — 458 #/day — 14% load

80% RH, 80 F — 470 #/day — 13.61% loading

50% RH, 80° — 300 #/day

LOADING
0.75 lb VC
12% DCE
32% TCE

Telephone Call on 3/15/99 w/ Paul Baran
1st unit - picks up TCE, DCE, TCA
2nd unit — VC - 597 lb/day @ 80°F
0.31 lbs VC/100 lb carbon

VC - 396 lb/day @ 60°F
0.48 lb VC/100 lb carbon

2000 lb units - on shelf
2-3 days

Run 1

Flow Rate: 180 CFM
Temperature: 80 f
Relative Humidity: 50 %
Adsorption Pressure: 1 ATM

Concentration(ppmv)	Component
45.000	vinyl chloride

Band	Chemicals	Y	LBS/100 LBS Carbon	Overall LBS/100 LBS Carbon
1	vinyl chloride	1.00	.310	.310

597.351 Pounds Carbon Per Day

597.35 Pounds Carbon Per Day
Average Loading: .310 Pounds Per 100 Pounds Carbon

Run 1

Flow Rate: 180 CFM
Temperature: 60 f
Relative Humidity: 50 %
Adsorption Pressure: 1 ATM

Concentration(ppmv)	Component
45.000	vinyl chloride

Band	Chemicals	Y	LBS/100 LBS Carbon	Overall LBS/100 LBS Carbon
1	vinyl chloride	1.00	.484	.484

396.654 Pounds Carbon Per Day

396.65 Pounds Carbon Per Day
Average Loading: .484 Pounds Per 100 Pounds Carbon

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OU 7, Site 16 AS/SVE Design

ESTIMATE GAC USAGE

3/17/99

By:
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Some Additional calculations to check/review with above

Estimate the lbs of total off-gas over the initial 1 year period assuming 30 days per month and calculating the lbs of total off-gas using averaging method

Time (mo)	lbs of off-gas per day	Average lb per day	lb over time period
0	60.7		
1	60.5	60.6	1818.0
3	46.7	53.6	3216.3
6	31.6	39.1	3522.4
12	14.5	23.0	4147.9
		Total lb/yr	**12704.6**
		of off-gas	

Estimate the initial lb/day loading and lb/day carbon usage to compare with the information provided by TIGG

Initial ppm	Initial loading (lb/day)	Carbon Usage Rate from Attached Table (lb/200 lb)	Initial Carbon Usage (lb/day)
750	68.9	84	164.0

TIGG said they estimated 395 lb/day and the talked with Calgon who estimated 300 lb/day
Also according to TIGG the TCE loading for the carbon is 32% (32 lb TCE to 100 lb carbon). Using this information, the amount of carbon is estimated using the estimated off-gas lb/day calculated above.

Time (mo)	Total VOC lbs of off-gas per day	Average lb per day	GAC used per time period
0	68.9		
1	60.5	64.7	6069.0
3	46.7	53.6	10050.8
6	31.6	39.1	11007.6
12	14.5	23.0	12962.2
		Total GAC used in a 1 year period	**40089.7**
		Number of 2000 lb GAC Units	**20.0**

Check Vinyl Chloride Adsorption based on TIGG information

Per TIGG - 0.75 lb Vinly Chloride sorbed/100 lb GAC at 50% RH and 80 F with other contaminants
- 0.31 lb Vinyl Chloride sorbed/100 lb GAC at 50% RH and 80 F - Vinyl Chloride only
- 0.48 lb Vinyl Chloride sorbed/100 lb GAC at 50% RH and 60 F - Vinyl Chloride only

If Vinyl Chloride is 45 ppmv with a flow rate of 190 scfm, calculate the lbs per day of Vinyl Chloride

lb/day = 0.57 at 13 ppm

ESTIMATE GAC USAGE

By:
Checked:

3/17/99

Determine range of Vinyl Chloride sorbed in a 2000 lb GAC vessel

lb Vinyl Chloride sorbed / 100 lb GAC * 2000 lb GAC

lb VC/100 lb GAC	lb VC per GAC vessel	Say Vessel is 80 % efficient
0.75	15	12
0.31	6.2	4.96

From the calculations above, it appears that the change outs will occur approximately every 20 days

Determine the amount of Vinyl Chloride released over a 20 day period

lb produced = 0.57 * 20 =	11
lb sorbed =12 @ 0.75 lb/100 lb GAC or 5 @ 0.31 lb/100 lb GAC	8
lb released	3
on a per day basis = 32/20 =	0.17
Convert lb per day back to ppmv	3.9

APPENDIX D

GROUNDWATER MODELING RESULTS

D.1 DEVELOPMENT OF GROUNDWATER REMEDIAL GOAL OPTIONS (GW RGO)

D.2 ESTIMATION OF GROUNDWATER WASHOUT TIME BY NATURAL ATTENUATION

D.1.0 INTRODUCTION

The following sections present technical discussions and results of groundwater modeling at Operable Unit (OU) 7, Site 16, at Naval Air Station (NAS) Cecil Field, Jacksonville, Florida. OU 7 consists of Site 16, Aircraft Intermediate Maintenance Department (AIMD) seepage pit, holding tank, and adjacent areas affected by these facilities (Figure B-1). The modeling work performed consists of the following two tasks:

- TASK 1 - The development of TCE Groundwater Remedial Goal Options (GW RGO) in the source area that are protective of human health from exposure to groundwater from the surficial aquifer.
- TASK 2 - Estimation of groundwater washout time in the source area by natural attenuation mechanisms.

The modeling tasks were conducted to support the remedial design for groundwater treatment of volatile organic compounds. The proposed groundwater treatment system consists of in-situ Air Sparging/Soil Vapor Extraction (AS/SVE) system within the OU 7, Site 16 source area (including seepage pit and holding tank) followed by site-wide natural attenuation.

D.1.1 OBJECTIVES

The objective of TASK 1 is to determine the GW RGO for trichloroethene (TCE). GW RGO can be used as a guideline or a target clean-up level for the groundwater treatment system. GW RGO represents the maximum allowable TCE concentration beneath the source area such that when natural attenuation occurs effectively, the groundwater criteria at downgradient exposure point will be met. It follows that the target clean-up level of TCE will not cause the groundwater concentrations at the exposure point to exceed the acceptable groundwater criteria. For TASK 1, the exposure point is a single point down gradient of the source along the centerline of the plume where the groundwater enters the drainage ditch east of the north-south runways. The drainage ditch ultimately discharges into Sal Taylor Creek. The Florida Guidance Concentration for TCE (i.e., 3 ug/L) is chosen as the acceptable groundwater criteria. TCE was selected for modeling because this chemical is widely distributed at OU 7, Site 16. The GW RGO was developed through the use of a groundwater flow contaminant fate and transport model.

TASK 2 is to provide a computation of groundwater washout time by site-wide natural attenuation for TCE to be further reduced from GW RGO level to at or below the 3 ug/L criteria. The predicted time was calculated for the groundwater beneath the source area. The computations considered the natural processes affecting contaminant fate and transport in groundwater. Naturally occurring mechanisms will reduce contaminant concentrations in groundwater over time. The mechanisms/processes affecting chemical fate and transport in groundwater that were accounted for during the modeling include sorption,

dilution, advection, dispersion, and chemical/biological decay. With the source of contamination reduced substantially by an in-situ AS/SVE technique, infiltration of rainfall into the aquifer will flush the aquifer with clean water. Task 2 has also considered four additional similar calculations by assuming TCE by attenuated from 1 mg/L (the residual TCE concentration following shut-off of the AS/SVE system) to 3 µg/L under the source area as well as at the downgradient plume. The washout time computations were also accomplished through the use of the same modeling tool.

Also, the groundwater modeling for TCE assumes that no dense non-aqueous phase liquids (NDAPLs) is present at the site. Because the quantity of TCE disposed at the site has not been identified, the presence of DNAPL in the groundwater could not be confirmed.

D.1.2 REPORT ORGANIZATION

This appendix has been divided into five discrete sections. In addition to the introduction (Section D.1.0), Section D.2.0 presents the technical approach used for the development of GW RGO. Section D.3.0 provides the input data used for the development of GW RGO. Section D.4.0 provides a technical discussion for the estimation of groundwater washout time by natural attenuation. Section D.5.0 presents modeling results for the two tasks performed for OU 7, Site 16.

D.2.0 GROUNDWATER RGO DEVELOPMENT

The technical approach used to develop the GW RGO is described in the following subsections. The first subsection describes the analytical groundwater contaminant fate and transport model used for the task. The second subsection briefly describes the geology, hydrogeology, the pattern of contaminant releases, and the associated simplifying assumptions.

D.2.1. GROUNDWATER MODEL TOOL

The groundwater modeling was performed using ECTran model (Chiou, et al., 1993). The ECTran model is an analytical contaminant fate and transport model, and is a multi-layer one dimensional model based on straightforward mass-balances and advection/dispersion analytical equations.

The groundwater model is implemented on the spreadsheet software Excel 4.0 and Crystal Ball 3.0 and is called ECTran (Excel-Crystal Ball Transport). The ECTran model can be used to simulate a variety of complex conditions. To date, ECTran and its predecessors have been employed at hazardous waste sites in U.S. EPA Regions III, IV, V, VI, and X to evaluate soil cleanup goals, cleanup time estimations, and to support baseline risk assessments. It has been used at DOD, DOE, Naval Air Station, and industrial sites for both RCRA and CERCLA applications.

The ECTran model simulates vertical contaminant transport with uniform (thickness, concentration, porosity, etc.) layers. The model predicts the concentration down gradient of the source at a single point at a specified distance from the exposure point. This predicted concentration is at the centerline of the contaminant plume.

D.2.2 CONCEPTUAL MODEL

A description of the conceptualization of the natural processes that govern groundwater flow and contaminant transport at the site is provided in this subsection. Sections D.2.2.1 and D.2.2.2 briefly describe the geology and hydrogeology at OU 7, Site 16. Section D.2.2.3 provides the site conceptual model.

D.2.2.1 Topography

OU 7, Site 16 is located west of and adjacent to the north-south jet runways on NAS Cecil Field. OU 7, Site 16 is vegetated with grass that is mowed regularly. The general area adjacent to OU 7, Site 16 is relatively flat and is covered with asphalt and concrete. Several utility lines were installed in the immediate area of OU 7, Site 16. Surface water flow from OU 7, Site 16 is typically toward the adjacent paved roads and parking lots. The runoff from the paved roads and parking lots in the vicinity of OU 7,

Site 16 ultimately flows to the NAS Cecil Field stormwater sewer system (RI, 1995). The stormwater sewer system discharges into drainage ditches that lead to the wetlands on the east side of the runways and eventually discharges into Sal Taylor Creek farther to the east (Figure D-1).

The Jacksonville area has a climate approaching the semi-tropical range. This influence is pronounced along the coast but decreases in the vicinity of NAS Cecil Field. The region experiences an average of 53 to 54 inches of rainfall per year.

D.2.2.2 Site-Specific Geology And Hydrogeology

For complete descriptions of geology and hydrogeology features for OU 7, Site 16 refer to Sections 3.5 and 3.6 of the Remedial Investigation (RI) conducted by ABB-ES (1995).

Generally, OU 7, Site 16 is underlain by approximately 90 feet of fine-grained silty sand. Thin layers of clayey sand, sandy clay, and clay were encountered throughout this lithologic strata. Beneath the sand is a layer of clay containing between 40 to 50 percent dolomite fragments. This clay is underlain by dolomites.

More specifically, undifferentiated sediments (deposited less than 10 thousand years ago) are between 90 and 102 feet thick at OU 7, Site 16. These sediments generally grade in tones that vary from dark brown at the land surface to dark gray at the bottom of the sand unit. The sediments consist of fine to medium-grained, poorly to well-sorted quartz sands with some silty sands, clayey sands, and clays. Based on the Unified Soil Classification System (USCS), these sediments are classified as SP or SM. The sand layer is underlain by a layer of clay. This clay is approximately 6 to 10 feet thick, dark gray, with soft to medium stiffness, and contains dolomite fragments. Beneath the clay layer are sediments of Miocene age Hawthorn Group. The uppermost layers of the Hawthorn Group are a carbonate-rich unit of dolomite. Historically, this unit has been called the "rock aquifer."

Figure D-2 presents a general lithologic cross-section that is depicted generally following the groundwater flow path (southeast orientation).

Underlying OU 7, Site 16 are three water-bearing formations from most shallow to deepest: 1) a surficial aquifer, 2) an intermediate aquifer, and 3) the Floridan Aquifer system. Between each system is an aquitard (less permeable). Only the surficial aquifer was modeled at OU 7, Site 16.

Surficial Aquifer

The surficial aquifer is unconfined and composed of undifferentiated fine-grained sand with some clayey sand and clay. These sediments extend to approximately 90 to 100 feet below land surface (bls) and are underlain by a layer of clay with dolomite fragments. Well screens were placed to investigate hydrogeologic and geochemical conditions in the shallow (UZS), intermediate (IZS), and deep (LZS) parts of the surfical aquifer system. The surficial aquifer is considered to behave as one hydrological unit since it is an unconfined layer and extends downward to the top of the clay unit.

Water table depths in the surficial aquifer are typically between 5 to 10 feet bls. The general groundwater flow direction in the surficial aquifer is to the southeast. This general groundwater flow direction indicates that the groundwater discharges to the wetland areas and Sal Taylor Creek east of the runways (ABB-ES, Section 3.6.2.1, 1995). The average horizontal gradient in the surficial aquifer measured along the flowpath from the seepage pit area (CEF-16-5S in Figure B-2) to the lead edge of the plume is approximately 0.0029 foot per foot (ft/ft), based on the water level data collected in August 1994.

Slug tests were conducted at all existing monitoring wells at OU 7, Site 16 to estimate hydraulic conductivity (K). The results of the slug tests are summarized in Table 3-3 of the RI (Table B-3). The mathematical mean K values for the UZS wells, IZS wells, and LZS wells are 2.5 ft/day, 19 ft/day, and 18 ft/day, respectively. In comparison, the geometric mean K values for the UZS wells, IZS wells, and LZS wells are 2.2 ft/day, 18.2 ft/day, and 17.7 ft/day, respectively. The mathematical mean K values were used for modeling since the results are very similar. Based on the results of the aquifer pumping test conducted by the U. S. Geologic Survey (USGS) at NAS Cecil Field, the K values of the surficial aquifer range from 3.0 to 5.0 ft/day. The seepage velocity (the rate at which groundwater moves through the aquifer) is estimated at 101 feet per year (ft/yr). This seepage velocity was calculated using a mean K value from the IZS wells (19 ft/day), a hydraulic gradient of 0.0029 ft/ft, and an effective porosity of 0.2.

TCE contaminant exceedances have been detected in the groundwater to a depth of approximately 70 feet bls (IZS part of the surficial aquifer) based on the RI. Because the contaminated groundwater was only encountered within the surficial aquifer system, the hydrogeology and geology of the aquifer investigation at the lower intermediate aquifer system or confining unit are not discussed here. Refer to Section 3.6 of the RI for a detailed description of the intermediate aquifer system (ABB-ES, 1995).

D.2.2.3 Site Conceptual Model

Rainwater which falls on the site can transport contaminants through runoff and/or by infiltrating into the soil. Runoff can transport contaminants from the surface soils being eroded by the runoff. This pathway is not considered to be significant for this site. A portion of the rainwater that falls on the site reaches the

groundwater by directly infiltrating into the soil. As the water infiltrates through the contaminated soil, contaminants leach out of the soil and are transported with the water through the unsaturated zone to the shallow groundwater below. The contaminants can then be transported laterally in the groundwater and eventually enter a surface water body. In this study, upgradient groundwater flow is assumed to be clean (i.e., zero concentration). Upgradient flow will combine with infiltrated water and carry dissolved contaminants in the groundwater to the groundwater exposure point. Dissolved contaminants migrate through the groundwater at a slower velocity than the velocity of the groundwater. This contaminant velocity is said to be retarded. The amount of the retardation is chemical specific. Also the contaminant may decay in the environment by biological and/or chemical processes. Therefore, as contaminants migrate through the groundwater, they may decay and their concentrations decrease.

The proposed AS/SVE system will be installed at the OU 7, Site 16 source area (Figure D-3). Figure D-4 presents the site conceptual model. Conceptually, the groundwater contaminant pathway consists of an unsaturated zone and an unconfined aquifer. The unsaturated zone and shallow aquifer consist of the entire unconfined surficial aquifer, based on geology and hydrogeology of the aquifer investigation at the site. The layer conceptualization is reasonable since the primary route for contaminant migration in groundwater from OU 7, Site 16 would be through the surficial aquifer (ABB-ES, Section 5.2.3.3, 1995). At OU 7, Site 16, the typical depth to groundwater is estimated to be approximately 7 feet, which is determined as the thickness of the unsaturated zone. The modeled thickness of the saturated layer would cover the entire surficial aquifer system, and is selected to be 100 feet. This depth also agrees with the deep air injection well screened at intervals in the surficial aquifer from 91 to 101 feet bls. The general groundwater flow direction in the surficial aquifer is to the southeast toward the Drainage Ditch east of the runways. Groundwater can travel horizontally and vertically in the saturated zone.

D.2.2.5 Groundwater Modeling Procedures and Assumptions

Modeling Procedures

The groundwater concentrations in the surficial aquifer under the source area were first estimated, based on the maximum measured soil concentrations in the source area and the contaminant transport pathway (groundwater). The estimated groundwater concentration was then iteratively changed until the model-predicted concentration at the groundwater/surface water interface at the Drainage Ditch was just below the Florida Guidance Concentration (i.e. 3 ug/L). The final assumed groundwater concentration under the source area is the cross-media groundwater RGO.

Modeling Assumptions

Source Area

The source area was selected based on the locations at which contaminants were detected. The source area is designated as a rectangular area with length parallel to groundwater flow direction, and width perpendicular to the flow direction. Figure D-1 also shows the location of source area for the groundwater RGO development.

Layer simulated in the model

Based on site geologic conditions as well as the lithologic cross section provided in Section D.2.2, the uppermost layer simulated in the ECTran model is the unsaturated zone. And, the bottom most layer simulated in the ECTran model is the shallow unconfined surficial aquifer (saturated zone). Using a single-layer to represent the saturated zone is reasonable since the vertical extent of the TCE plume was only encountered within the surficial aquifer system.

Initial Soil Concentration

During an interim remedial action in March 1994, soil contaminated with TCE at concentrations above 1 mg/kg in the source area was removed and was replaced by clean fill. Only minor concentrations of contaminants were detected in the surface soil at the edge of the excavated area. Therefore, in the groundwater RGO development, the unsaturated soil is assumed to be clean.

Modeling Time Frame

The contaminant simulations were continued until the concentration at the exposure point peaked or until the simulation reached 1000 years.

Chemical Fate and Transport

Several mechanisms/processes affecting chemical fate and transport in groundwater were accounted for during the development of the RGO. They include sorption, dilution, advection, dispersion, and chemical/biological decay. Sorption is the reaction that occurs between solute and the surfaces of solids causing the solute to bond to varying degrees to the surface. Dilution occurs because of the mixing of contaminated groundwater with unaffected groundwater. Advection is the primary mechanism responsible for the movement of contaminants as a consequence of groundwater flow. Dispersion occurs

because of fluid mixing due to effects of unresolved heterogeneities in the permeability distribution. Decay involves the degradation of a chemical by natural chemical and biological processes.

D.3.0 INPUT DATA FOR MODELING

D.3.1. CHEMICAL INPUT PARAMETERS

The primary chemical input parameters include the soil/water partitioning coefficient, K_d, the exposure criteria, and chemical and biological decay half-lives. The chemical input parameters used in the modeling were directly imported from the RI (ABB-ES, 1995), which has been reviewed and approved by the regulatory agencies.

Modeled Chemical and Initial Soil concentrations

TCE was modeled since this chemical was detected in groundwater samples collected from the surficial aquifer, and is the most and widespread contaminant identified at OU 7, Site 16. The initial soil concentration in the source area was assumed to be 0 ug/kg since the contaminated soil in the source area was excavated and backfilled with clean fill during an interim removal action. The current maximum groundwater concentration for TCE is 1.5 X 10^6 ug/L, based on shallower IZS Aquaprobe™ results sampled at 20 feet west of well CEF-16-12I.

Site-Specific Soil/Water Partitioning Coefficient

Chemical-specific soil/water partitioning coefficients (K_ds) were used to estimate each chemical's mobility. A chemical's K_d value is the ratio of its concentration in soil (or sediment) to its concentration in water when the two concentrations are in equilibrium. A high K_d value would be representative of a chemical which has a tendency to bind to the soil and is therefore less mobile in water. Depending on the chemical form of a certain contaminant (specifically for inorganics), the K_d value can vary substantially. The site-specific K_d value used in this evaluation was calculated based on the procedures proposed in the SSL Guidance (EPA 1996).

The K_d values for organic constituents are typically calculated by multiplying the K_{oc} value (soil organic carbon/water partition coefficient) by the foc (fraction of organic carbon) (EPA, 1988). Based on the RI, a K_{oc} of 126 L/kg was used in the calculation for leaching of TCE from the vadose zone soil (ABB-ES, Appendix K page 6-9). The source of K_{oc} referenced in the RI was from the USEPA document (EPA/600/8-90/003). The site-specific foc value used in this evaluation was based on 1,200 mg/kg (or 0.12 %) median TOC concentration from all Cecil Field soil samples that were collected from the unconfined surficial aquifer to 50 feet bls. The following equation was used to compute the K_d for TCE:

$$K_d = k_{oc} * foc \quad (1)$$

where:

foc = fraction of organic carbon
K_{oc} = soil organic carbon/water partitioning coefficient

The K_d value is calculated as 0.151 L/Kg. The K_d value and their corresponding sources are presented in Table D-2.

Half-life Decay Constants

Decay of organic contaminants can occur by biological and non-biological mechanisms. This decay is quantified by chemical specific half-life. Half-life for TCE in groundwater media ranges from 10.7 months to 4.5 years, and was derived from scientific judgement based upon hydrolysis half-life (low $t_{1/2}$), and anaerobic sediment grab sample data (high $t_{1/2}$) (Howard 1991). To be conservative for the groundwater modeling, the longest half-life (4.5 years) was selected for TCE. Also, in order to model the worst worse scenario, it was conservatively assumed that TCE does not decay. Table D-2 presents the half-life decay constants used in the modeling.

Exposure Criteria

The Florida Guidance Concentration for TCE (i.e., 3 ug/L) was used as the exposure criteria for the GWRGO development. Florida Guidance Concentrations are taken from Chapter 6 (Guidance Concentrations Index) of the FEDP Groundwater Guidance Concentrations (June 1994).

D.3.2 PHYSICAL INPUT PARAMETERS AT SITE 16

The groundwater physical input parameters are described in the next two subsections.

D.3.2.1 Surface Water Infiltration Rates:

Infiltration rates in the seepage pit area are estimated to be one-quarter of the annual precipitation (infiltration rates =13.5 inches per year) because the surface feature of the seepage pit is non-paved. An average of 54 inches of rainfall per year was reported in the RI report for the area in Jacksonville, Florida (ABB-ES, 1995).

D.3.2.2 Groundwater Physical Input Parameters at Site 16

Layer Thickness: As described in the Conceptual Model section, a typical thickness of the unsaturated zone was assumed to be 7 feet. The saturated zone was assumed to be 100 feet thick based on the geologic cross section and TCE plume vertical extent (Figure D-2, Sections D.2.2.2 and D.2.2.3). Table D-4 presents a summary of physical and geologic parameters used for the modeling task.

Source Area Size: In GW RGO development, it is assumed that the source area corresponds to a rectangular area encompassing the seepage pit area. Based on the reported TCE groundwater concentrations in the surficial aquifer, the size of the rectangular area was estimated to be 860 feet long (parallel to groundwater flow direction) by 320 feet wide (perpendicular to flow direction) for TCE plume (Figure D-5).

Exposure Point: The exposure point for groundwater RGO development was at a point downgradient of the source area where groundwater enters into a drainage ditch. Groundwater discharges into drainage ditches that lead to the wetlands on the east side of the runways and eventually discharges into Sal Taylor Creek farther to the east (ABB-ES, Section 5.2.3.3, 1995). The distance to this exposure point is approximately 3,450 feet along groundwater flow path direction (Figures D-1 and D-4).

Hydraulic Conductivity K: The K value was selected from IZS surficial aquifer since the intermediate part of the surficial aquifer has reported the maximum TCE groundwater concentration. The IZS surficial aquifer has a reported K of 12 to 24 feet per day (ft/day). An average K value of 19 ft/day from the IZS wells was selected for modeling (Table D-3 or ABB-ES, Table 3-3, Section 3.6.2.2, 1995).

Gradient: The gradient was calculated to be 0.0029 (ABB-ES, Section 3.6.2.3 and Table 3-5, 1995).

Effective Porosity: An effective porosity of 0.2 was incorporated from the study by USGS, as was referenced by the RI (ABB-ES, Section 3.6.2.3 and Table 3-5, 1995).

Seepage Velocity: The seepage velocity can be calculated with the following equation.

$$V_{seep} = \frac{KI}{effective\ porosity} \qquad (2)$$

Where: K = hydraulic conductivity (19 ft/day)
I = gradient (0.0029)
Effective porosity = 0.2

The seepage velocity is then estimated to be 101 ft/yr.

D.4.0 GROUNDWATER WASHOUT TIME BY NATURAL ATTENUATION

The time required for TCE concentrations in the groundwater beneath the source area to naturally attenuate from the GW RGO level to Florida Guidance Concentration (3 ug/L) is the washout time. The technical approach and groundwater modeling tool selected for estimating the washout time are similar to the groundwater RGO development for Site 16. A discussion on other relevant information is provided below. Refer to the details outlined in Section B.2.0 for a description of the modeling process.

D.4.1 MODELING ASSUMPTIONS FOR GROUNDWATER WASHOUT TIME

The following general assumptions were made for the analysis:

- Washout time was estimated in the saturated layer under the source area.
- Maximum soil concentrations selected from surface soil and subsurface soil samples were used as the initial soil concentrations.
- Assume the source is depleting from the source area, which means non-constant source loading rates.
- The same infiltration rate used for GW RGO development was selected.

The calculation was performed through the use of a groundwater flow contaminant fate and transport model (ECTran model). The time corresponding to when the groundwater concentration under the source reduced to at or below 3 µg/L was selected as the washout time. Groundwater washout time calculations were also performed for conditions to reduce residual TCE concentrations from 1 mg/L to 3 µg/L. It is anticipated that the residual TCE concentrations is 1 mg/L, following shut-off of the AS/SVE system. Similar to GW RGO development, a range of washout time was calculated based on the range of the proposed GW RGO.

D.4.2 SITE CONCEPTUAL MODEL

The conceptual model for groundwater washout time by natural occurring process is similar in nature to the groundwater RGO development. The major difference lies in that a forward numerical computation without an iterative procedure was performed. As depicted in Figure D-5, the exposure point is now selected as the groundwater directly beneath the groundwater contaminant source area.

D.4.3 CHEMICAL INPUT PARAMETERS

The primary chemical input parameters include the soil/water partitioning coefficient, K_d, the exposure criteria, and chemical and biological decay half-lives. These input parameters are the same as were used for GW RGO development.

D.4.4 PHYSICAL INPUT PARAMETERS

The same groundwater physical input parameters including layer thickness, source area size, hydraulic conductivity, porosity, and seepage velocity used for GW RGO development were incorporated for washout time calculations. The only exception was the exposure point. Refer to the details outlined in Sections D.2.2 and D.3.2 for a description of the physical input parameters.

Exposure Point: The exposure point for the washout time estimation was the groundwater under the source area (near seepage pit area) (Figure D-5).

Source Area Size: Table D-2 summarizes the source area size that will correspond to the six scenarios.

D.5.0 RESULTS

The results of the groundwater modeling tasks for groundwater RGO as well as groundwater washout time computations are discussed in the following sections. As discussed previously (Section D.1.1), the model assumes that no DNAPL is present at the site. Because the quantity of TCE disposed at the site has not been identified, the presence of DNAPL in the groundwater could not be confirmed.

D.5.1 GROUNDWATER RGO DEVELOPMENT

Groundwater RGO (or the target clean-up level) was developed for TCE beneath the source area and is presented in Table D-1. The TCE results show that half-life is the most influential parameter on the predicted groundwater concentration at the exposure point. Other input parameters such as K_d value, mixing depth, and infiltration rates generally present an insignificant impact on the predicted groundwater concentration at the exposure point. Two scenarios were considered. The first scenario assumed that half-life of TCE is 4.5 years; whereas, the second scenario assumed no natural degradation occurs for TCE. The target clean-up level for TCE estimated from the first scenario is 428,000 µg/L based on the Florida Guidance Concentration of 3 µg/L at the exposure point. The target clean-up level of TCE computed for the second scenario (i.e., no decay for TCE) is 49 µg/L. The results from these two scenarios establish a range for GW RGO to be 49 to 428,000 µg/L (or 0.05 to 428 ppm).

The results of the analysis indicate that the model's predictions can vary over several orders of magnitude depending on whether decay for TCE was accounted for in the model. It is believed that TCE does show some degradation in the groundwater and therefore the scenario, not considering the natural degradation process, is overly conservative. The current maximum groundwater concentration for TCE is 1.5 X 10^6 µg/L. This data was based on shallower IZS Aquaprobe™ results sampled in depths from 28 to 32 feet bgs at 20 feet west of well CEF-16-12I. The range of GW RGO represent the concentrations to which TCE in the source area must be reduced by the AS/SVE system to meet the 3 µg/L groundwater discharging criteria at the Drainage Ditch east of the jet runways. ECTran model's input and output are presented in Attachment D.1.

D.5.2 ESTIMATION OF GROUNDWATER WASHOUT TIME BY NATURAL ATTENUATION

Table D-5 presents the results of groundwater washout time by natural attenuation for TCE. The predicted time was calculated for the groundwater beneath the source area. Modeling scenarios for clean-up time calculations include the first two scenarios evaluated in TASK 1. In addition, four scenarios (Scenarios 3 through 6) were modeled to determine the time frame of natural attenuation of TCE

concentrations under the source. Scenario 3 evaluated the duration of natural attenuation of TCE concentrations reducing from the residual concentration of 1 mg/L (1,000 µg/L) to the MCL of 3 µg/L. For comparison purposes, Scenario 4 assumed no natural degradation occurs for TCE. Similar to the simulations of Scenarios 3 and 4, Scenarios 5 and 6 consider the washout time for TCE concentrations in the downgradient plume along the groundwater migration pathway. The groundwater plume considered for Scenarios 5 and 6 include the downgradient plume to the southeast of the current source. The groundwater plume size is conservatively selected to encompassing an area of 800 feet long and 320 feet wide (including monitoring wells CEF-16-MW-41S and CEF-16-32S).

Figures D-6 and D-7 show TCE concentration reductions with time for Scenarios 1 and 2. The results from scenario 1 indicate that the washout time for TCE to naturally attenuate from the GW RGO concentrations (428,000 µg/L) to Florida Guidance Concentration (3.0 µg/L) is approximately 48 years. In comparison, the washout time for TCE to naturally attenuate without decay from its GW RGO concentrations (49 ug/L) to 3.0 µg/L is approximately 30 years.

As indicated in Table D-5, the time at which the TCE plume will reach the MCLs (3 µg/L) at the location of source, following shut-off of the AS/SVE system, were computed to be approximately 12 to 16.5 years with an average of 14.5 years. This range includes the condition of an extreme case when decay was not accounted for in the model. The modeling results from Scenarios 5 and 6 indicate that the time frame required to washout the entire downgradient plume is approximately 17.3 to 45 years with an average of 31 years. Figures D-8 through D-11 show TCE concentration reductions with time for Scenarios 3 through 6.

Natural attenuation processes that were accounted for during groundwater modeling include sorption, dilution, advection, dispersion, and chemical/biological decay. Clean-up time calculations by natural attenuation are presented in Attachment D.2.

D.6.0 REFERENCES

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TABLE D-1

CALCULATED GROUNDWATER RGO - TCE
OPERABLE UNIT 7, SITE 16, SEEPAGE PIT AREA
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Scenario	Soil Concentrations in Source Area (1) (ug/kg)	Half-Life (2) (years)	Groundwater Criteria (FEDP Groundwater Guidance Concentration) (3) (ug/L)	Maximum Groundwater RGO (ug/L)
Scenario 1	0	4.5	3.0	428,000
Scenario 2	0	0	3.0	49

Notes:

1 Soils in the source area (near Seepage Pit) was assumed to be clean since the contaminated soils were excavated and replaced with clean backfill during an interim soil removal action (ABB-ES, 1995).

2 TCE half-life was taken from literature values (Howard 1991). Half-life for TCE in groundwater ranges from 10.7 months to 4.5 years.

3 Florida Guidance Concentrations are taken from Chapter 6 (Guidance Concentrations Index) of the FEDP Groundwater Guidance Concentrations (June 1994).

TABLE D-2

PARTITIONING COEFFICIENT AND HALF-LIFE
OPERABLE UNIT 7, SITE 16
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Chemicals of Concern	Organic Carbon/Water Partitioning Coef. KOC (1) (L/kg)	Soil Organic Carbon Content FOC (2)	Partitioning Coefficient Kd (3) (L/kg)	Half-Life (4) (years)
Trichloroethene (TCE)	126	0.0012	0.151	0 ~ 4.5

1 The KOC was imported from the RI (ABB-ES, Appendix K, page 6-9, 1995). Source of KOC was from USEPA document (EPA/600/8-90/003).
2 The FOC value used in this evaluation was based on 1,200 mg/kg (or 0.12 %) median TOC concentrations from all Cecil Field soil samples results to 50 feet bls (ABB-ES, 1995).
3 Kd = FOC x KOC, USEPA, December 1996, Soil Screening Guidance Users Guide.
4 TCE half-life was taken from literature values (Howard 1991). Half-life for TCE in groundwater ranges from 10.7 months to 4.5 years. The worst scenario assuming no decay for TCE was also considered.

TABLE D-3
HYDRAULIC CONDUCTIVITY ESTIMATES FOR THE SURFICIAL AQUIFER SYSTEM
OPERABLE UNIT 7, SITE 16
NAVAL AIR STATION CECIL FIELD

Upper Zone of Surficial System (UZS)		Intermediate Zone of Surficial System (IZS)		Lower Zone of Surficial System (LZS)	
Well	K in ft/day	Well	K in ft/day	Well	K in ft/day
CEF-16-13S	2.6	CEF-16-12I	15	CEF-16-14D	17
CEF-16-15S	1.0	CEF-16-22I	12	CEF-16-16D	18
CEF-16-17S	5.7	CEF-16-27I	22	CEF-16-18D	23
CEF-16-19s	2.9	CEF-16-36I	24	CEF-16-20D	21
CEF-16-21S	1.8	CEF-16-39I	21	CEF-16-23D	26
CEF-16-24S	1.9			CEF-16-28D	15
CEF-16-29S	1.1			CEF-16-30D	17
CEF-16-32S	3.1			CEF-16-33D	14
CEF-16-35S	1.3			CEF-16-37D	12
CEF-16-38S	3.3			CEF-16-40D	18

Notes: K in ft/day = hydraulic conductivity from slug test data in feet per day.

Upper Zone of Surficial System (UZS):
number of runs = 10.
minimum = 1.0 ft/day.
maximum = 5.7 ft/day.
mean = 2.5 ft/day.
median = 2.25 ft/day.

Intermediate Zone of Surficial System (IZS):
number of runs = 5.
minimum = 12 ft/day.
maximum = 24 ft/day.
mean = 19 ft/day.
median = 21 ft/day.

Lower Zone of Surficial System (LZS):
number of runs = 10.
minimum = 12 ft/day.
maximum = 26 ft/day.
mean = 18 ft/day.
median = 17.5 ft/day.

Notes: Table D-3 is an excerpt of Table 3-3 from the RI (ABB-ES, 1995)
The geometric mean K values for the UZS wells, IZS wells, and LZS wells are 2.2 ft/day, 18.2 ft/day , and 17.7 ft/day, respectively.

TABLE D-4

SUMMARY OF PHYSICAL AND GEOLOGIC PARAMETERS FOR TCE PLUME
OPERABLE UNIT 7, SITE 16
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Scenario	Source Area (1)		Shallow Aquifer Thickness (2) (ft)	Unsaturated Zone Thickness (3) (ft)	Hydraulic Conductivity K (4) (ft/day)	Mixing Depth (5) (ft)	Distance to Exposure Point (6) (ft)
	Length (ft)	Width (ft)					
1	860	320	100	7	19	70	3,450
2	860	320	100	7	19	70	3,450
3	150	150	100	7	19	70	NA(7)
4	150	150	100	7	19	70	NA
5	800	320	100	7	19	70	NA
6	800	320	100	7	19	70	NA

1 Source area size was based on the reported TCE groundwater concentrations in the surficial aquifer (Figures B-1 and B-5, and the RI of ABB-ES, 1995).
2 Shallow surficial aquifer thickness is based on the RI (ABB-ES, 1995).
3 The unsaturated zone thickness is based on the water table elevations presented in the RI (ABB-ES, 1995).
4 An average K value from the IZS surficial aquifer wells was selected for modeling (Table D-3).
5 The mixing depth was determined based on the vertical extent of TCE plume (ABB-ES, 1995).
6 Measured from the edge of the source area to the Drainage Ditch (Figure D-1).
7 Scenarios 3 through 6 are to estimate the washout time for groundwater under the source.

TABLE D-5

PREDICTED GROUNDWATER WASHOUT TIME FOR TCE USING FATE AND TRANSPORT MODELING
OPERABLE UNIT 7, SITE 16, SEEPAGE PIT AREA
NAVAL AIR STATION CECIL FIELD
JACKSONVILLE, FLORIDA

Scenario	Soil Concentrations in Source Area (ug/kg)	Half-Life (years)	Initial Groundwater Conc. (Groundwater RGO Concentrations) (ug/L)	Groundwater Criteria (FEDP Groundwater Guidance Concentration) (2) ug/L	Predicted Groundwater Washout Times (3) (years)
Scenario 1	0	4.5	428,000 (1)	3	48
Scenario 2	0	0	49 (1)	3	30
Scenario 3	0	4.5	1,000 (4)	3	12
Scenario 4	0	0	1,000 (4)	3	16.5
Scenario 5	0	4.5	228 (5)	3	17.3
Scenario 6	0	0	228 (5)	3	45

Notes:
1 The initial groundwater concentration at the source area was based on the developed groundwater RGO for TCE (Sections D.2.0 and D.3.0).
2 Florida Guidance Concentrations are taken from Chapter 6 (Guidance Concentrations Index) of the FEDP Groundwater Guidance Concentrations (June 1994).
3 The groundwater washout time was calculated at the saturated layer beneath the source area.
4 The initial groundwater concentration at the source area was based on 1 mg/L, following shut-off of the AS/SVE system.
5 The initial groundwater concentration in the downgradient plume was based on the maximum detected TCE concentration at well CEF-16-MW-41S.
6 The average times at which the TCE concentration will reach the 3 ug/L criteria beneath the source area (Scenarios 3 and 4) and at the downgradient plume (Scenarios 5 and 6) were estimated to be 14.5 and 31 years respectively.

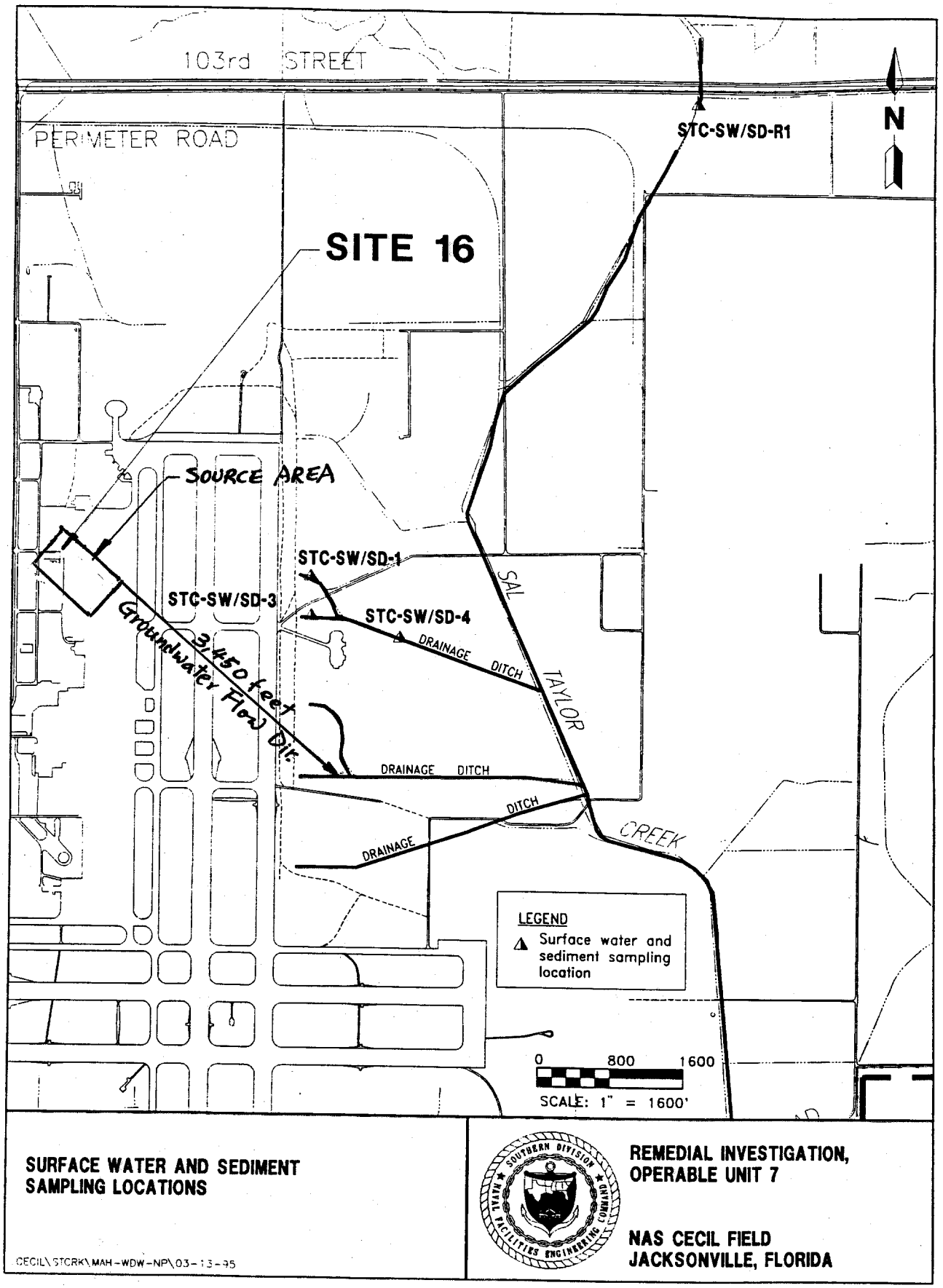

Figure D-1 Source Area and Exposure Point, Groundwater RGO Development (OU 7 Site 16, Cecil Field)

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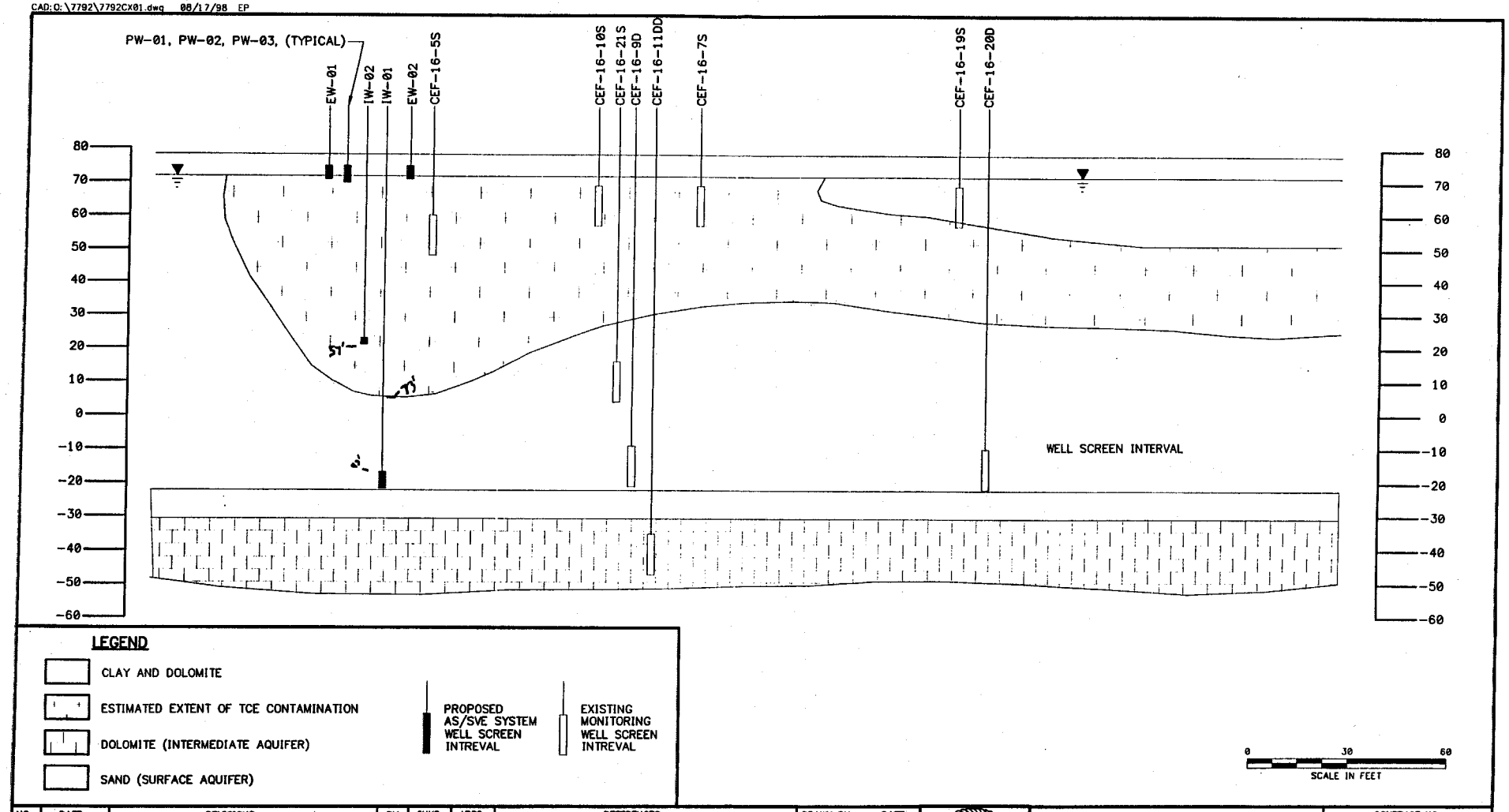

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 7/23/98
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

CROSS SECTION
SITE 16, OPERABLE UNIT 7
AS/SVE TREATABILITY STUDY SYSTEM
NAS CECIL FIELD
JACKSONVILLE, FLORIDA

CONTRACT NO. 7792
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO.
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

Figure D-2 Lithologic Cross Section, Southeast Orientation (OU 7 Site 16, Cecil Field)

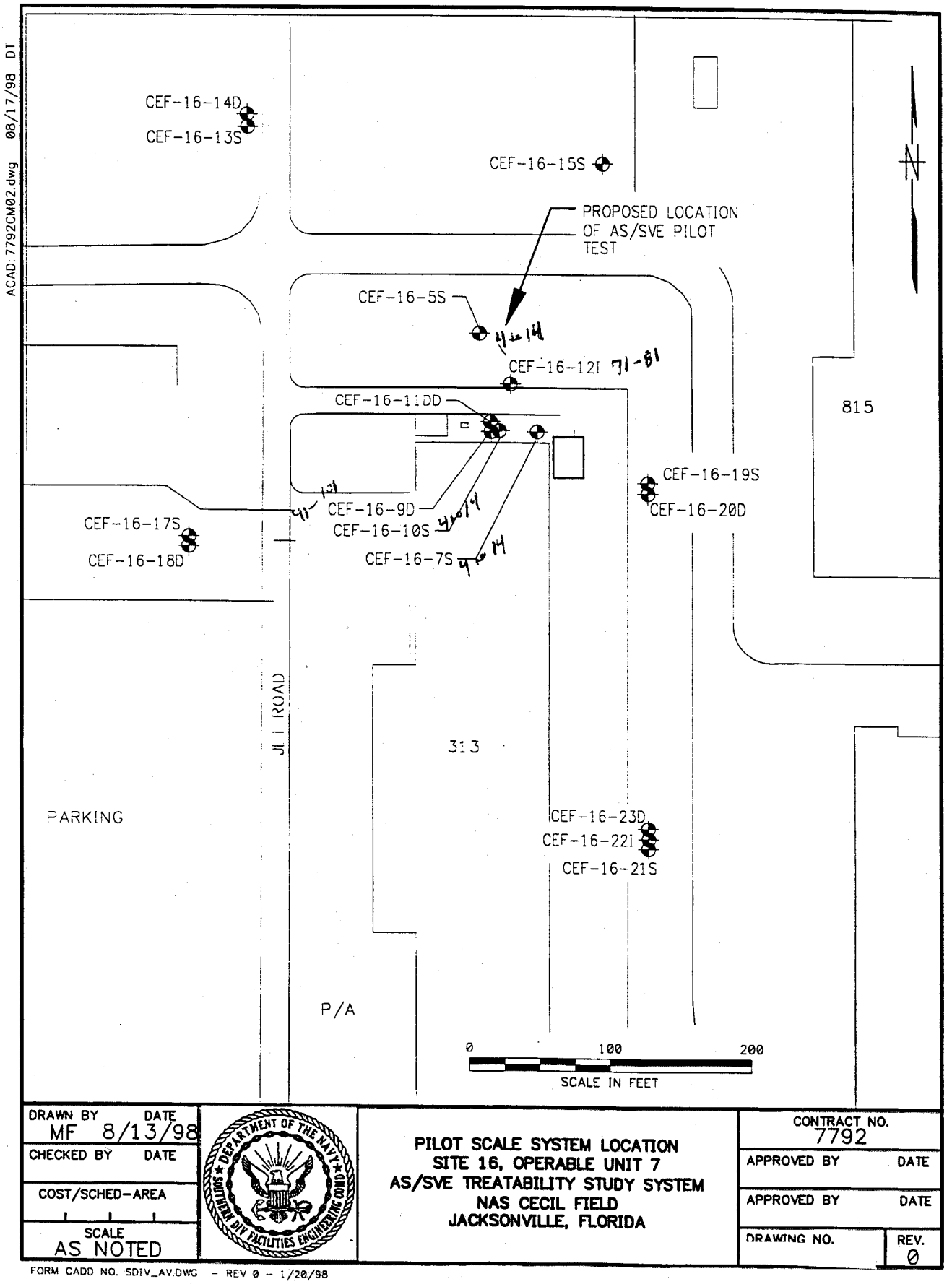

Figure D-3 Propose Area for AS/SVE System (OU 7 Site 16, Cecil Field)

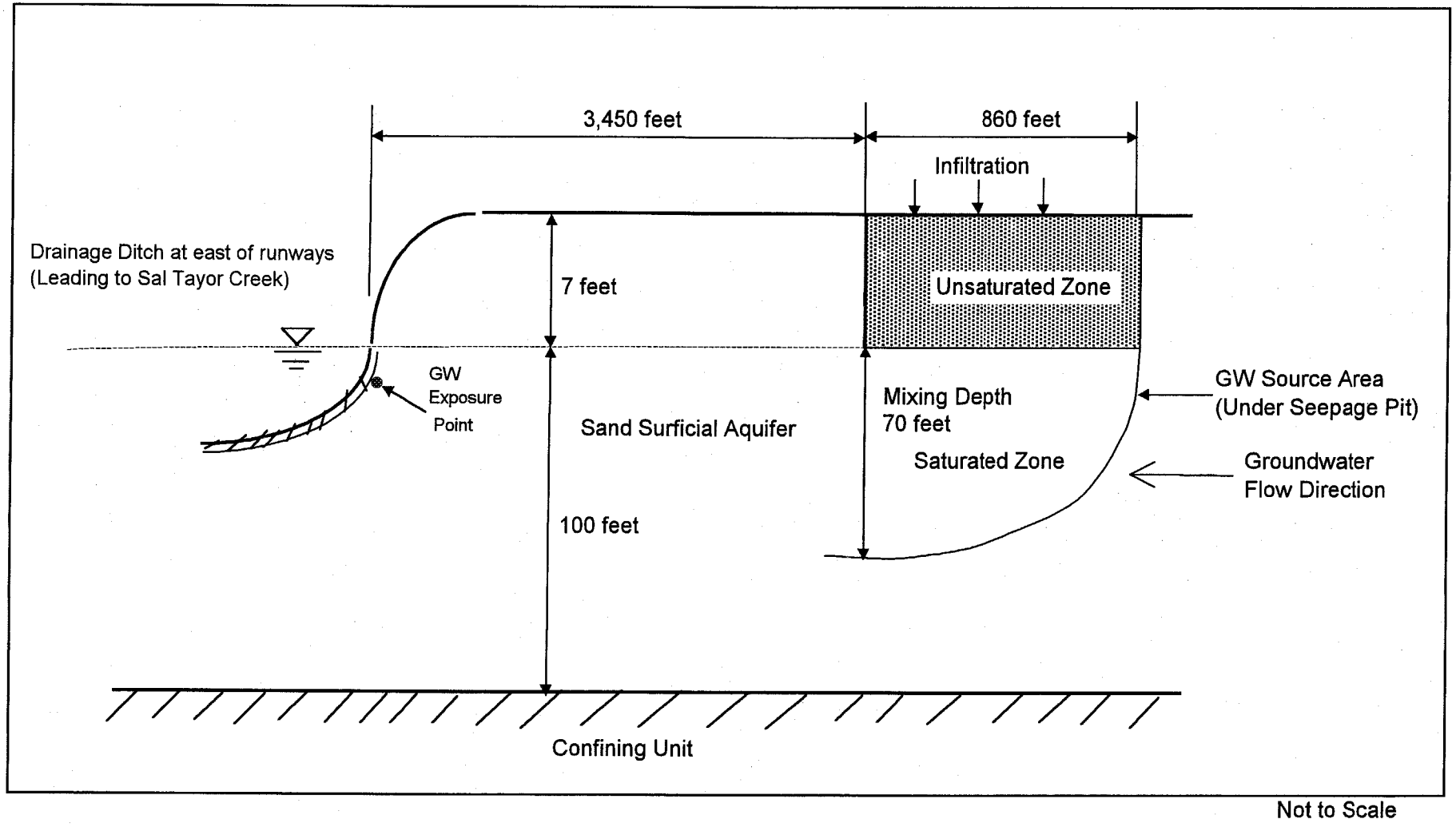

Figure D-4 Conceptual Model for Groundwater RGO Development (OU 7 Site 16, Cecil Field)

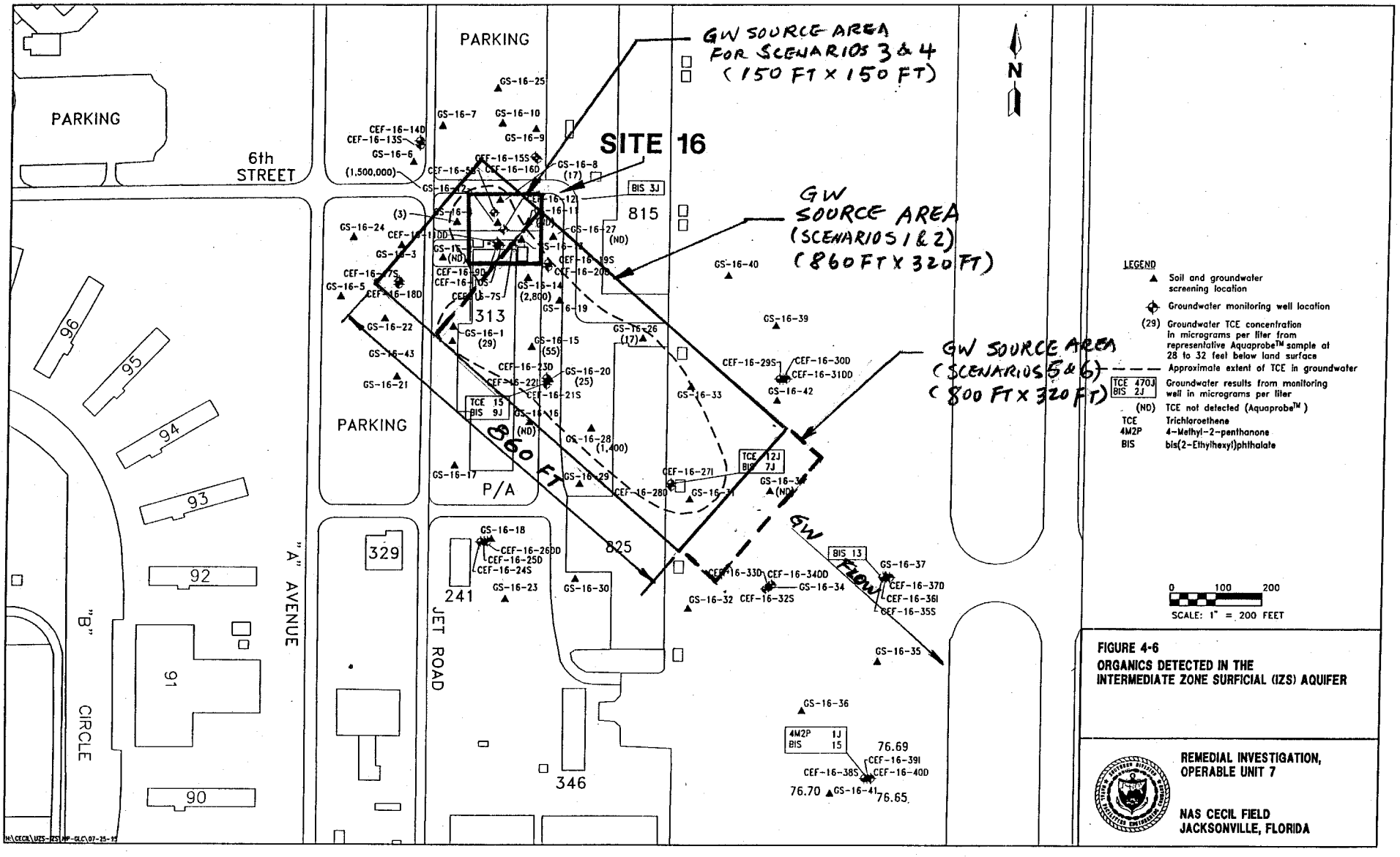

Figure D-5 TCE Detected in the Intermediate zone surficial (IZS) Aquifer (OU 7 Site 16, Cecil Field)

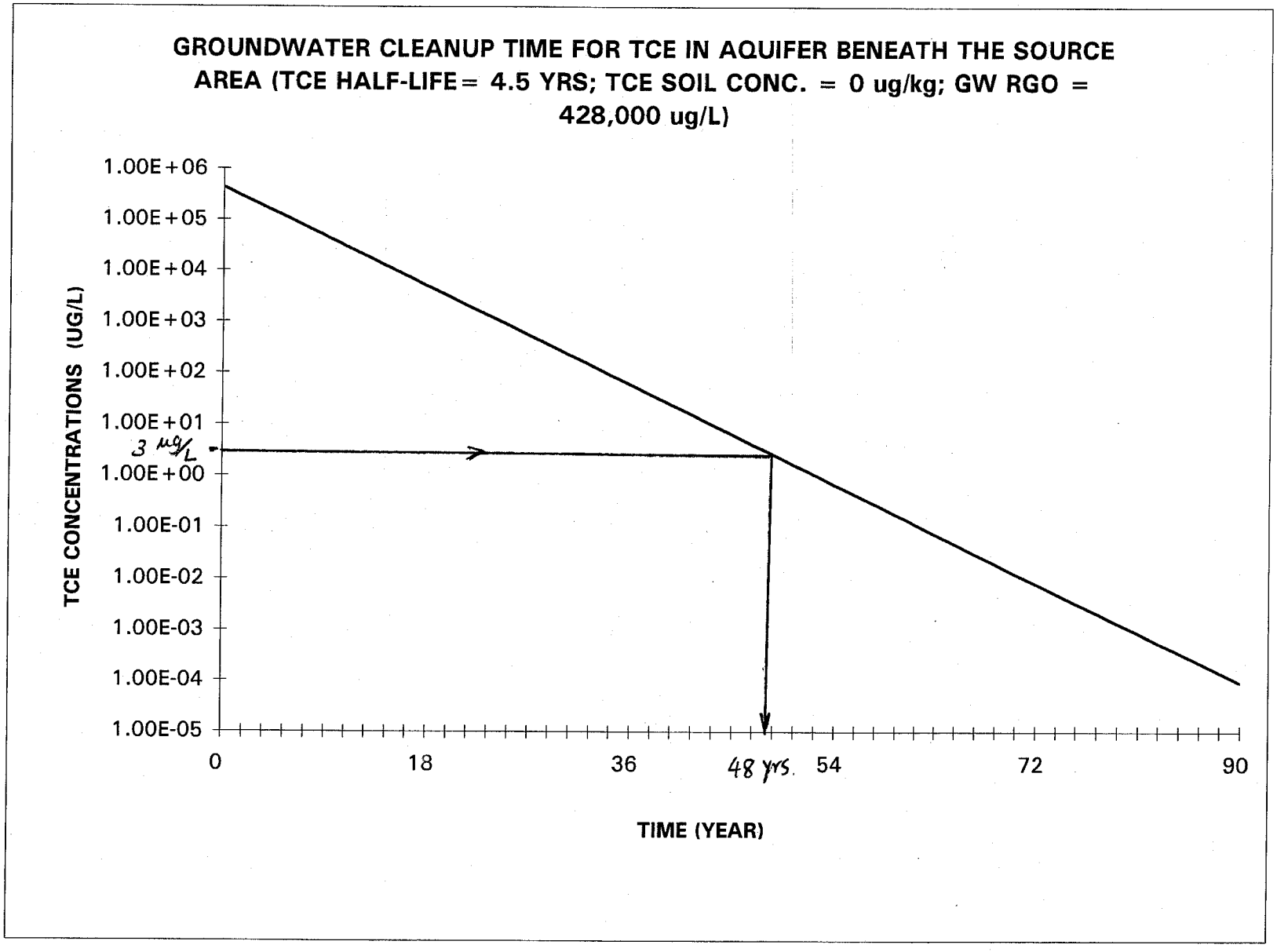

Figure D-6 Groundwater Clean-up Time for TCE (With Decay) in Source Area - Scenario 1
OU 7 Site 16, Cecil Field

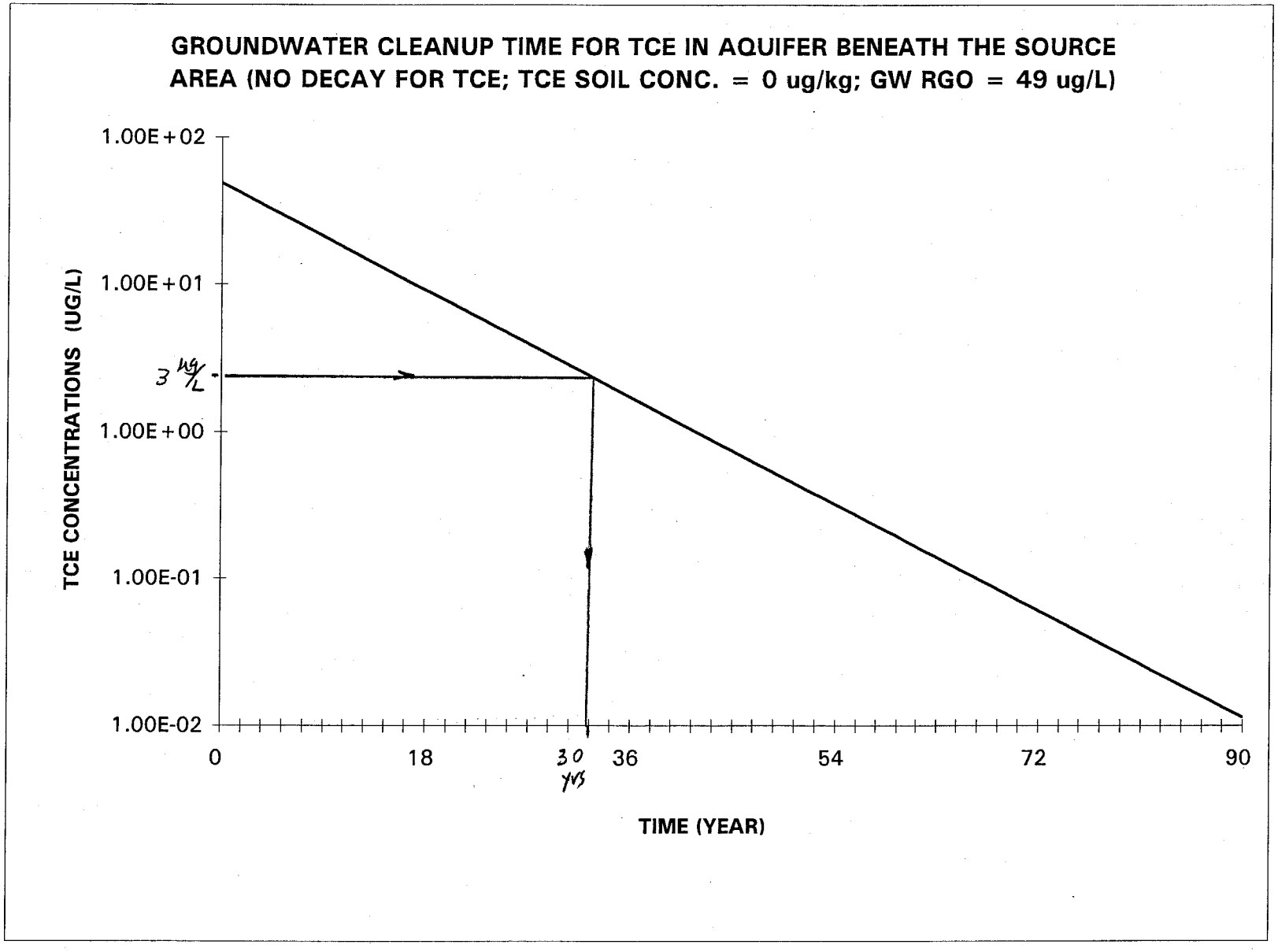

Figure D-7 Groundwater Clean-up Time for TCE (Without Decay) in Source Area - Scenario 2
OU 7 Site 16, Cecil Field

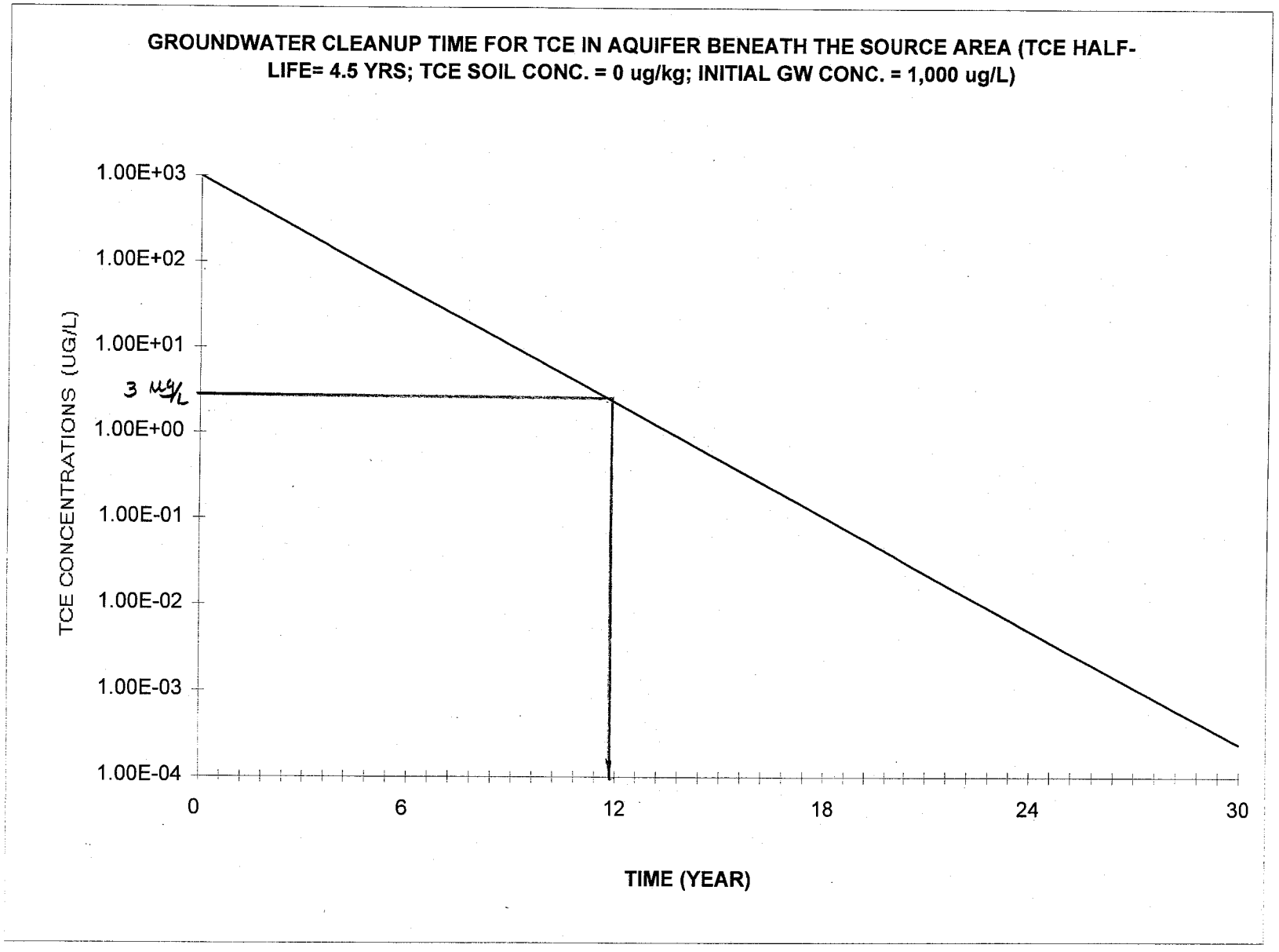

Figure D-8 Groundwater Clean-up Time for TCE in Source Area
OU 7 Site 16, Cecil Field - Scenario 3

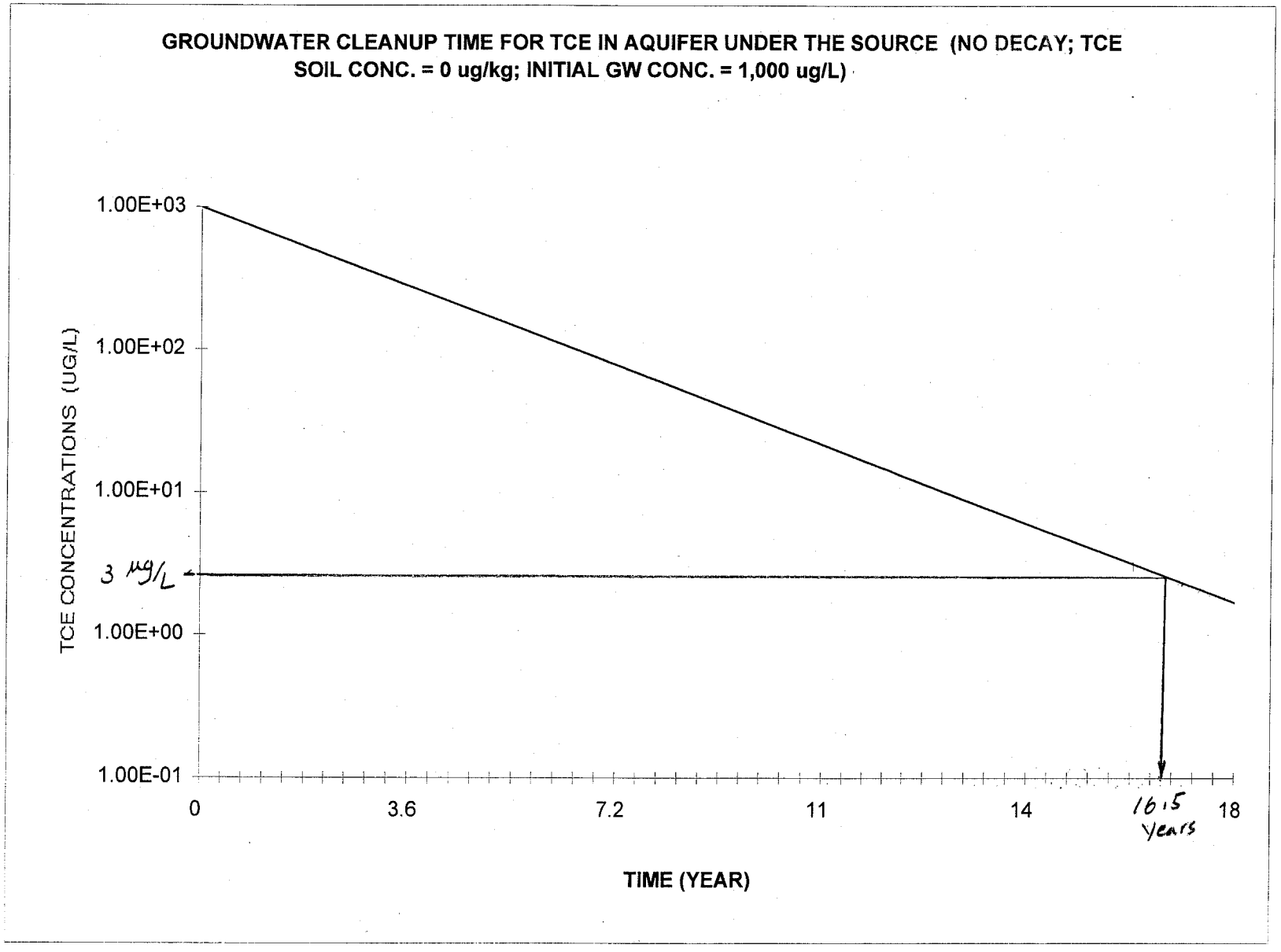

Figure D-9 Groundwater Clean-up Time for TCE in Source Area
OU 7 Site 16, Cecil Field - Scenario 4

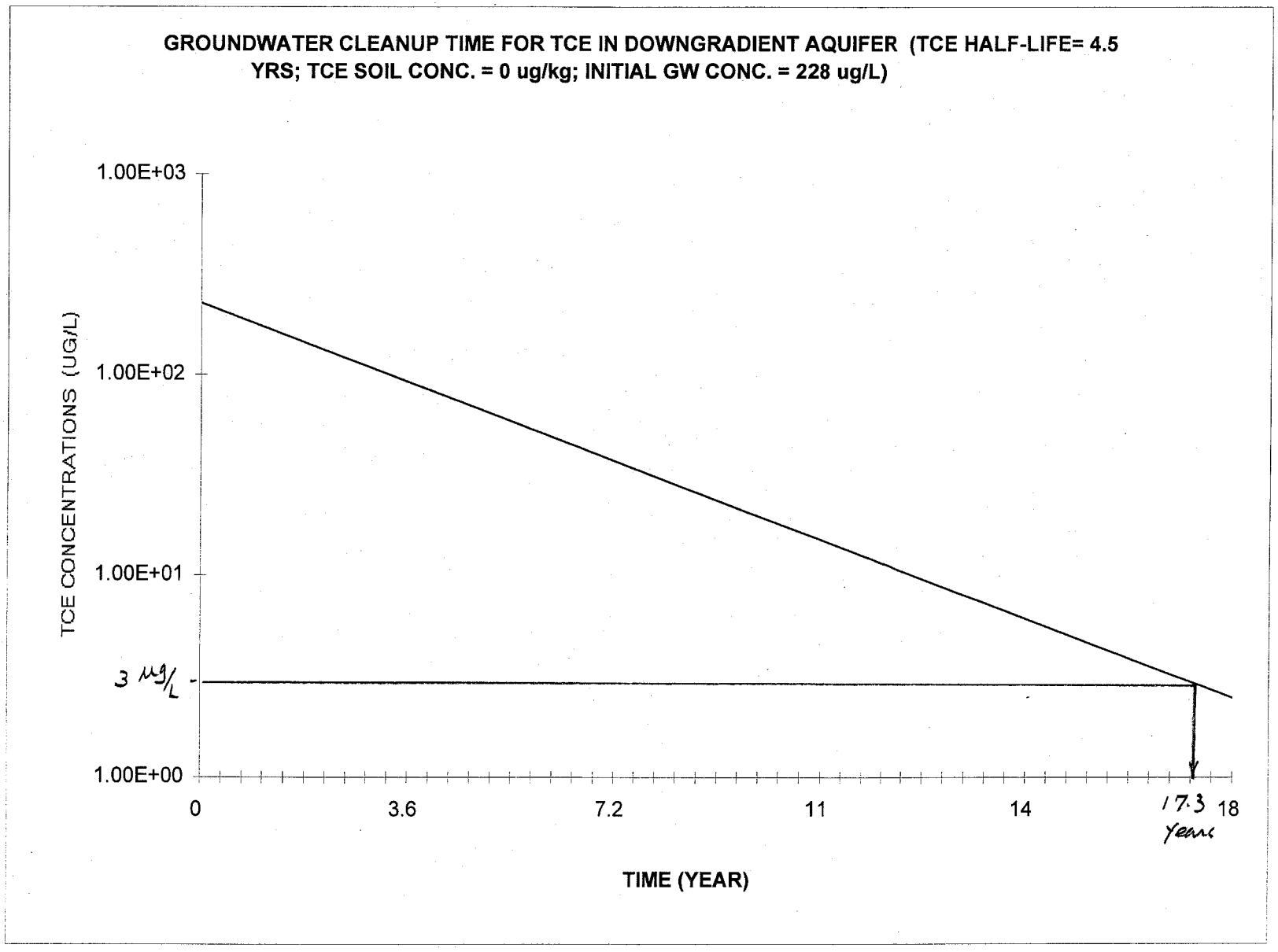

Figure D-10 Groundwater Clean-up Time for TCE in Downgradient Plume
OU 7 Site 16, Cecil Field - Scenario 5

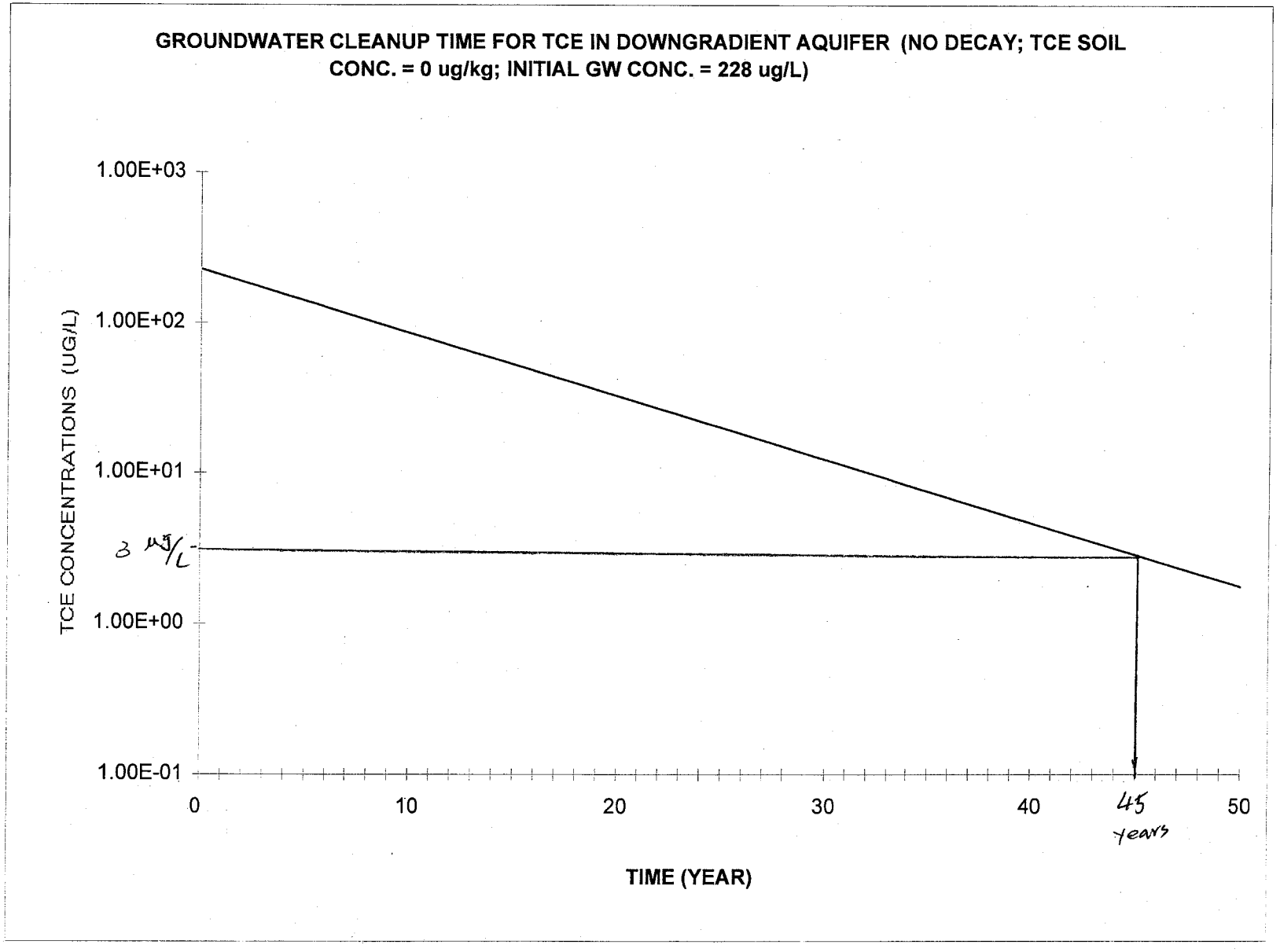

Figure D-11 Groundwater Clean-up Time for TCE in Downgradient Plume
OU 7 Site 16, Cecil Field - Scenario 6

ATTACHMENT D.1

THE DEVELOPMENT OF GROUNDWATER REMEDIAL GOAL OPTIONS (GW RGO) OR TARGET CLEAN-UP LEVEL

P 1/2

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SITE: OU7, Site 16, GW RGO | INVESTIGATOR: LK | DATE: 10/19/98

CHEMICAL CHARACTERISTICS		ITERATIVE DECISION-MAKING BOX			
CONTAMINANT:	TCE	EXPOSURE POINT: (UNDERS, FL)	FL	LEACHATE CONCENTRATION (YES,NO) ?	no
		UNDERS: Under source, FL: Fenceline		INPUT SOLID-PHASE CONCENTRATION (MG/KG)	✓ 0.000E+00
		WATER CRITERIA (UG/L):	3.00E+00	CONSTANT CONCENTRATION (YES,NO)?	no
HALF-LIFE (YRS):	✓ 4.50E+00			TRY NEW GOAL:	0.00E+00
SPECIFIC ACTIVITY (Ci/g):	0.00E+00	TIME FRAME (YRS):	90	ACCEPTABLE!	YES

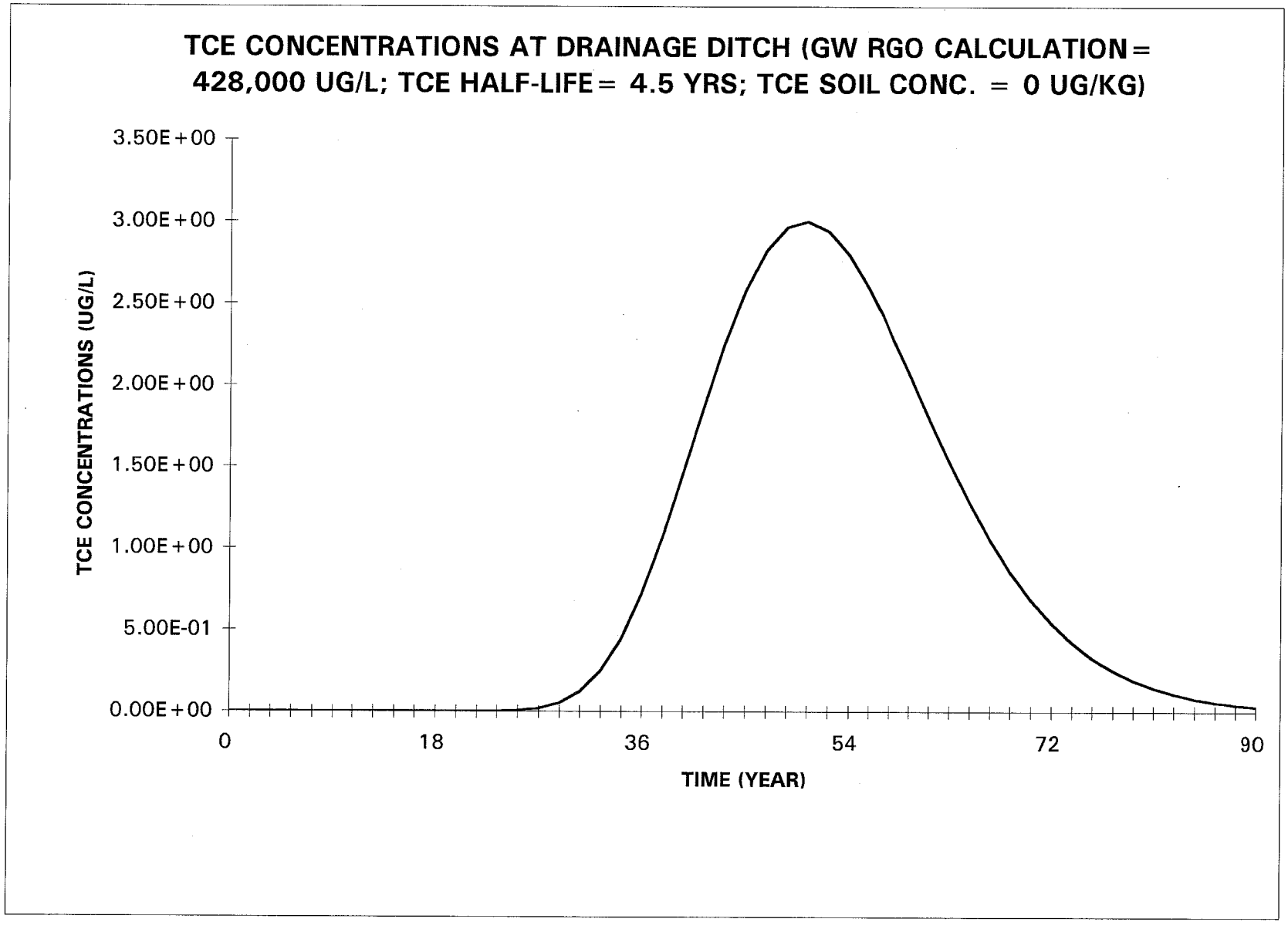
SOURCE-TERM INFORMATION		ENGINEERING CONTROL INFORMATION	
Ke:	1.00	INFILT(FT/YR):	1.13E+00
Kl (L/KG):	1.51E-01	LENGTH (FT):	860
		WIDTH (FT):	320
DEPLETING SOURCE:		IS THERE A CLAY LINER LAYER (YES,NO)?	no
WASTE CHARACTERISTICS:			
INITIAL SOLID-PHASE CONCENTRATION (MG/KG):	0.00E+00	THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
INPUT FOLLOWING PARAMETERS:		HOW MANY SUBLAYERS (1 - 10)?	3
THICKNESS (FT):	6.81	TOTAL THICKNESS (UP TO 30 FT) (FT):	10
SATURATION RATE:	0.6	SATURATION RATE:	0.95
POROSITY:	0.2	POROSITY:	0.2
BULK DENSITY (G/CM^3)	1.5	BULK DENSITY (G/CM^3):	1.78
		Kd (L/KG):	1.00E-05

IS THERE A TYPE 1 LAYER (YES,NO)?	NO	IS THERE A TYPE 2 LAYER (YES,NO)?	NO
THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION		THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
HOW MANY SUBLAYERS (1 - 10)?	6	HOW MANY SUBLAYERS (1 - 10)?	5
TOTAL THICKNESS (UP TO 30 FT) (FT):	2.20E+01	TOTAL THICKNESS (UP TO 30 FT) (FT):	20
SATURATION RATE:	0.95	SATURATION RATE:	0.13
POROSITY:	0.2	POROSITY:	0.3
BULK DENSITY (G/CM^3)	1.5	BULK DENSITY (G/CM^3)	1.5
Kd (L/KG):	1.00E-05	Kd (L/KG):	1.00E-05
INITIAL SOIL CONC. (MG/KG):	0	INITIAL SOIL CONC. (MG/KG):	0

SATURATED LAYER			
TOTAL SATURATED ZONE THICKNESS, B (FT):	100	VERTICAL SEEPAGE VELOCITY, Vzo (FT/YR):	10.03
HORIZONTAL SEEPAGE VELOCITY, V (FT/YR):	101	DOWNGRADIENT AREA INFILTRATION RATE, q (FT/YR)	0
Kd (L/KG):	1.51E-01	SPECIFY MIXING DEPTH (Computed from formula if input NO)	NO
POROSITY:	0.2	MIXING DEPTH, H (FT):	70.0
VERTICAL DISPERSIVITY, Az (FT):	0.12	TIME OF PUMPING STOP, P&T (YEARS):	0
LONGITUDINAL DISPERSIVITY, Ax (FT):	100.0	AGE (YRS):	0
LATERAL DISPERSIVITY, Ay (FT):	33.3	CONC. IN UPGRADIENT GROUNDWATER,CU2 (UG/L)	0
INITIAL CONC. (ug/L):	✓ 4.280E+05	DISTANCE TO Fence.Line.:	3450

PREDICTED IMPACTS:		TIME OF MAXIMUM (YR)
SATURATED LAYER CONCENTRATION:	4.28E+05 (UG/L)	0
FENCE LINE CONCENTRATION:	✓ 3.00E+00 (UG/L)	50.4

GW RGO · SCENARIO 1 : TCE Half-life = 4.5 yrs


TCE CONCENTRATIONS AT DRAINAGE DITCH (GW RGO CALCULATION = 428,000 UG/L; TCE HALF-LIFE = 4.5 YRS; TCE SOIL CONC. = 0 UG/KG)
TCE CONCENTRATIONS (UG/L)
3.50E+00
3.00E+00
2.50E+00
2.00E+00
1.50E+00
1.00E+00
5.00E-01
0.00E+00
0
18
36
54
72
90
TIME (YEAR)

2/2d

P 1/2

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SITE: OU7, Site 16, GW RGO | INVESTIGATOR: LK | DATE: 10/19/98

CHEMICAL CHARACTERISTICS		ITERATIVE DECISION-MAKING BOX			
CONTAMINANT:	TCE	EXPOSURE POINT: (UNDERS, FL)	FL	LEACHATE CONCENTRATION (YES,NO) ?	no
		UNDERS: Under source, FL: Fenceline		INPUT SOLID-PHASE CONCENTRATION (MG/KG)	✓ 0.000E+00
		WATER CRITERIA (UG/L):	3.00E+00	CONSTANT CONCENTRATION (YES,NO)?	no
HALF-LIFE (YRS):	✓ 0.00E+00			TRY NEW GOAL:	0.00E+00
SPECIFIC ACTIVITY (Ci/g):	0.00E+00	TIME FRAME (YRS):	90	ACCEPTABLE!	YES

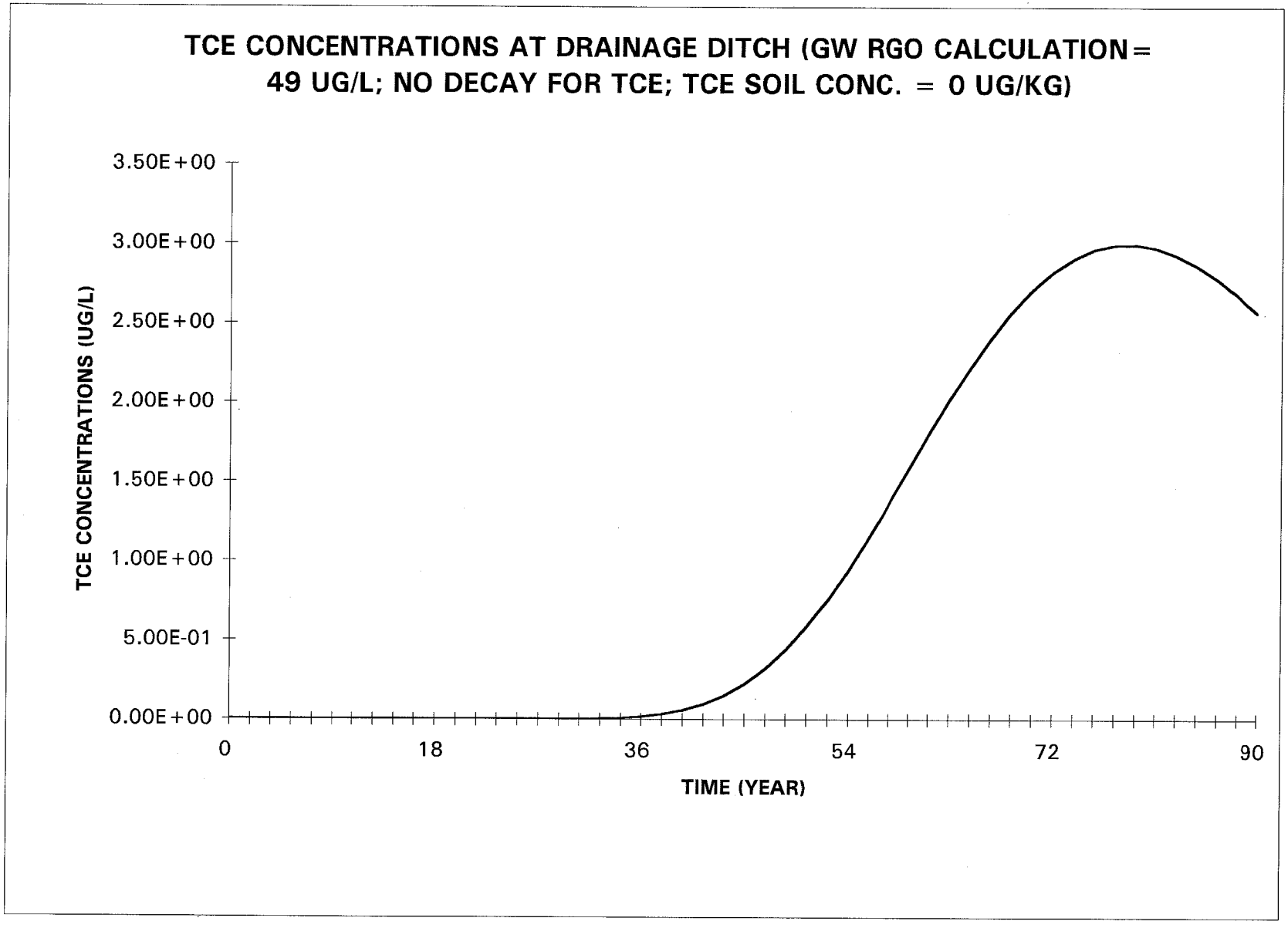
SOURCE-TERM INFORMATION		ENGINEERING CONTROL INFORMATION	
Ke:	1.00	INFILT(FT/YR):	1.13E+00
Kl (L/KG):	1.51E-01	LENGTH (FT):	860
		WIDTH (FT):	320
DEPLETING SOURCE:		IS THERE A CLAY LINER LAYER (YES,NO)?	no
WASTE CHARACTERISTICS:		THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
INITIAL SOLID-PHASE CONCENTRATION (MG/KG):	0.00E+00	HOW MANY SUBLAYERS (1 - 10)?	3
INPUT FOLLOWING PARAMETERS:		TOTAL THICKNESS (UP TO 30 FT) (FT):	10
THICKNESS (FT):	6.81	SATURATION RATE:	0.95
SATURATION RATE:	0.6	POROSITY:	0.2
POROSITY:	0.2	BULK DENSITY (G/CM^3):	1.78
BULK DENSITY (G/CM^3)	1.5	Kd (L/KG):	1.00E-05

IS THERE A TYPE 1 LAYER (YES,NO)?	NO	IS THERE A TYPE 2 LAYER (YES,NO)?	NO
THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION		THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
HOW MANY SUBLAYERS (1 - 10)?	6	HOW MANY SUBLAYERS (1 - 10)?	5
TOTAL THICKNESS (UP TO 30 FT) (FT):	2.20E+01	TOTAL THICKNESS (UP TO 30 FT) (FT):	20
SATURATION RATE:	0.95	SATURATION RATE:	0.13
POROSITY:	0.2	POROSITY:	0.3
BULK DENSITY (G/CM^3)	1.5	BULK DENSITY (G/CM^3)	1.5
Kd (L/KG):	1.00E-05	Kd (L/KG):	1.00E-05
INITIAL SOIL CONC. (MG/KG):	0	INITIAL SOIL CONC. (MG/KG):	0

SATURATED LAYER			
TOTAL SATURATED ZONE THICKNESS, B (FT):	100	VERTICAL SEEPAGE VELOCITY, Vzo (FT/YR):	10.03
HORIZONTAL SEEPAGE VELOCITY, V (FT/YR):	101	DOWNGRADIENT AREA INFILTRATION RATE, q (FT/YR)	0
Kd (L/KG):	1.51E-01	SPECIFY MIXING DEPTH (Computed from formula if input NO)	NO
POROSITY:	0.2	MIXING DEPTH, H (FT):	70.0
VERTICAL DISPERSIVITY, Az (FT):	0.12	TIME OF PUMPING STOP, P&T (YEARS):	0
LONGITUDINAL DISPERSIVITY, Ax (FT):	100.0	AGE (YRS):	0
LATERAL DISPERSIVITY, Ay (FT):	33.3	CONC. IN UPGRADIENT GROUNDWATER,CU2 (UG/L)	0
INITIAL CONC. (ug/L):	✓ 4.870E+01	DISTANCE TO Fence.Line.:	3450

PREDICTED IMPACTS:		TIME OF MAXIMUM (YR)
SATURATED LAYER CONCENTRATION:	4.87E+01 (UG/L)	0
FENCE LINE CONCENTRATION:	✓ 3.00E+00 (UG/L)	79.2

GW RGO SCENARIO 2 : NO DECAY FOR TCE


TCE CONCENTRATIONS AT DRAINAGE DITCH (GW RGO CALCULATION=
49 UG/L; NO DECAY FOR TCE; TCE SOIL CONC. = 0 UG/KG)
TCE CONCENTRATIONS (UG/L)
3.50E+00
3.00E+00
2.50E+00
2.00E+00
1.50E+00
1.00E+00
5.00E-01
0.00E+00
0
18
36
54
72
90
TIME (YEAR)

P 2/2

ATTACHMENT D.2

ESTIMATION OF GROUNDWATER WASHOUT TIME BY NATURAL ATTENUATION

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SITE:	OU7, Site 16, GW Washout Time	INVESTIGATOR:	LK	DATE:	10/19/98

CHEMICAL CHARACTERISTICS

CONTAMINANT:	TCE
HALF-LIFE (YRS):	✓ 4.50E+00
SPECIFIC ACTIVITY (Ci/g):	0.00E+00

ITERATIVE DECISION-MAKING BOX

EXPOSURE POINT: (UNDERS, FL)	FL	LEACHATE CONCENTRATION (YES,NO) ?	no
UNDERS: Under source, FL: Fenceline		INPUT SOLID-PHASE CONCENTRATION (MG/KG)	✓ 0.000E+00
WATER CRITERIA (UG/L):	3.00E+00	CONSTANT CONCENTRATION (YES,NO)?	no
		TRY NEW GOAL:	0.00E+00
TIME FRAME (YRS):	90	ACCEPTABLE!	YES

SOURCE-TERM INFORMATION

Ke:	1.00
Kl (L/KG):	1.51E-01
DEPLETING SOURCE:	
WASTE CHARACTERISTICS:	
INITIAL SOLID-PHASE CONCENTRATION (MG/KG):	0.00E+00
INPUT FOLLOWING PARAMETERS:	
THICKNESS (FT):	6.81
SATURATION RATE:	0.6
POROSITY:	0.2
BULK DENSITY (G/CM^3)	1.5

ENGINEERING CONTROL INFORMATION

INFILT(FT/YR):	1.13E+00
LENGTH (FT):	860
WIDTH (FT):	320
IS THERE A CLAY LINER LAYER (YES,NO)?	no
THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
HOW MANY SUBLAYERS (1 - 10)?	3
TOTAL THICKNESS (UP TO 30 FT) (FT):	10
SATURATION RATE:	0.95
POROSITY:	0.2
BULK DENSITY (G/CM^3):	1.78
Kd (L/KG):	1.00E-05

IS THERE A TYPE 1 LAYER (YES,NO)?	NO
THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
HOW MANY SUBLAYERS (1 - 10)?	6
TOTAL THICKNESS (UP TO 30 FT) (FT):	2.20E+01
SATURATION RATE:	0.95
POROSITY:	0.2
BULK DENSITY (G/CM^3)	1.5
Kd (L/KG):	1.00E-05
INITIAL SOIL CONC. (MG/KG):	0

IS THERE A TYPE 2 LAYER (YES,NO)?	NO
THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
HOW MANY SUBLAYERS (1 - 10)?	5
TOTAL THICKNESS (UP TO 30 FT) (FT):	20
SATURATION RATE:	0.13
POROSITY:	0.3
BULK DENSITY (G/CM^3)	1.5
Kd (L/KG):	1.00E-05
INITIAL SOIL CONC. (MG/KG):	0

SATURATED LAYER

TOTAL SATURATED ZONE THICKNESS, B (FT):	100
HORIZONTAL SEEPAGE VELOCITY, V (FT/YR):	101
Kd (L/KG):	1.51E-01
POROSITY:	0.2
VERTICAL DISPERSIVITY, Az (FT):	0.12
LONGITUDINAL DISPERSIVITY, Ax (FT):	100.0
LATERAL DISPERSIVITY, Ay (FT):	33.3
INITIAL CONC. (ug/L):	✓ 4.280E+05

VERTICAL SEEPAGE VELOCITY, Vzo (FT/YR):	10.03
DOWNGRADIENT AREA INFILTRATION RATE, q (FT/YR)	0
SPECIFY MIXING DEPTH (Computed from formula if input NO)	NO
MIXING DEPTH, H (FT):	70.0
TIME OF PUMPING STOP, P&T (YEARS):	0
AGE (YRS):	0
CONC. IN UPGRADIENT GROUNDWATER,CU2 (UG/L)	0
DISTANCE TO Fence.Line.:	3450

PREDICTED IMPACTS:

		TIME OF MAXIMUM (YR)
SATURATED LAYER CONCENTRATION:	4.28E+05 (UG/L)	0
FENCE LINE CONCENTRATION:	✓ 3.00E+00 (UG/L)	50.4

GW Clean-Up Time ; SCENARIO 1 :
TCE Half-life = 4.5 yrs

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BROWN & ROOT ENVIRONMENTAL
SCREENING-LEVEL EXCEL-CRYSTAL BALL TRANSPORT (ECTran) MODEL

SITE: OU7, Site 16, GW RGO

INVESTIGATOR: LK
DATE: 10/19/98

CONTAMINANT: TCE

HALF-LIFE (YRS):
LAYER 2: 4.50E+00
SATURATED LAYER 4.50E+00
DOWNGRADIENT 4.50E+00

INITIAL CONC. (ug/L): 4.28E+05

SATURATED LAYER

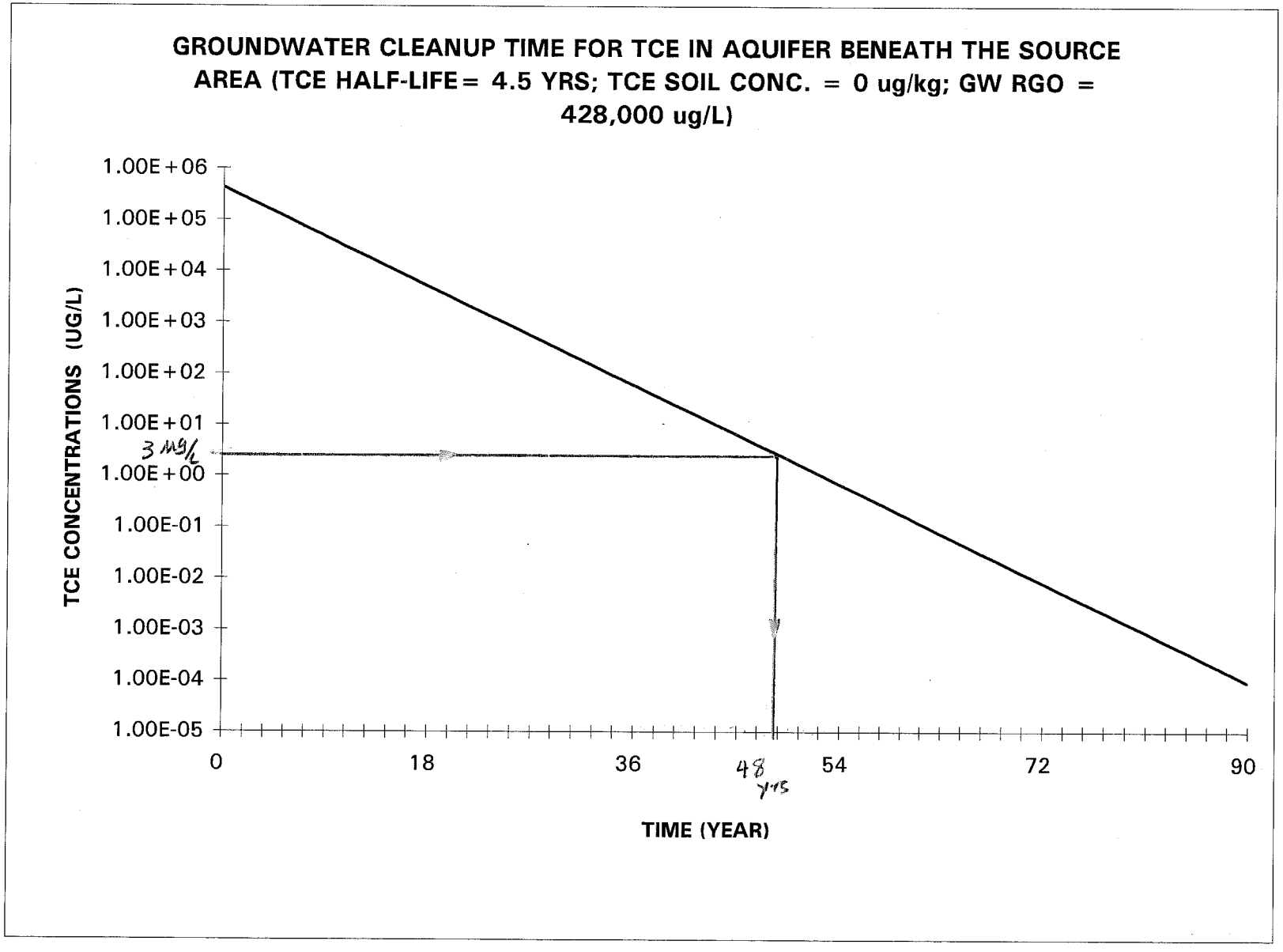
INFILT (FT/YR):	1.13			B (FT):	100	Vzo (FT/YR):	10.03
LENGTH (FT):	860			GW Q3 (L/DAY):	5.92E+04		
WIDTH (FT):	320	Kd (L/KG):	1.51E-01	GW V. (FT/YR):	101.00	Kd (L/KG):	0.151
POROSITY 2:	0.3	SATURATION:	1.00	H (FT):	70.0000	RETARDATION:	2.1325
POROSITY SAT. LAYER:	0.2	THICKNESS (FT):	70.00	EFF. POROSITY:	0.20	q (FT/YR) :	0
DENSITY 2 (G/CM3):	1.5	DECAY (1/DAY):	4.22E-04	DISPERSIVITY:		DECAY (1/YR):	1.5E-01
DENSITY GMA (G/CM3):	1.50	CBo (PPB):	4.28E+05	Az (FT):	0.12		
		CU2 (PPB):	0.00E+00	Ax (FT):	100.00	P&T (YEARS):	0
AGE (YEARS):	0	Q1 (L/DAY): 2.41E+04	Q2 (L/DAY): 3.51E+04	Ay (FT):	33.33	DISTANCE TO F.L. (FT):	3450

TIME INTERVAL (YRS) 1.8

ELAPSED TIME - YRS	LAYER 2(PPB)	SOURCE AREA CONC.(GMA) (UG/L)	FENCE LINE CONC. (UG/L)
0	0.00E+00	4.28E+05 ← initial GW Conc.	0.00E+00
1.8	0.00E+00	2.74E+05	0.00E+00
3.6	0.00E+00	1.76E+05	0.00E+00
5.4	0.00E+00	1.13E+05	0.00E+00
7.2	0.00E+00	7.23E+04	0.00E+00
9	0.00E+00	4.64E+04	0.00E+00
10.8	0.00E+00	2.97E+04	0.00E+00
12.6	0.00E+00	1.90E+04	0.00E+00
14.4	0.00E+00	1.22E+04	4.64E-10
16.2	0.00E+00	7.83E+03	4.01E-08
18	0.00E+00	5.02E+03	1.31E-06
19.8	0.00E+00	3.22E+03	2.09E-05
21.6	0.00E+00	2.06E+03	1.96E-04
23.4	0.00E+00	1.32E+03	1.21E-03
25.2	0.00E+00	8.48E+02	5.43E-03
27	0.00E+00	5.44E+02	1.87E-02
28.8	0.00E+00	3.48E+02	5.23E-02
30.6	0.00E+00	2.23E+02	1.23E-01
32.4	0.00E+00	1.43E+02	2.49E-01
34.2	0.00E+00	9.18E+01	4.47E-01
36	0.00E+00	5.89E+01	7.23E-01
37.8	0.00E+00	3.77E+01	1.07E+00
39.6	0.00E+00	2.42E+01	1.46E+00
41.4	0.00E+00	1.55E+01	1.87E+00
43.2	0.00E+00	9.94E+00	2.25E+00
45	0.00E+00	6.38E+00	2.58E+00
46.8	0.00E+00	4.09E+00	2.82E+00
48.6	0.00E+00	2.62E+00 < 3 PPB	2.96E+00
50.4	0.00E+00	1.68E+00	3.00E+00
52.2	0.00E+00	1.08E+00	2.94E+00
54	0.00E+00	6.90E-01	2.79E+00
55.8	0.00E+00	4.43E-01	2.59E+00
57.6	0.00E+00	2.84E-01	2.34E+00
59.4	0.00E+00	1.82E-01	2.07E+00
61.2	0.00E+00	1.17E-01	1.79E+00
63	0.00E+00	7.48E-02	1.52E+00
64.8	0.00E+00	4.79E-02	1.28E+00
66.6	0.00E+00	3.07E-02	1.05E+00
68.4	0.00E+00	1.97E-02	8.53E-01
70.2	0.00E+00	1.26E-02	6.84E-01
72	0.00E+00	8.10E-03	5.41E-01
73.8	0.00E+00	5.19E-03	4.24E-01
75.6	0.00E+00	3.33E-03	3.28E-01
77.4	0.00E+00	2.13E-03	2.52E-01
79.2	0.00E+00	1.37E-03	1.91E-01
81	0.00E+00	8.77E-04	1.44E-01
82.8	0.00E+00	5.62E-04	1.08E-01
84.6	0.00E+00	3.60E-04	8.01E-02
86.4	0.00E+00	2.31E-04	5.90E-02
88.2	0.00E+00	1.48E-04	4.32E-02
90	0.00E+00	9.50E-05	3.15E-02
MAXIMUM:	0.00E+00	4.28E+05	3.00E+00

48 yrs

GW Clean-Up Time 3 Scenario 1 :
TCE Half-life = 4.5 yrs


GROUNDWATER CLEANUP TIME FOR TCE IN AQUIFER BENEATH THE SOURCE AREA (TCE HALF-LIFE= 4.5 YRS; TCE SOIL CONC. = 0 ug/kg; GW RGO = 428,000 ug/L)
TCE CONCENTRATIONS (UG/L)
1.00E+06
1.00E+05
1.00E+04
1.00E+03
1.00E+02
1.00E+01
3 mg/L
1.00E+00
1.00E-01
1.00E-02
1.00E-03
1.00E-04
1.00E-05
0
18
36
48
yrs
54
72
90
TIME (YEAR)

SCENARIO 1

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SITE:	OU7, Site 16, GW Washout times	INVESTIGATOR:	LK	DATE:	10/19/98

CHEMICAL CHARACTERISTICS

CONTAMINANT:	TCE
HALF-LIFE (YRS):	✓ 0.00E+00
SPECIFIC ACTIVITY (Ci/g):	0.00E+00

ITERATIVE DECISION-MAKING BOX

EXPOSURE POINT: (UNDERS, FL)	FL	LEACHATE CONCENTRATION (YES,NO) ?	no
UNDERS: Under source, FL: Fenceline		INPUT SOLID-PHASE CONCENTRATION (MG/KG)	0.000E+00
WATER CRITERIA (UG/L):	3.00E+00	CONSTANT CONCENTRATION (YES,NO)?	no
		TRY NEW GOAL:	0.00E+00
TIME FRAME (YRS):	90	ACCEPTABLE!	YES

SOURCE-TERM INFORMATION

Ke:	1.00
Kl (L/KG):	1.51E-01
DEPLETING SOURCE:	
WASTE CHARACTERISTICS:	
INITIAL SOLID-PHASE CONCENTRATION (MG/KG):	0.00E+00
INPUT FOLLOWING PARAMETERS:	
THICKNESS (FT):	6.81
SATURATION RATE:	0.6
POROSITY:	0.2
BULK DENSITY (G/CM^3)	1.5

ENGINEERING CONTROL INFORMATION

INFILT(FT/YR):	1.13E+00
LENGTH (FT):	860
WIDTH (FT):	320
IS THERE A CLAY LINER LAYER (YES,NO)?	no
THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
HOW MANY SUBLAYERS (1 - 10)?	3
TOTAL THICKNESS (UP TO 30 FT) (FT):	10
SATURATION RATE:	0.95
POROSITY:	0.2
BULK DENSITY (G/CM^3):	1.78
Kd (L/KG):	1.00E-05

IS THERE A TYPE 1 LAYER (YES,NO)?	NO
THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
HOW MANY SUBLAYERS (1 - 10)?	6
TOTAL THICKNESS (UP TO 30 FT) (FT):	2.20E+01
SATURATION RATE:	0.95
POROSITY:	0.2
BULK DENSITY (G/CM^3)	1.5
Kd (L/KG):	1.00E-05
INITIAL SOIL CONC. (MG/KG):	0

IS THERE A TYPE 2 LAYER (YES,NO)?	NO
THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
HOW MANY SUBLAYERS (1 - 10)?	5
TOTAL THICKNESS (UP TO 30 FT) (FT):	20
SATURATION RATE:	0.13
POROSITY:	0.3
BULK DENSITY (G/CM^3)	1.5
Kd (L/KG):	1.00E-05
INITIAL SOIL CONC. (MG/KG):	0

SATURATED LAYER

TOTAL SATURATED ZONE THICKNESS, B (FT):	100
HORIZONTAL SEEPAGE VELOCITY, V (FT/YR):	101
Kd (L/KG):	1.51E-01
POROSITY:	0.2
VERTICAL DISPERSIVITY, Az (FT):	0.12
LONGITUDINAL DISPERSIVITY, Ax (FT):	100.0
LATERAL DISPERSIVITY, Ay (FT):	33.3
INITIAL CONC. (ug/L):	✓ 4.870E+01

VERTICAL SEEPAGE VELOCITY, Vzo (FT/YR):	10.03
DOWNGRADIENT AREA INFILTRATION RATE, q (FT/YR)	0
SPECIFY MIXING DEPTH (Computed from formula if input NO)	NO
MIXING DEPTH, H (FT):	70.0
TIME OF PUMPING STOP, P&T (YEARS):	0
AGE (YRS):	0
CONC. IN UPGRADIENT GROUNDWATER,CU2 (UG/L)	0
DISTANCE TO Fence.Line.:	3450

PREDICTED IMPACTS:

		TIME OF MAXIMUM (YR)
SATURATED LAYER CONCENTRATION:	4.87E+01 (UG/L)	0
FENCE LINE CONCENTRATION:	✓ 3.00E+00 (UG/L)	79.2

GW Clean-Up Time ; Scenario 2 :
No Decay for TCE

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BROWN & ROOT ENVIRONMENTAL
SCREENING-LEVEL EXCEL-CRYSTAL BALL TRANSPORT (ECTran) MODEL

SITE: OU7, Site 16, GW Washout times

INVESTIGATOR: LK
DATE: 10/19/98

CONTAMINANT: TCE

HALF-LIFE (YRS):
LAYER 2: 0.00E+00
SATURATED LAYER 0.00E+00
DOWNGRADIENT 0.00E+00

INITIAL CONC. (ug/L): 4.87E+01

SATURATED LAYER

INFILT (FT/YR):	1.13			B (FT):	100	Vzo (FT/YR):	10.03
LENGTH (FT):	860			GW Q3 (L/DAY):	5.92E+04		
WIDTH (FT):	320	Kd (L/KG):	1.51E-01	GW V. (FT/YR):	101.00	Kd (L/KG):	0.151
POROSITY 2:	0.3	SATURATION:	1.00	H (FT):	70.0000	RETARDATION:	2.1325
POROSITY SAT. LAYER:	0.2	THICKNESS (FT):	70.00	EFF. POROSITY:	0.20	q (FT/YR) :	0
DENSITY 2 (G/CM3):	1.5	DECAY (1/DAY):	0.00E+00	DISPERSIVITY:		DECAY (1/YR):	0.0E+00
DENSITY GMA (G/CM3):	1.50	CBo (PPB):	4.87E+01	Az (FT):	0.12		
		CU2 (PPB):	0.00E+00	Ax (FT):	100.00	P&T (YRS):	0
AGE (YEARS):	0	Q1 (L/DAY): 2.41E+04	Q2 (L/DAY): 3.51E+04	Ay (FT):	33.33	DISTANCE TO F.L. (FT):	3450

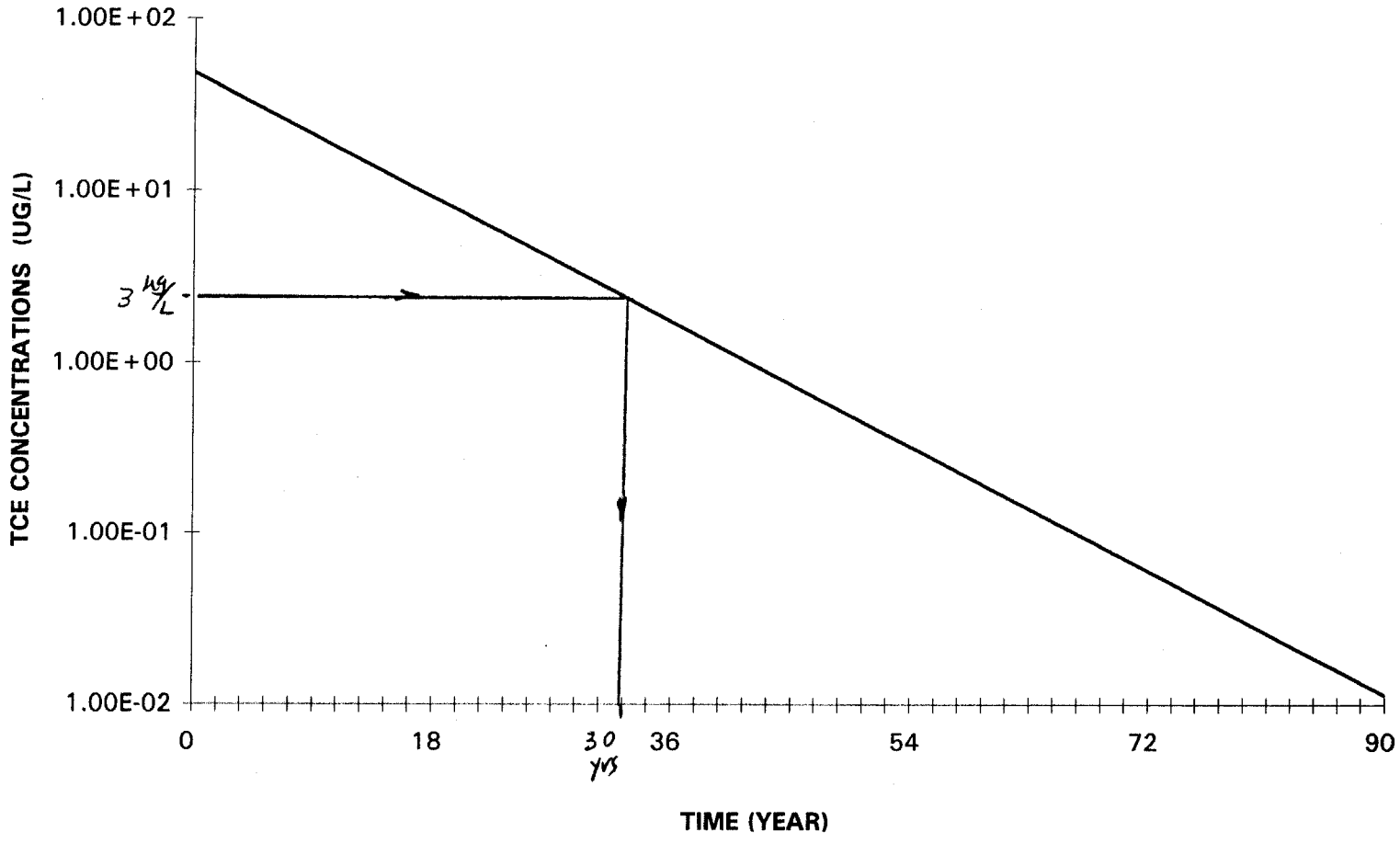
TIME INTERVAL (YRS) 1.8

ELAPSED TIME - YRS	LAYER 2(PPB)	SOURCE AREA CONC.(GMA) (UG/L)	FENCE LINE CONC. (UG/L)
0	0.00E+00	4.87E+01 initial GW Conc	0.00E+00
1.8	0.00E+00	4.12E+01	0.00E+00
3.6	0.00E+00	3.48E+01	0.00E+00
5.4	0.00E+00	2.95E+01	0.00E+00
7.2	0.00E+00	2.49E+01	0.00E+00
9	0.00E+00	2.11E+01	0.00E+00
10.8	0.00E+00	1.78E+01	0.00E+00
12.6	0.00E+00	1.51E+01	0.00E+00
14.4	0.00E+00	1.28E+01	0.00E+00
16.2	0.00E+00	1.08E+01	4.78E-11
18	0.00E+00	9.14E+00	2.02E-09
19.8	0.00E+00	7.73E+00	4.18E-08
21.6	0.00E+00	6.54E+00	5.08E-07
23.4	0.00E+00	5.53E+00	4.10E-06
25.2	0.00E+00	4.68E+00	2.39E-05
27	0.00E+00	3.96E+00	1.08E-04
28.8	0.00E+00	3.35E+00	3.93E-04
30.6	0.00E+00	2.83E+00 < 3 ug/L	1.21E-03
32.4	0.00E+00	2.40E+00	3.20E-03
34.2	0.00E+00	2.03E+00	7.52E-03
36	0.00E+00	1.71E+00	1.59E-02
37.8	0.00E+00	1.45E+00	3.09E-02
39.6	0.00E+00	1.23E+00	5.54E-02
41.4	0.00E+00	1.04E+00	9.31E-02
43.2	0.00E+00	8.78E-01	1.47E-01
45	0.00E+00	7.43E-01	2.21E-01
46.8	0.00E+00	6.28E-01	3.18E-01
48.6	0.00E+00	5.32E-01	4.39E-01
50.4	0.00E+00	4.50E-01	5.83E-01
52.2	0.00E+00	3.80E-01	7.51E-01
54	0.00E+00	3.22E-01	9.39E-01
55.8	0.00E+00	2.72E-01	1.14E+00
57.6	0.00E+00	2.30E-01	1.36E+00
59.4	0.00E+00	1.95E-01	1.58E+00
61.2	0.00E+00	1.65E-01	1.80E+00
63	0.00E+00	1.39E-01	2.01E+00
64.8	0.00E+00	1.18E-01	2.22E+00
66.6	0.00E+00	9.97E-02	2.40E+00
68.4	0.00E+00	8.44E-02	2.57E+00
70.2	0.00E+00	7.14E-02	2.71E+00
72	0.00E+00	6.04E-02	2.82E+00
73.8	0.00E+00	5.11E-02	2.91E+00
75.6	0.00E+00	4.32E-02	2.96E+00
77.4	0.00E+00	3.65E-02	2.99E+00
79.2	0.00E+00	3.09E-02	3.00E+00
81	0.00E+00	2.62E-02	2.97E+00
82.8	0.00E+00	2.21E-02	2.93E+00
84.6	0.00E+00	1.87E-02	2.86E+00
86.4	0.00E+00	1.58E-02	2.78E+00
88.2	0.00E+00	1.34E-02	2.68E+00
90	0.00E+00	1.13E-02	2.57E+00
MAXIMUM:	0.00E+00	4.87E+01	3.00E+00

30 years

GW Clean-Up Time ; SCENARIO 2 :
NO DECAY FOR TCE

GROUNDWATER CLEANUP TIME FOR TCE IN AQUIFER BENEATH THE SOURCE AREA (NO DECAY FOR TCE; TCE SOIL CONC. = 0 ug/kg; GW RGO = 49 ug/L)



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BROWN & ROOT ENVIRONMENTAL

SITE: OU7, Site 16, GW Washout Time **INVESTIGATOR:** LK **DATE:** 1/28/99

CHEMICAL CHARACTERISTICS		ITERATIVE DECISION-MAKING BOX			
CONTAMINANT:	TCE	EXPOSURE POINT: (UNDERS, FL)	FL	LEACHATE CONCENTRATION (YES,NO) ?	no
		UNDERS: Under source, FL: Fenceline		INPUT SOLID-PHASE CONCENTRATION (MG/KG)	0.000E+00
		WATER CRITERIA (UG/L):	3.00E+00	CONSTANT CONCENTRATION (YES,NO)?	no
HALF-LIFE (YRS):	✓ 4.50E+00			TRY NEW GOAL:	0.00E+00
SPECIFIC ACTIVITY (Ci/g):	0.00E+00	TIME FRAME (YRS):	30	ACCEPTABLE!	INCREASE

SOURCE-TERM INFORMATION		ENGINEERING CONTROL INFORMATION	
Ke:	1.00	INFILT(FT/YR):	1.13E+00
Kl (L/KG):	1.51E-01	LENGTH (FT):	✓ 150
		WIDTH (FT):	✓ 150
DEPLETING SOURCE:		**IS THERE A CLAY LINER LAYER (YES,NO)?**	no
WASTE CHARACTERISTICS:			
INITIAL SOLID-PHASE CONCENTRATION (MG/KG):	0.00E+00	THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
INPUT FOLLOWING PARAMETERS:		HOW MANY SUBLAYERS (1 - 10)?	3
THICKNESS (FT):	6.81	TOTAL THICKNESS (UP TO 30 FT) (FT):	10
SATURATION RATE:	0.6	SATURATION RATE:	0.95
POROSITY:	0.2	POROSITY:	0.2
BULK DENSITY (G/CM^3)	1.5	BULK DENSITY (G/CM^3):	1.78
		Kd (L/KG):	1.00E-05

IS THERE A TYPE 1 LAYER (YES,NO)?	NO	**IS THERE A TYPE 2 LAYER (YES,NO)?**	NO
THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION		THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
HOW MANY SUBLAYERS (1 - 10)?	6	HOW MANY SUBLAYERS (1 - 10)?	5
TOTAL THICKNESS (UP TO 30 FT) (FT):	2.20E+01	TOTAL THICKNESS (UP TO 30 FT) (FT):	20
SATURATION RATE:	0.95	SATURATION RATE:	0.13
POROSITY:	0.2	POROSITY:	0.3
BULK DENSITY (G/CM^3)	1.5	BULK DENSITY (G/CM^3)	1.5
Kd (L/KG):	1.00E-05	Kd (L/KG):	1.00E-05
INITIAL SOIL CONC. (MG/KG):	0	INITIAL SOIL CONC. (MG/KG):	0

SATURATED LAYER

TOTAL SATURATED ZONE THICKNESS, B (FT):	100	VERTICAL SEEPAGE VELOCITY, Vzo (FT/YR):	10.03
HORIZONTAL SEEPAGE VELOCITY, V (FT/YR):	101	DOWNGRADIENT AREA INFILTRATION RATE, q (FT/YR)	0
Kd (L/KG):	1.51E-01	SPECIFY MIXING DEPTH (Computed from formula if input NO)	NO
POROSITY:	0.2	MIXING DEPTH, H (FT):	70.0
VERTICAL DISPERSIVITY, Az (FT):	0.12	TIME OF PUMPING STOP, P&T (YEARS):	0
LONGITUDINAL DISPERSIVITY, Ax (FT):	100.0	AGE (YRS):	0
LATERAL DISPERSIVITY, Ay (FT):	33.3	CONC. IN UPGRADIENT GROUNDWATER,CU2 (UG/L)	0
INITIAL CONC. (ug/L):	✓ 1.000E+03	DISTANCE TO Fence.Line.:	3450

PREDICTED IMPACTS:

		TIME OF MAXIMUM (YR)
SATURATED LAYER CONCENTRATION:	1.00E+03 (UG/L)	0
FENCE LINE CONCENTRATION:	8.34E-03 (UG/L)	0.6

SCENARIO 3 UNDER THE SOURCE W/ DECAY

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BROWN & ROOT ENVIRONMENTAL
SCREENING-LEVEL EXCEL-CRYSTAL BALL TRANSPORT (ECTran) MODEL

SITE: OU7, Site 16, GW Washout Time

INVESTIGATOR: LK
DATE: 1/28/99

CONTAMINANT: TCE

HALF-LIFE (YRS):
LAYER 2: 4.50E+00
SATURATED LAYER 4.50E+00
DOWNGRADIENT 4.50E+00

INITIAL CONC. (ug/L): 1.00E+03

SATURATED LAYER

INFILT (FT/YR):	1.13			B (FT):	100	Vzo (FT/YR):	10.03
LENGTH (FT):	150			GW Q3 (L/DAY):	1.84E+04		
WIDTH (FT):	150	Kd (L/KG):	1.51E-01	GW V. (FT/YR):	101.00	Kd (L/KG):	0.151
POROSITY 2:	0.3	SATURATION:	1.00	H (FT):	70.0000	RETARDATION:	2.1325
POROSITY SAT. LAYER:	0.2	THICKNESS (FT):	70.00	EFF. POROSITY:	0.20	q (FT/YR) :	0
DENSITY 2 (G/CM3):	1.5	DECAY (1/DAY):	4.22E-04	DISPERSIVITY:		DECAY (1/YR):	1.5E-01
DENSITY GMA (G/CM3):	1.50	CBo (PPB):	1.00E+03	Az (FT):	0.12		
		CU2 (PPB):	0.00E+00	Ax (FT):	100.00	P&T (YEARS):	0
AGE (YEARS):	0	Q1 (L/DAY): 1.97E+03	Q2 (L/DAY): 1.65E+04	Ay (FT):	33.33	DISTANCE TO F.L. (FT):	3450

TIME INTERVAL (YRS) 0.6

ELAPSED TIME - YRS	LAYER 2(PPB)	SOURCE AREA CONC.(GMA) (UG/L)	FENCE LINE CONC. (UG/L)
0	0.00E+00	1.00E+03	0.00E+00
0.6	0.00E+00	7.37E+02	8.34E-03
1.2	0.00E+00	5.44E+02	-2.19E-03
1.8	0.00E+00	4.01E+02	-1.62E-03
2.4	0.00E+00	2.96E+02	-1.19E-03
3	0.00E+00	2.18E+02	-8.78E-04
3.6	0.00E+00	1.61E+02	-6.48E-04
4.2	0.00E+00	1.19E+02	-4.77E-04
4.8	0.00E+00	8.74E+01	-3.52E-04
5.4	0.00E+00	6.44E+01	-2.60E-04
6	0.00E+00	4.75E+01	-1.91E-04
6.6	0.00E+00	3.50E+01	-1.41E-04
7.2	0.00E+00	2.58E+01	-1.04E-04
7.8	0.00E+00	1.91E+01	-7.68E-05
8.4	0.00E+00	1.40E+01	-5.66E-05
9	0.00E+00	1.04E+01	-4.17E-05
9.6	0.00E+00	7.64E+00	-3.08E-05
10.2	0.00E+00	5.63E+00	-2.27E-05
10.8	0.00E+00	4.15E+00	-1.67E-05
12 yrs 11.4	0.00E+00	3.06E+00	-1.23E-05
12	0.00E+00	2.26E+00 < 3 µg/L	-9.10E-06
12.6	0.00E+00	1.67E+00	-6.71E-06
13.2	0.00E+00	1.23E+00	-4.95E-06
13.8	0.00E+00	9.05E-01	-3.65E-06
14.4	0.00E+00	6.68E-01	-2.69E-06
15	0.00E+00	4.92E-01	-1.98E-06
15.6	0.00E+00	3.63E-01	-1.46E-06
16.2	0.00E+00	2.68E-01	-1.08E-06
16.8	0.00E+00	1.97E-01	-7.95E-07
17.4	0.00E+00	1.46E-01	-5.86E-07
18	0.00E+00	1.07E-01	-4.31E-07
18.6	0.00E+00	7.91E-02	-3.15E-07
19.2	0.00E+00	5.84E-02	-2.26E-07
19.8	0.00E+00	4.30E-02	-1.53E-07
20.4	0.00E+00	3.17E-02	-8.37E-08
21	0.00E+00	2.34E-02	-2.52E-09
21.6	0.00E+00	1.73E-02	1.12E-07
22.2	0.00E+00	1.27E-02	2.92E-07
22.8	0.00E+00	9.38E-03	5.85E-07
23.4	0.00E+00	6.92E-03	1.06E-06
24	0.00E+00	5.10E-03	1.81E-06
24.6	0.00E+00	3.76E-03	2.97E-06
25.2	0.00E+00	2.77E-03	4.69E-06
25.8	0.00E+00	2.04E-03	7.21E-06
26.4	0.00E+00	1.51E-03	1.08E-05
27	0.00E+00	1.11E-03	1.57E-05
27.6	0.00E+00	8.20E-04	2.23E-05
28.2	0.00E+00	6.05E-04	3.11E-05
28.8	0.00E+00	4.46E-04	4.24E-05
29.4	0.00E+00	3.29E-04	5.66E-05
30	0.00E+00	2.42E-04	7.44E-05
MAXIMUM:	0.00E+00	1.00E+03	8.34E-03

SCENARIO 3

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BROWN & ROOT ENVIRONMENTAL

SITE: Site 16, cleanup time; no dacey **INVESTIGATOR:** LK **DATE:** 1/29/99

CHEMICAL CHARACTERISTICS		ITERATIVE DECISION-MAKING BOX			
CONTAMINANT:	TCE	EXPOSURE POINT: (UNDERS, FL)	FL	LEACHATE CONCENTRATION (YES,NO) ?	no
		UNDERS: Under source, FL: Fenceline		INPUT SOLID-PHASE CONCENTRATION (MG/KG)	0.000E+00
		WATER CRITERIA (UG/L):	3.00E+00	CONSTANT CONCENTRATION (YES,NO)?	no
HALF-LIFE (YRS):	0.00E+00			TRY NEW GOAL:	0.00E+00
SPECIFIC ACTIVITY (Ci/g):	0.00E+00	TIME FRAME (YRS):	18	ACCEPTABLE!	INCREASE

SOURCE-TERM INFORMATION		ENGINEERING CONTROL INFORMATION	
Ke:	1.00	INFILT(FT/YR):	1.13E+00
Kl (L/KG):	1.51E-01	LENGTH (FT):	150
		WIDTH (FT):	150
DEPLETING SOURCE:		**IS THERE A CLAY LINER LAYER (YES,NO)?**	no
WASTE CHARACTERISTICS:			
INITIAL SOLID-PHASE CONCENTRATION (MG/KG):	0.00E+00	THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
INPUT FOLLOWING PARAMETERS:		HOW MANY SUBLAYERS (1 - 10)?	3
THICKNESS (FT):	6.81	TOTAL THICKNESS (UP TO 30 FT) (FT):	10
SATURATION RATE:	0.6	SATURATION RATE:	0.95
POROSITY:	0.2	POROSITY:	0.2
BULK DENSITY (G/CM^3)	1.5	BULK DENSITY (G/CM^3):	1.78
		Kd (L/KG):	1.00E-05

IS THERE A TYPE 1 LAYER (YES,NO)?	NO	**IS THERE A TYPE 2 LAYER (YES,NO)?**	NO
THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION		THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
HOW MANY SUBLAYERS (1 - 10)?	6	HOW MANY SUBLAYERS (1 - 10)?	5
TOTAL THICKNESS (UP TO 30 FT) (FT):	2.20E+01	TOTAL THICKNESS (UP TO 30 FT) (FT):	20
SATURATION RATE:	0.95	SATURATION RATE:	0.13
POROSITY:	0.2	POROSITY:	0.3
BULK DENSITY (G/CM^3)	1.5	BULK DENSITY (G/CM^3)	1.5
Kd (L/KG):	1.00E-05	Kd (L/KG):	1.00E-05
INITIAL SOIL CONC. (MG/KG):	0	INITIAL SOIL CONC. (MG/KG):	0

SATURATED LAYER

TOTAL SATURATED ZONE THICKNESS, B (FT):	100	VERTICAL SEEPAGE VELOCITY, Vzo (FT/YR):	10.03
HORIZONTAL SEEPAGE VELOCITY, V (FT/YR):	101	DOWNGRADIENT AREA INFILTRATION RATE, q (FT/YR)	0
Kd (L/KG):	1.51E-01	SPECIFY MIXING DEPTH (Computed from formula if input NO)	NO
POROSITY:	0.2	MIXING DEPTH, H (FT):	70.0
VERTICAL DISPERSIVITY, Az (FT):	0.12	TIME OF PUMPING STOP, P&T (YEARS):	0
LONGITUDINAL DISPERSIVITY, Ax (FT):	100.0	AGE (YRS):	0
LATERAL DISPERSIVITY, Ay (FT):	33.3	CONC. IN UPGRADIENT GROUNDWATER,CU2 (UG/L)	0
INITIAL CONC. (ug/L):	1.000E+03	DISTANCE TO Fence.Line.:	3450

PREDICTED IMPACTS:		TIME OF MAXIMUM (YR)
SATURATED LAYER CONCENTRATION:	1.00E+03 (UG/L)	0
FENCE LINE CONCENTRATION:	1.77E-08 (UG/L)	18

SCENARIO 4 UNDER THE SOURCE ; NO DECAY

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BROWN & ROOT ENVIRONMENTAL
SCREENING-LEVEL EXCEL-CRYSTAL BALL TRANSPORT (ECTran) MODEL

SITE: Site 16, cleanup time; no dacey

INVESTIGATOR: LK
DATE: 1/29/99

CONTAMINANT: TCE

HALF-LIFE (YRS):
LAYER 2: 0.00E+00
SATURATED LAYER 0.00E+00
DOWNGRADIENT 0.00E+00

INITIAL CONC. (ug/L): 1.00E+03

SATURATED LAYER

INFILT (FT/YR):	1.13			B (FT):	100	Vzo (FT/YR):	10.03
LENGTH (FT):	150			GW Q3 (L/DAY):	1.84E+04		
WIDTH (FT):	150	Kd (L/KG):	1.51E-01	GW V. (FT/YR):	101.00	Kd (L/KG):	0.151
POROSITY 2:	0.3	SATURATION:	1.00	H (FT):	70.0000	RETARDATION:	2.1325
POROSITY SAT. LAYER:	0.2	THICKNESS (FT):	70.00	EFF. POROSITY:	0.20	q (FT/YR) :	0
DENSITY 2 (G/CM3):	1.5	DECAY (1/DAY):	0.00E+00	DISPERSIVITY:		DECAY (1/YR):	0.0E+00
DENSITY GMA (G/CM3):	1.50	CBo (PPB):	1.00E+03	Az (FT):	0.12		
		CU2 (PPB):	0.00E+00	Ax (FT):	100.00	P&T (YEARS):	0
AGE (YEARS):	0	Q1 (L/DAY): 1.97E+03	Q2 (L/DAY): 1.65E+04	Ay (FT):	33.33	DISTANCE TO F.L. (FT):	3450

TIME INTERVAL (YRS) 0.36

ELAPSED TIME - YRS	LAYER 2(PPB)	SOURCE AREA CONC.(GMA) (UG/L)	FENCE LINE CONC. (UG/L)
0	0.00E+00	1.00E+03	0.00E+00
0.36	0.00E+00	8.80E+02	0.00E+00
0.72	0.00E+00	7.75E+02	0.00E+00
1.08	0.00E+00	6.82E+02	0.00E+00
1.44	0.00E+00	6.01E+02	0.00E+00
1.8	0.00E+00	5.29E+02	0.00E+00
2.16	0.00E+00	4.66E+02	0.00E+00
2.52	0.00E+00	4.10E+02	0.00E+00
2.88	0.00E+00	3.61E+02	0.00E+00
3.24	0.00E+00	3.18E+02	0.00E+00
3.6	0.00E+00	2.80E+02	0.00E+00
3.96	0.00E+00	2.46E+02	0.00E+00
4.32	0.00E+00	2.17E+02	0.00E+00
4.68	0.00E+00	1.91E+02	0.00E+00
5.04	0.00E+00	1.68E+02	0.00E+00
5.4	0.00E+00	1.48E+02	0.00E+00
5.76	0.00E+00	1.30E+02	0.00E+00
6.12	0.00E+00	1.15E+02	0.00E+00
6.48	0.00E+00	1.01E+02	0.00E+00
6.84	0.00E+00	8.90E+01	0.00E+00
7.2	0.00E+00	7.83E+01	0.00E+00
7.56	0.00E+00	6.90E+01	0.00E+00
7.92	0.00E+00	6.07E+01	0.00E+00
8.28	0.00E+00	5.35E+01	0.00E+00
8.64	0.00E+00	4.71E+01	0.00E+00
9	0.00E+00	4.14E+01	0.00E+00
9.36	0.00E+00	3.65E+01	0.00E+00
9.72	0.00E+00	3.21E+01	0.00E+00
10.08	0.00E+00	2.83E+01	0.00E+00
10.44	0.00E+00	2.49E+01	0.00E+00
10.8	0.00E+00	2.19E+01	0.00E+00
11.16	0.00E+00	1.93E+01	0.00E+00
11.52	0.00E+00	1.70E+01	0.00E+00
11.88	0.00E+00	1.50E+01	0.00E+00
12.24	0.00E+00	1.32E+01	0.00E+00
12.6	0.00E+00	1.16E+01	0.00E+00
12.96	0.00E+00	1.02E+01	0.00E+00
13.32	0.00E+00	8.99E+00	0.00E+00
13.68	0.00E+00	7.92E+00	0.00E+00
14.04	0.00E+00	6.97E+00	0.00E+00
14.4	0.00E+00	6.14E+00	0.00E+00
14.76	0.00E+00	5.40E+00	0.00E+00
15.12	0.00E+00	4.76E+00	0.00E+00
15.48	0.00E+00	4.19E+00	0.00E+00
15.84	0.00E+00	3.69E+00	1.98E-10
16.2	0.00E+00	3.25E+00	4.43E-10
16.56	0.00E+00	2.86E+00	9.80E-10
16.92	0.00E+00	2.52E+00	2.11E-09
17.28	0.00E+00	2.22E+00	4.42E-09
17.64	0.00E+00	1.95E+00	8.98E-09
18	0.00E+00	1.72E+00	1.77E-08
MAXIMUM:	0.00E+00	1.00E+03	1.77E-08

16.5 yrs →

< 3 µg/L

SCENARIO 4

P1/2

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BROWN & ROOT ENVIRONMENTAL

SITE: OU7, Site 16, GW Washout Time **INVESTIGATOR:** LK **DATE:** 1/28/99

CHEMICAL CHARACTERISTICS		ITERATIVE DECISION-MAKING BOX			
CONTAMINANT:	TCE	EXPOSURE POINT: (UNDERS, FL)	FL	LEACHATE CONCENTRATION (YES,NO) ?	no
		UNDERS: Under source, FL: Fenceline		INPUT SOLID-PHASE CONCENTRATION (MG/KG)	0.000E+00
		WATER CRITERIA (UG/L):	3.00E+00	CONSTANT CONCENTRATION (YES,NO)?	no
HALF-LIFE (YRS):	4.50E+00			TRY NEW GOAL:	0.00E+00
SPECIFIC ACTIVITY (Ci/g):	0.00E+00	TIME FRAME (YRS):	18	ACCEPTABLE!	INCREASE

SOURCE-TERM INFORMATION		ENGINEERING CONTROL INFORMATION	
Ke:	1.00	INFILT(FT/YR):	1.13E+00
Kl (L/KG):	1.51E-01	LENGTH (FT):	800
		WIDTH (FT):	320
DEPLETING SOURCE:		**IS THERE A CLAY LINER LAYER (YES,NO)?**	no
WASTE CHARACTERISTICS:			
INITIAL SOLID-PHASE CONCENTRATION (MG/KG):	0.00E+00	THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
INPUT FOLLOWING PARAMETERS:		HOW MANY SUBLAYERS (1 - 10)?	3
THICKNESS (FT):	6.81	TOTAL THICKNESS (UP TO 30 FT) (FT):	10
SATURATION RATE:	0.6	SATURATION RATE:	0.95
POROSITY:	0.2	POROSITY:	0.2
BULK DENSITY (G/CM^3)	1.5	BULK DENSITY (G/CM^3):	1.78
		Kd (L/KG):	1.00E-05

IS THERE A TYPE 1 LAYER (YES,NO)?	NO	**IS THERE A TYPE 2 LAYER (YES,NO)?**	NO
THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION		THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
HOW MANY SUBLAYERS (1 - 10)?	6	HOW MANY SUBLAYERS (1 - 10)?	5
TOTAL THICKNESS (UP TO 30 FT) (FT):	2.20E+01	TOTAL THICKNESS (UP TO 30 FT) (FT):	20
SATURATION RATE:	0.95	SATURATION RATE:	0.13
POROSITY:	0.2	POROSITY:	0.3
BULK DENSITY (G/CM^3)	1.5	BULK DENSITY (G/CM^3)	1.5
Kd (L/KG):	1.00E-05	Kd (L/KG):	1.00E-05
INITIAL SOIL CONC. (MG/KG):	0	INITIAL SOIL CONC. (MG/KG):	0

SATURATED LAYER

TOTAL SATURATED ZONE THICKNESS, B (FT):	100	VERTICAL SEEPAGE VELOCITY, Vzo (FT/YR):	10.03
HORIZONTAL SEEPAGE VELOCITY, V (FT/YR):	101	DOWNGRADIENT AREA INFILTRATION RATE, q (FT/YR)	0
Kd (L/KG):	1.51E-01	SPECIFY MIXING DEPTH (Computed from formula if input NO)	NO
POROSITY:	0.2	MIXING DEPTH, H (FT):	70.0
VERTICAL DISPERSIVITY, Az (FT):	0.12	TIME OF PUMPING STOP, P&T (YEARS):	0
LONGITUDINAL DISPERSIVITY, Ax (FT):	100.0	AGE (YRS):	0
LATERAL DISPERSIVITY, Ay (FT):	33.3	CONC. IN UPGRADIENT GROUNDWATER,CU2 (UG/L)	0
INITIAL CONC. (ug/L):	2.280E+02	DISTANCE TO Fence.Line.:	3450

PREDICTED IMPACTS:		TIME OF MAXIMUM (YR)
SATURATED LAYER CONCENTRATION:	2.28E+02 (UG/L)	0
FENCE LINE CONCENTRATION:	6.44E-10 (UG/L)	18

SCENARIO 5 ; DOWNGRADIENT PLUME

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BROWN & ROOT ENVIRONMENTAL
SCREENING-LEVEL EXCEL-CRYSTAL BALL TRANSPORT (ECTran) MODEL

SITE: OU7, Site 16, GW Washout Time

CONTAMINANT: TCE

HALF-LIFE (YRS):
LAYER 2: 4.50E+00
SATURATED LAYER 4.50E+00
DOWNGRADIENT 4.50E+00

INVESTIGATOR: LK
DATE: 1/28/99

INITIAL CONC. (ug/L): 2.28E+02

SATURATED LAYER

INFILT (FT/YR):	1.13			B (FT):	100	Vzo (FT/YR):	10.03
LENGTH (FT):	800			GW Q3 (L/DAY):	5.76E+04		
WIDTH (FT):	320	Kd (L/KG):	1.51E-01	GW V. (FT/YR):	101.00	Kd (L/KG):	0.151
POROSITY 2:	0.3	SATURATION:	1.00	H (FT):	70.0000	RETARDATION:	2.1325
POROSITY SAT. LAYER:	0.2	THICKNESS (FT):	70.00	EFF. POROSITY:	0.20	q (FT/YR) :	0
DENSITY 2 (G/CM3):	1.5	DECAY (1/DAY):	4.22E-04	DISPERSIVITY:		DECAY (1/YR):	1.5E-01
DENSITY GMA (G/CM3):	1.50	CBo (PPB):	2.28E+02	Az (FT):	0.12		
		CU2 (PPB):	0.00E+00	Ax (FT):	100.00	P&T (YEARS):	0
AGE (YEARS):	0	Q1 (L/DAY): 2.24E+04	Q2 (L/DAY): 3.51E+04	Ay (FT):	33.33	DISTANCE TO F.L. (FT):	3450

TIME INTERVAL (YRS) 0.36

ELAPSED TIME - YRS	LAYER 2(PPB)	SOURCE AREA CONC.(GMA) (UG/L)	FENCE LINE CONC. (UG/L)
0	0.00E+00	2.28E+02	0.00E+00
0.36	0.00E+00	2.08E+02	0.00E+00
0.72	0.00E+00	1.90E+02	0.00E+00
1.08	0.00E+00	1.74E+02	0.00E+00
1.44	0.00E+00	1.59E+02	0.00E+00
1.8	0.00E+00	1.45E+02	0.00E+00
2.16	0.00E+00	1.33E+02	0.00E+00
2.52	0.00E+00	1.21E+02	0.00E+00
2.88	0.00E+00	1.11E+02	0.00E+00
3.24	0.00E+00	1.01E+02	0.00E+00
3.6	0.00E+00	9.23E+01	0.00E+00
3.96	0.00E+00	8.43E+01	0.00E+00
4.32	0.00E+00	7.71E+01	0.00E+00
4.68	0.00E+00	7.04E+01	0.00E+00
5.04	0.00E+00	6.43E+01	0.00E+00
5.4	0.00E+00	5.88E+01	0.00E+00
5.76	0.00E+00	5.37E+01	0.00E+00
6.12	0.00E+00	4.90E+01	0.00E+00
6.48	0.00E+00	4.48E+01	0.00E+00
6.84	0.00E+00	4.09E+01	0.00E+00
7.2	0.00E+00	3.74E+01	0.00E+00
7.56	0.00E+00	3.42E+01	0.00E+00
7.92	0.00E+00	3.12E+01	0.00E+00
8.28	0.00E+00	2.85E+01	0.00E+00
8.64	0.00E+00	2.60E+01	0.00E+00
9	0.00E+00	2.38E+01	0.00E+00
9.36	0.00E+00	2.17E+01	0.00E+00
9.72	0.00E+00	1.99E+01	0.00E+00
10.08	0.00E+00	1.81E+01	0.00E+00
10.44	0.00E+00	1.66E+01	0.00E+00
10.8	0.00E+00	1.51E+01	0.00E+00
11.16	0.00E+00	1.38E+01	0.00E+00
11.52	0.00E+00	1.26E+01	0.00E+00
11.88	0.00E+00	1.15E+01	0.00E+00
12.24	0.00E+00	1.05E+01	0.00E+00
12.6	0.00E+00	9.63E+00	0.00E+00
12.96	0.00E+00	8.80E+00	0.00E+00
13.32	0.00E+00	8.04E+00	9.02E-15
13.68	0.00E+00	7.34E+00	2.82E-14
14.04	0.00E+00	6.71E+00	8.39E-14
14.4	0.00E+00	6.13E+00	2.36E-13
14.76	0.00E+00	5.60E+00	6.32E-13
15.12	0.00E+00	5.12E+00	1.61E-12
15.48	0.00E+00	4.67E+00	3.89E-12
15.84	0.00E+00	4.27E+00	9.03E-12
16.2	0.00E+00	3.90E+00	2.01E-11
16.56	0.00E+00	3.56E+00	4.31E-11
16.92	0.00E+00	3.26E+00	8.89E-11
17.28	0.00E+00	2.97E+00	1.78E-10
17.64	0.00E+00	2.72E+00	3.43E-10
18	0.00E+00	2.48E+00	6.44E-10
MAXIMUM:	0.00E+00	2.28E+02	6.44E-10

SCENARIO 5

P1/2

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BROWN & ROOT ENVIRONMENTAL

SITE: Site 16, cleanup time; no dacey **INVESTIGATOR:** LK **DATE:** 1/29/99

CHEMICAL CHARACTERISTICS		ITERATIVE DECISION-MAKING BOX			
CONTAMINANT:	TCE	EXPOSURE POINT: (UNDERS, FL)	FL	LEACHATE CONCENTRATION (YES,NO) ?	no
		UNDERS: Under source, FL: Fenceline		INPUT SOLID-PHASE CONCENTRATION (MG/KG)	0.000E+00
		WATER CRITERIA (UG/L):	3.00E+00	CONSTANT CONCENTRATION (YES,NO)?	no
HALF-LIFE (YRS):	0.00E+00			TRY NEW GOAL:	0.00E+00
SPECIFIC ACTIVITY (Ci/g):	0.00E+00	TIME FRAME (YRS):	50	ACCEPTABLE!	INCREASE

SOURCE-TERM INFORMATION		ENGINEERING CONTROL INFORMATION	
Ke:	1.00	INFILT(FT/YR):	1.13E+00
Kl (L/KG):	1.51E-01	LENGTH (FT):	800
		WIDTH (FT):	320
DEPLETING SOURCE:		**IS THERE A CLAY LINER LAYER (YES,NO)?**	no
WASTE CHARACTERISTICS:			
INITIAL SOLID-PHASE CONCENTRATION (MG/KG):	0.00E+00	THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
INPUT FOLLOWING PARAMETERS:		HOW MANY SUBLAYERS (1 - 10)?	3
THICKNESS (FT):	6.81	TOTAL THICKNESS (UP TO 30 FT) (FT):	10
SATURATION RATE:	0.6	SATURATION RATE:	0.95
POROSITY:	0.2	POROSITY:	0.2
BULK DENSITY (G/CM^3)	1.5	BULK DENSITY (G/CM^3):	1.78
		Kd (L/KG):	1.00E-05

IS THERE A TYPE 1 LAYER (YES,NO)?	NO	**IS THERE A TYPE 2 LAYER (YES,NO)?**	NO
THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION		THE FOLLOWING DATA ARE NOT USED IN THIS CALCULATION	
HOW MANY SUBLAYERS (1 - 10)?	6	HOW MANY SUBLAYERS (1 - 10)?	5
TOTAL THICKNESS (UP TO 30 FT) (FT):	2.20E+01	TOTAL THICKNESS (UP TO 30 FT) (FT):	20
SATURATION RATE:	0.95	SATURATION RATE:	0.13
POROSITY:	0.2	POROSITY:	0.3
BULK DENSITY (G/CM^3)	1.5	BULK DENSITY (G/CM^3)	1.5
Kd (L/KG):	1.00E-05	Kd (L/KG):	1.00E-05
INITIAL SOIL CONC. (MG/KG):	0	INITIAL SOIL CONC. (MG/KG):	0

SATURATED LAYER

TOTAL SATURATED ZONE THICKNESS, B (FT):	100	VERTICAL SEEPAGE VELOCITY, Vzo (FT/YR):	10.03
HORIZONTAL SEEPAGE VELOCITY, V (FT/YR):	101	DOWNGRADIENT AREA INFILTRATION RATE, q (FT/YR)	0
Kd (L/KG):	1.51E-01	SPECIFY MIXING DEPTH (Computed from formula if input NO)	NO
POROSITY:	0.2	MIXING DEPTH, H (FT):	70.0
VERTICAL DISPERSIVITY, Az (FT):	0.12	TIME OF PUMPING STOP, P&T (YEARS):	0
LONGITUDINAL DISPERSIVITY, Ax (FT):	100.0	AGE (YRS):	0
LATERAL DISPERSIVITY, Ay (FT):	33.3	CONC. IN UPGRADIENT GROUNDWATER,CU2 (UG/L)	0
INITIAL CONC. (ug/L):	2.280E+02	DISTANCE TO Fence.Line.:	3450

PREDICTED IMPACTS:

		TIME OF MAXIMUM (YR)
SATURATED LAYER CONCENTRATION:	2.28E+02 (UG/L)	0
FENCE LINE CONCENTRATION:	2.45E+00 (UG/L)	50

SCENARIO 6 ; DOWNGRADIENT PLUME
NO DECAY

P2/2

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BROWN & ROOT ENVIRONMENTAL
SCREENING-LEVEL EXCEL-CRYSTAL BALL TRANSPORT (ECTran) MODEL

SITE: Site 16, cleanup time; no dacey

INVESTIGATOR: LK
DATE: 1/29/99

CONTAMINANT: TCE

HALF-LIFE (YRS):
LAYER 2: 0.00E+00
SATURATED LAYER 0.00E+00
DOWNGRADIENT 0.00E+00

INITIAL CONC. (ug/L): 2.28E+02

SATURATED LAYER

INFILT (FT/YR):	1.13			B (FT):	100	Vzo (FT/YR):	10.03
LENGTH (FT):	800			GW Q3 (L/DAY):	5.76E+04		
WIDTH (FT):	320	Kd (L/KG):	1.51E-01	GW V. (FT/YR):	101.00	Kd (L/KG):	0.151
POROSITY 2:	0.3	SATURATION:	1.00	H (FT):	70.0000	RETARDATION:	2.1325
POROSITY SAT. LAYER:	0.2	THICKNESS (FT):	70.00	EFF. POROSITY:	0.20	q (FT/YR) :	0
DENSITY 2 (G/CM3):	1.5	DECAY (1/DAY):	0.00E+00	DISPERSIVITY:		DECAY (1/YR):	0.0E+00
DENSITY GMA (G/CM3):	1.50	CBo (PPB):	2.28E+02	Az (FT):	0.12		
		CU2 (PPB):	0.00E+00	Ax (FT):	100.00	P&T (YEARS):	0
AGE (YEARS):	0	Q1 (L/DAY): 2.24E+04	Q2 (L/DAY): 3.51E+04	Ay (FT):	33.33	DISTANCE TO F.L. (FT):	3450

TIME INTERVAL (YRS) 1

ELAPSED TIME - YRS	LAYER 2(PPB)	SOURCE AREA CONC.(GMA) (UG/L)	FENCE LINE CONC. (UG/L)
0	0.00E+00	2.28E+02	0.00E+00
1	0.00E+00	2.07E+02	0.00E+00
2	0.00E+00	1.88E+02	0.00E+00
3	0.00E+00	1.70E+02	0.00E+00
4	0.00E+00	1.55E+02	0.00E+00
5	0.00E+00	1.40E+02	0.00E+00
6	0.00E+00	1.27E+02	0.00E+00
7	0.00E+00	1.16E+02	0.00E+00
8	0.00E+00	1.05E+02	0.00E+00
9	0.00E+00	9.52E+01	0.00E+00
10	0.00E+00	8.64E+01	0.00E+00
11	0.00E+00	7.84E+01	0.00E+00
12	0.00E+00	7.11E+01	0.00E+00
13	0.00E+00	6.45E+01	0.00E+00
14	0.00E+00	5.86E+01	0.00E+00
15	0.00E+00	5.31E+01	0.00E+00
16	0.00E+00	4.82E+01	1.40E-10
17	0.00E+00	4.38E+01	1.30E-09
18	0.00E+00	3.97E+01	9.34E-09
19	0.00E+00	3.60E+01	5.41E-08
20	0.00E+00	3.27E+01	2.61E-07
21	0.00E+00	2.97E+01	1.07E-06
22	0.00E+00	2.69E+01	3.83E-06
23	0.00E+00	2.44E+01	1.22E-05
24	0.00E+00	2.22E+01	3.49E-05
25	0.00E+00	2.01E+01	9.11E-05
26	0.00E+00	1.83E+01	2.19E-04
27	0.00E+00	1.66E+01	4.91E-04
28	0.00E+00	1.50E+01	1.03E-03
29	0.00E+00	1.37E+01	2.04E-03
30	0.00E+00	1.24E+01	3.84E-03
31	0.00E+00	1.12E+01	6.88E-03
32	0.00E+00	1.02E+01	1.18E-02
33	0.00E+00	9.26E+00	1.95E-02
34	0.00E+00	8.40E+00	3.11E-02
35	0.00E+00	7.62E+00	4.81E-02
36	0.00E+00	6.92E+00	7.20E-02
37	0.00E+00	6.28E+00	1.05E-01
38	0.00E+00	5.70E+00	1.49E-01
39	0.00E+00	5.17E+00	2.07E-01
40	0.00E+00	4.69E+00	2.82E-01
41	0.00E+00	4.26E+00	3.75E-01
42	0.00E+00	3.86E+00	4.91E-01
43	0.00E+00	3.51E+00	6.31E-01
44	0.00E+00	3.18E+00	7.98E-01
45	0.00E+00	2.89E+00	9.94E-01
46	0.00E+00	2.62E+00	1.22E+00
47	0.00E+00	2.38E+00	1.48E+00
48	0.00E+00	2.16E+00	1.77E+00
49	0.00E+00	1.96E+00	2.10E+00
50	0.00E+00	1.78E+00	2.45E+00
MAXIMUM:	0.00E+00	2.28E+02	2.45E+00

45 yr

< 3 ug/L

SCENARIO 6

APPENDIX E

ESTIMATION OF REMEDIAL ACTION DURATIONS

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NAS, Cecil Field	JOB NUMBER: 7792
SUBJECT: Estimation of ASVE Remedial duration (conservative approach)	
BASED ON	DRAWING NUMBER
BY: JPradeep / CHECKED BY: JMH	APPROVED BY / DATE: NOV 3/98

ASVE – Estimation of concentration reduction durations [reference: "Air Sparging Model for Predicting Groundwater Cleanup Rate" K.L. Sellers and R.P. Schreiber, CDM, Inc. 1992.]

$$C(t) = C(0)e^{-Bt}$$

Where $C(t)$ = groundwater concentration at time t.
$C(0)$ = groundwater concentration at present
t = time to attain $C(t)$

1 $$B = f \cdot d \cdot D/L \cdot S/V \cdot H/U \cdot Q/V_s$$

Where f = fraction of plume sparged ≈ 1.0 (assume entire source area)
d = fraction of 24hr day sparging system operates = 1.0
D = Contaminant diffusion coefficient (cm^2/s)

L = Diffusive distance around bubble (length)

S/V = Effective surface area to volume ratio of a bubble
$= 3/r$

Where r = effective radius of bubble, based on sparger opening.

$$r = 2R \times \{6\sigma / [R^2 \cdot (\rho_w - \rho_a) \cdot g]\}^{1/3}$$

Where R = orifice diameter (m)
σ = air-water surface tension = 0.0728 N/m
ρ_w = density of water = 1000 kg/m^3

ρ_a = density of air = 1.29 kg/m^3 @ 50°F
g = 9.8 m/s^2

[Typically expect r to be: 0.5 to 2.0 mm]

CLIENT: NAS Cecil Field	JOB NUMBER: 7792
SUBJECT: ASVE Remedial Duration	
BASED ON:	DRAWING NUMBER:
BY: JJP	CHECKED BY: JJP
APPROVED BY:	DATE: Nov 3/98

H = Depth of screen below water table

v_t = Bubble terminal rise velocity

$$= \left[1.04 \times g \cdot r + 1.07\sigma/(r \cdot \rho_w)\right]^{1/2}$$

Q = Total air flow rate injected

V_s = Volume of water in plume that contacts air sparging bubbles.

[Assume cylindrical volume]

$$V_s = \text{no of wells} \times \pi \times R_{oi}^2 \times H \times n$$

Where: R_{oi} = radius of influence of each well

n = porosity

Input values of variables

$C(0)$ = 83 mg/L (average in source area) for TCE

$C(t)$ = 1 mg/L (assumed cleanup criterion) for TCE

Other contaminants are relatively lower concentrations and more easily volatilized.

$f = 1.0$

$d = 1.0$

D = Diffusion coefficient $= 1 \times 10^{-5}\ cm^2/s$ (typical for VOCs)

$= 1 \times 10^{-9}\ m^2/s$

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT	JOB NUMBER
NAS Ceil Field	
SUBJECT: Estimation of Remedial Durations	
BASED ON	DRAWING NUMBER

BY	CHECKED BY	APPROVED BY	DATE
			Nov 3 '98

$L = r$ (assumption presented in model)

r = effective radius of bubble

Assume screen slot width approximates for orifice diameter

Slot width = 0.01"

$= 0.01'' \times \frac{ft}{12''} \times 0.3048 \frac{m}{ft} = \underline{\underline{0.25 \times 10^{-3} m}}$

$$\Rightarrow r = 2 \times (0.25 \times 10^{-3} m) \times \left\{ \left[\frac{6 \times 0.0728 \, kg \, m/s^2}{m} \right] \div \left[(0.25 \times 10^{-3})^2 m^2 \times (1000 - 1.29) \frac{kg}{m^3} \cdot 9.8 \, m/s^2 \right] \right\}^{1/3}$$

$= \underline{\underline{4.5 \times 10^{-3} m}}$

$S/V = 3/r$

$= 3 / 4.5 \times 10^{-3} m = \underline{\underline{667 \, m^{-1}}}$

H = well screen depth

= average of 100' and 60'

= $\underline{\underline{80'}}$

= $\underline{\underline{24.4 \, m}}$

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NAS Cecil Field	JOB NUMBER: 7792
SUBJECT: Estimation of Remedial Durations	
BASED ON	DRAWING NUMBER
BY: JBS / CHECKED BY: JWK	APPROVED BY / DATE: Nov. 19 '98

V = terminal velocity

$$= \left[1.04 \times 9.8\,m\,s^{-2} \times 4.5\times10^{-3}\,m + \frac{1.07 \times 0.0728\,N/m}{(4.5\times10^{-3}\,m \times 1000\,kg/m^3)}\right]^{1/2}$$

$$= \left[0.045\,m^2/s^2 + 0.017\,m^2/s^2\right]^{1/2}$$

$$= 0.25\,m\,s^{-1}$$

Q = total air flowrate

$$= 6 \text{ wells} \times \cancel{6}\,10\ cfm/well$$

$$= \cancel{36}\,60\ cfm \times \text{adjustment for pressure } \left(\frac{14.7}{17.4+14.7}\right) \text{ (for ave 40' below watertable)}$$

$$= \cancel{36}\,60\ ft^3\,min^{-1} \times \frac{min}{60\,s} \times (0.3048)^3\,\frac{m^3}{ft^3} \times \frac{14.7}{32.1}$$

$$= \cancel{0.017}\ 0.013\ m^3\,s^{-1}$$

V = volume of plume in sparged area (ignore overlap)

$$= 3 \times \pi \times (30')^2 \times 80' \times \cancel{0.2}\ 0.2$$

$$= 135{,}717\ ft^3$$

$$= 3{,}800\ m^3$$

CALCULATION WORKSHEET Order No. 19116 (01-91)

CLIENT: NAS Cecil Field	JOB NUMBER: 7792
SUBJECT: Estimation of Remedial Durations	
BASED ON	DRAWING NUMBER
BY: JJP	CHECKED BY: JRD
APPROVED BY	DATE: NOV 19 98

$$B = 1 \times 1 \times \frac{1\times10^{-9}\,m^2 s^{-1}}{4.5\times10^{-3}\,m} \times 667\,m^{-1} \times \frac{24.4\,m}{0.25\,m s^{-1}} \times \frac{0.017\,m^3 s^{-1}}{3800\,m^3}$$

0.013 $m^3 s^{-1}$

$$= \cancel{6.47\times10^{-8}\,s^{-1}}\ 4.95\times10^{-8}\,s^{-1}$$

$$= \cancel{2.04}\ 1.56\ yr^{-1}$$

$$C(t) = C(0) \times e^{-Bt}$$

$$\ln C(t) = \ln C(0) - Bt$$

$$t_{ave} = -\frac{1}{B} \times \ln \frac{C(t)}{C(0)}$$

$$= -\frac{1}{\cancel{2.04}\ 1.56\ yr^{-1}} \times \ln\left(\frac{8}{83}\right)$$

$$= \cancel{2.2}\ yr \quad \boxed{2.8\ yr}$$ (for average conc of initial TCE levels)

$$t_{max} = -\frac{1}{\cancel{2.04}\ 1.56\ yr^{-1}} \times \ln \frac{1}{408}$$

$$= \cancel{2.9}\ yr \quad \boxed{3.85\ yr}$$ (for maximum conc of initial TCE levels)

APPENDIX F

SOIL BORINGS LOGS AND GROUNDWATER MONITORING WELL FORMS

APPENDIX F

TABLE OF CONTENTS

SOIL BORING LOGS
MONITORING WELL CONSTRUCTION FORMS
WELL DEVLEOPMENT SHEETS

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7792
DRILLING COMPANY: Gulf Atlantic
DRILLING RIG: Failing F1

BORING NUMBER: CEF-16-GW-415
DATE:
GEOLOGIST: Tom Nicotera
DRILLER: Mark Murray

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
		NA	NA				Brown Fine Grain Sand				0	0	0
	2												
	4												
	6			▽					WT@ 6' BLS		0		0
	8												
	10						LT. Brown Fine Grain Sand				0	0	0
	12												
	14												
	15										0	0	0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Hollow Stem Auger Method

Drilling Area Background (ppm): 0

Converted to Well: Yes ✓ No ____ Well I.D. #: CEF-16-GW-415

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7792
DRILLING COMPANY: GULF ATLANTIC
DRILLING RIG: FAILING F1
BORING NUMBER: CEF-16-GW-42I
DATE:
GEOLOGIST: Tom Nicotera
DRILLER: MARK MURRAY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		NA	NA				Dark Brown Fine Grain Sand		Loose		0	0	0
	2												
	4												
	6			▽					WT @ 6' BLS		0	0	0
	8												
	10						CT. Brown Fine Grain Sand		MOIST				
	12												
	14												
	16												
	18												
	20										0	0	0
	22												
	24												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Hollow Stem Auger

Drilling Area Background (ppm): 0

Converted to Well: Yes ✓ No ____ Well I.D. #: CEF-16-GW-42I

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7792
DRILLING COMPANY: GULF ATLANTIC
DRILLING RIG: FAILING FL

BORING NUMBER: CEF-16-GW-42I
DATE:
GEOLOGIST: TOM NICOTERA
DRILLER: MARK MURRAY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	26	NA	NA				EF Brown Fine Grained Sand				0	0	0
	28												
	30												
	32										0	0	0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Hollow Stem Auger

Drilling Area Background (ppm): 0

Converted to Well: Yes ✓ No ____ Well I.D. #: CEF-16-GW-42I

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7292
DRILLING COMPANY: GULF ATLANTIC
DRILLING RIG: FAILING F-1

BORING NUMBER: CEF-16-GW-435
DATE:
GEOLOGIST: TOM NICOTERA
DRILLER: MARK MURRAY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
		NA	NA				Brown Fine Grain Sand				0	0	0
	2												
	4												
	6			▽					WT@ 6' BLS		0	0	0
	8												
	10						ET Brown Fine Grain Sand						
	12												
	14												
	15										0	0	0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Hollow Stem Auger

Drilling Area Background (ppm): 0

Converted to Well: Yes ✓ No ____ Well I.D. #: CEF-16-GW-435

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7792
DRILLING COMPANY: GULF ATLANTIC
DRILLING RIG: FAILING F1

BORING NUMBER: CEF-16-GW-44I
DATE:
GEOLOGIST: TOM NICOTERA
DRILLER: MARK MURRAY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		NA	NA				Brown Fine Grain Sand						
	2												
	4												
	6			▽					WT @ 6' BLS.		0	0	0
	8								MOIST				
	10												
	12					LT.	Brown Fine Grain Sand		MOIST				
	14										0	0	0
	16												
	18												
	20												
	22												
	24										0	0	0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: Hollow Stem Auger

Converted to Well: Yes ✓ No ____ Well I.D. #: CEF-16-GW-44I

BORING LOG

PROJECT NAME: NAS Cecil Field
BORING NUMBER: CEF-16-GW-44I
PROJECT NUMBER: 7292
DATE:
DRILLING COMPANY: GULF ATLANTIC
GEOLOGIST: Tom Nicotera
DRILLING RIG: Failing F.I.
DRILLER: MARK MURRAY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	26	NA	NA			LT	Brown Fine Grain Sand		MOIST		0	0	0
	28												
	30												
	32										0	0	0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Hollow Stem Auger

Drilling Area Background (ppm): 0

Converted to Well: Yes ✓ No _____ Well I.D. #: CEF-16-GW-44I

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7792
DRILLING COMPANY: Gulf Atlantic
DRILLING RIG: Failing F1.
BORING NUMBER: CEF-16-bw-45I
DATE:
GEOLOGIST: Tom Nicotra
DRILLER: Mark Murray

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
		NA	NA			DARK	Brown Fine Grain Sand		Loose		0	0	0
	2												
	4												
	6			▽					WT@ 6' BLS		0	0	0
	8								moist				
	10												
						LT	Brown Fine Grain Sand				0	0	0
	12												
	14												
	16												
	18												
	20												
	22												
	24												
											0	0	0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Hollow Stem Auger method

Drilling Area Background (ppm): 0

Converted to Well: Yes ✓ No _____ Well I.D. #: CEF-16-bw-45I

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7292
DRILLING COMPANY: GULF ATLANTIC
DRILLING RIG: FAILING F1.

BORING NUMBER: CEF-16-GW-45I
DATE:
GEOLOGIST: TOM NICOTERA
DRILLER: MARK MURRAY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	26	NA	NA			OT.	Brown Fine Grain Sand		Moist		0		0
	28												
	30												
	32										0	0	0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: Hollow Stem Auger method

Drilling Area Background (ppm): 0

Converted to Well: Yes ✓ No _____ Well I.D. #: CEF-16-GW-45I

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7792
DRILLING COMPANY: Gulf Atlantic
DRILLING RIG: Failing F-1
BORING NUMBER: EW01
DATE:
GEOLOGIST: Tom Nicotera
DRILLER: Mark Murray

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
		NA	NA			Brown	Fine Grain Sand				0		0
	2												
	4												
	6			▽					WT @ 6' BLS		0		0
	8										0		0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks:

Converted to Well: Yes ✓ No ____ Well I.D. #: CEF-16-EW01

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7292
DRILLING COMPANY: Gulf Atlantic
DRILLING RIG: Failing F-1
BORING NUMBER: EW02
DATE:
GEOLOGIST: Tom Nicters
DRILLER: Mark Murray

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
		NA	NA			Brown	Fine Grain Sand				0		0
	2												
											0		0
	4												
	6			▽					WT @ 6' BLS		0		0
	8										0		0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes ✓ No

Well I.D. #: CEF-16-EW02

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 779
DRILLING COMPANY: GULF ATLANTIC
DRILLING RIG: FAILING F-2

BORING NUMBER: IW-01
DATE: 8-27-98
GEOLOGIST: TOM NICETHA
DRILLER: MARK MURRAY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
		NA	NA						Posthole to				
	2	NA	NA			Brown	Fine Grain Sand		4' BIS	0	0	0	0
		NA	NA										
	4	NA	NA			Brown	Fine Grain Sand			0	0	0	0
		4 3	6" 6"										
	6	3 2	6" 6"	▽		Brown	Fine Grain Sand		Watertable @ 6' BIS	0	0	0	0
		4 3	2" 2"										
	8	2 2	5" 6"			Brown	Fine Grain Sand			0	0	0	0
		2 3	6" 6"										
	10	2 2	6" 6"			Brown	Fine Grain Sand			0	0	0	0
		3 1	0 0										
	12	1 1	0 2"			Brown	Fine Grain Sand - Mostly Rock			3	0	0	0
		2 2	0 0				"Backfill Rock"						
	14	2 2	0 4"			Brown	Fine Grain Sand - Most Rock			5	0	0	0
		3 3	0 0										
	16	4 5	0 6"			Brown	Fine Grain Sand Mostly Rock			2	0	0	0
		4 3	6" 6"										
	18	3 2	6" 6"			Brown/Tan	Fine Grain Sand		moist	1	0	1	0
		3 3	6" 6"										
	20	4 6	6" 6"			LT Tan	Fine Grain Sand		wet	1	0	0	0
		3 3	2" 4"										
	22	3 5	6" 6"			LT Tan Brown	Fine Grain Sand		wet	96	0	0	0
		6 7	0 6										
	24	8 8	6 6			LT Brown	Fine Grain Sand		wet	690	0	0	0
		8 9	6 6										

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: ▽ means water table @ 6' BIS

Drilling Area Background (ppm): 0 ppm

Converted to Well: Yes ✓ No ____ Well I.D. #: ____

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7792
DRILLING COMPANY: Gulf Atlantic
DRILLING RIG: Failing F2
BORING NUMBER: IW-01
DATE: 8-27-98
GEOLOGIST: Tom Nicofalk
DRILLER: Mark Murray

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	26	7/6	6"/6"			LT Brown	Fine Grain Sand		wet	≥900	0	0	0
		5/8	0"/2"										
	28	6/5	6"/6"			Tan	Fine Grain Sand		wet	≥900	0	0	0
		8/6	6/6										
	30	6/5	6/6			Tan	Fine Grain Sand		wet	≥900	0	0	0
		6/4	4/4										
	32	4/7	6/6			LT Brownish Tan	Fine Grain Sand		wet	≥760	0	0	0
		5/6	0/6										
	34	7/5	6/6			LT Brownish Tan	Fine Grain Sand		wet	≥900	0	0	0
		4/7	4/6										
	36	8/10	6/6			LT Brownish Tan	Fine Grain Sand		wet	184	0	0	0
		5/6	0/0										
	38	7/10	6/6			LT Brownish Tan	Fine Grain Sand		wet	100	0	0	0
		6/6	1/3										
	40	7/8	6/6			LT Brownish Tan	Fine Grain Sand		wet		0		0
		7/9	0/0										
	42	11/11	6/6			LT Tan/Brown Grey	Fine Grain Sand		moist				
		11/15	0/1										
	44	23/24	6/6			Whitish Tan	Fine Grain Sand		moist				
		8/9	0/0										
	46	11/14	6/6			Whitish Tan	Mostly White Fine Grain Sand		moist		0		0
		9/15	0/0										
	48	13/16	6/6			Whitish Tan	Fine Grain Sand Mostly White						
		11/12	0/0										
	50	15/16	6/6			Whitish/Gray	Fine Grain Sand				0		0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks:

Converted to Well: Yes ✓ No ____ Well I.D. #: ____

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7772
DRILLING COMPANY: Gulf Atlantic
DRILLING RIG: Failing F2
BORING NUMBER: IW-01
DATE: 8-28-98
GEOLOGIST: Tom Nicotera
DRILLER: Mark Murray

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
		10/12	0/0										
	52	17/22	6/6			whitish/yellow	Fine Grain Sand		wet		0	0	0
		8/9	0/4										
	54	7/6	6/6			whitish/Tan	Fine Grain Sand		wet		0	—	0
		8/7	3/3										
	56	8/8	6/6			LT Tan	Fine Grain Sand		wet		0	—	0
		17/12	0/0										
	58	12/13	6/6			LT Tan	Fine Grain Sand		wet		0	—	0
*		NA/NA	Pushed										
	60	NA/NA	Pushed			LT Tan	Fine Grain Sand		Shelby Tube (not taken)	—	—	—	—
		6/7	0/0										
	62	7/9	6/6			LT Tan	Fine Grain Sand		wet		0	—	—
		9/12	0/2										
	64	15/19	6/6			LT Tan	Fine Grain Sand		wet		0	—	—
		12/14	6/6										
	66	14/16	6/6			Tan	Fine Grain Sand		wet		0	0	0
		12/13	0/0										
	68	15/14	6/6			Tan	Fine Grain Sand		wet		0	—	—
		20/22	0/6										
	70	17/11	6/6			Tan	Fine Grain Sand		wet		0	—	—
		9/10	6/6										
	72	12/10	6/6			Tan	Fine Grain Sand		wet		0	—	0
		6/7	0/0										
	74	8/9	6/6			Tan	Fine Grain Sand		wet		0	—	0
		19/22	0/0										

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: * Collected Shelby Tube @ 58'-60' BLS. - Note (Just Sand Fell out) No Sample

Drilling Area Background (ppm): 0

Converted to Well: Yes ✓ No ____ Well I.D. #: ____

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7792
DRILLING COMPANY: Gulf Atlantic
DRILLING RIG: Failing F2
BORING NUMBER: IW01
DATE: 8-28-98
GEOLOGIST: Tom Nicotera
DRILLER: Mark Murray

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	76	24/26	6/6			Greyish/tan	Fine Grain Sand		wet		0	—	0
		6/6	0/0										
	78	13/14	6/6			Greyish/tan	Fine Grain Sand		wet		0	—	—
		17/21	0/4										
	80	12/14	6/6			Greyish/tan	Fine Grain Sand		wet		0	—	0
		8/9	4/4										
	82	11/14	6/2			Grey/tan	mix of Fine Grain Sand with some clay		wet		0	0	0
		10/10	0/0										
	84	11/12	6/6			Greyish/tan	Fine Grain Sand		wet		0	—	0
		5/5	0/0										
	86	5/7	6/6			Greyish/tan	Fine Grain Sand		wet		0	—	0
		6/6	0/0										
	88	8/14	6/[illegible]			Greyish/tan	Fine Grain Sand		wet		0	—	—
		18/17	0/0										
	90	28/19	6/6			Greyish/tan	Fine Grain Sand		wet		0	—	—
		6/6	0/0										
	92	8/11	6/6			Greyish/tan	Fine Grain Sand		wet		0	—	—
		6/8	0/0										
	94	10/13	6/6			Greyish/tan	Fine Grain Sand		wet		0	0	0
		12/17	0/0										
	96	15/15	6/6			Grey	Sand with Sandy Clay/Mostly Sand		moist	0	0	—	0
		11/15	0/6										
	98	24/32	6/6			Greyish/tan	Fine Grain Sand		moist	0	0	0	0
*		NA	Pushed										
	100	NA	Pushed			Greyish/tan	Fine Grain Sand			0	0	0	0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks: * Collected Shelby Tube @ 98'-100'

Converted to Well: Yes ✓ No ____ Well I.D. #: ____

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7292
DRILLING COMPANY: GULF ATLANTIC
DRILLING RIG: FAILING F-1

BORING NUMBER: PW01
DATE:
GEOLOGIST: TOM NICOTERA
DRILLER: MARK MURRAY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		NA	NA			Brown	med Grain Sand				0		0
2	2'												
4	4'												
6	6'			▽					WT @ 6' BLS.				
8	8'										0		0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes ✓ No ____ Well I.D. #: CEF-16-PW01

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 7292
DRILLING COMPANY: GULF ATLANTIC
DRILLING RIG: FAILING F-1

BORING NUMBER: PW02
DATE:
GEOLOGIST: TOM NICOTERA
DRILLER: MARK MURRAY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
		NA	NA			Brown	Fine Tomed Clayin Sand				0		0
	2												
	4												
	6			▽					WT @ 6' BLS		0		0
	8										0		0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

Converted to Well: Yes ✓ No ____ Well I.D. #: CEF-16-PW02

BORING LOG

PROJECT NAME: NAS Cecil Field
PROJECT NUMBER: 2292
DRILLING COMPANY: GULF ATLANTIC
DRILLING RIG: FAILING F.1

BORING NUMBER: fw03
DATE:
GEOLOGIST: Tom Nicotera
DRILLER: MARK MURRAY

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
		NA	NA			Brown	Fine Grain Sand				0		0
	2												
	4												
	6			▽					WT @ 6' BLS.		0		0
	8'										0		0

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 0

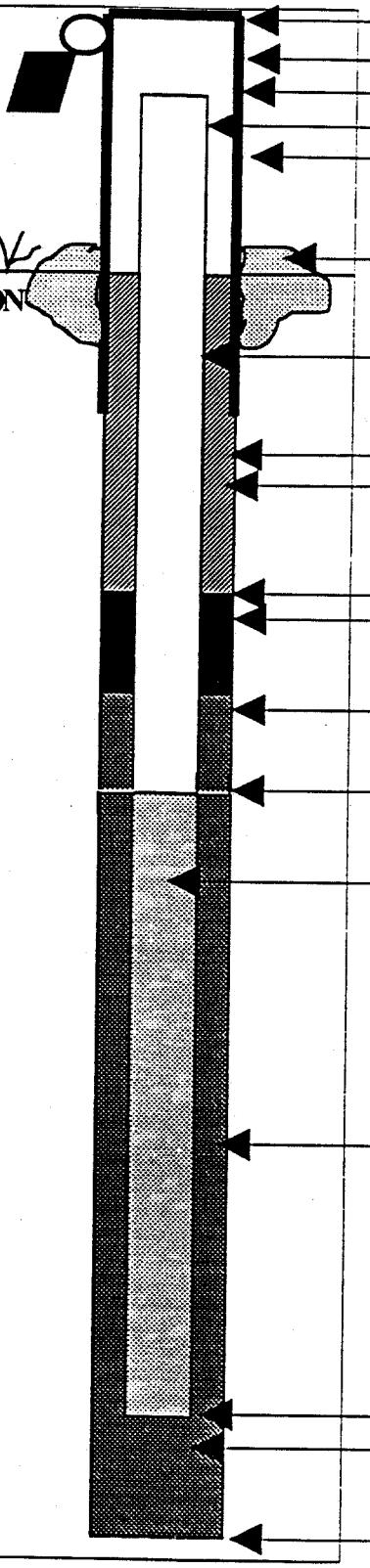
Converted to Well: Yes ✓ No

Well I.D. #: CEF-16-fw03

BORING NO.: CEF-16-GW41

OVERBURDEN MONITORING WELL SHEET

PROJECT	NAS Cecil Field	LOCATION:	Site 16	DRILLER	Mark Murray
PROJECT NO.	7292	BORING	CEF-16-GW41S	METHOD: ~~DPT~~	HSA
ELEVATION		DATE		DRILLING	
FIELD GEOLOGIST	Tom Nicotera			DEVELOPMENT: NA	



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: Neat Cement Grout

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER:

TYPE OF SEAL: 5% Bentonite + Neat Cement Grout

ELEVATION / DEPTH OF SEAL: 7.0'

TYPE OS SEAL: Bentonite

DEPTH TOP OF SAND PACK: 8.0'

ELEVATION / DEPTH TOP OF SCREEN: 100'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: 010 / 5.0'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 115.0'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 115.6

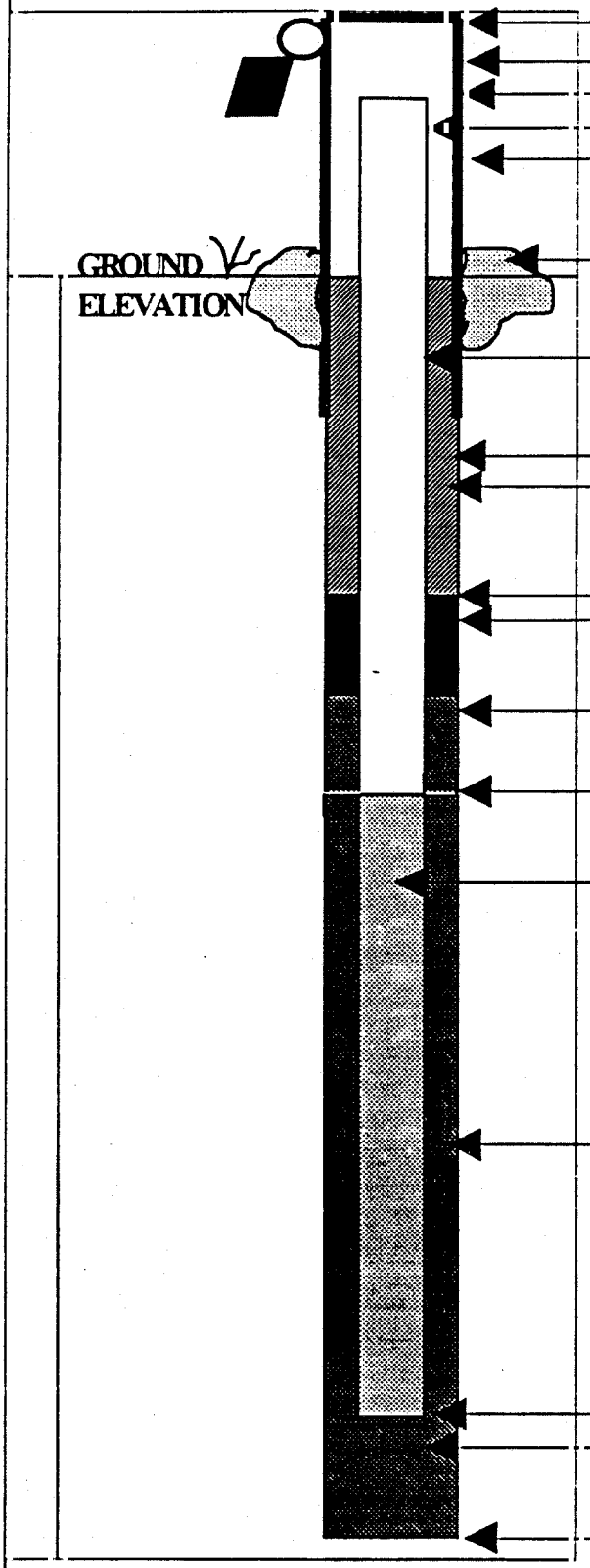
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand

ELEVATION / DEPTH OF HOLE: 115.6'

BORING NO. CEF-16-GW4

OVERBURDEN MONITORING WELL SHEET

PROJECT	NAS Cecil Field	LOCATION:	Site 16	DRILLER	Mark Murphy
PROJECT NO.	2292	BORING	CEF-16-GW42F	METHOD: ~~DPT~~	HSA
ELEVATION		DATE		DRILLING	
FIELD GEOLOGIST	Tom Mitsea			DEVELOPMENT: ~~NA~~	



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: Neat cement grout

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 6 1/4"

TYPE OF SEAL: 5% Bentonite + Neat cement grout

ELEVATION / DEPTH OF SEAL: 124.0'

TYPE OS SEAL: Bentonite

DEPTH TOP OF SAND PACK: 25.0'

ELEVATION / DEPTH TOP OF SCREEN: 127.0'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: .010 / 5.6'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 132.0'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 132.6'

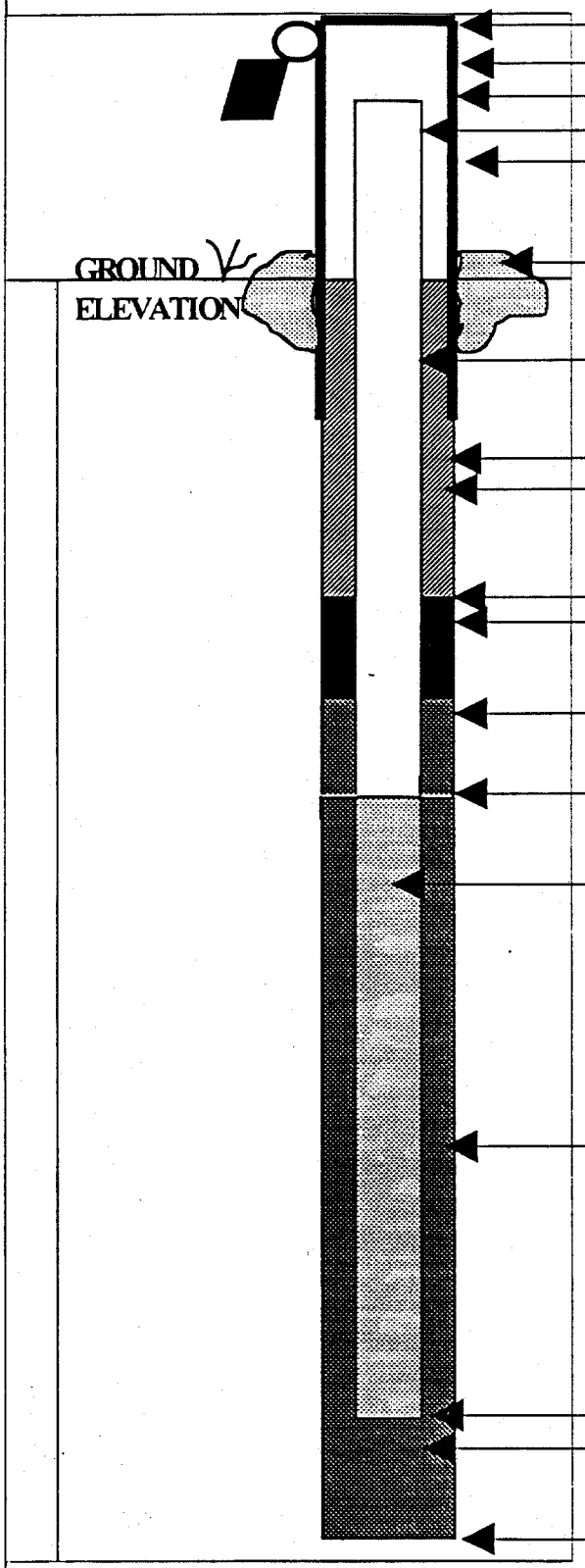
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand

ELEVATION / DEPTH OF HOLE: 132.6'

BORING NO. CEF-16-GW43s

OVERBURDEN MONITORING WELL SHEET

PROJECT	NAS Cecil Field	LOCATION:	Site 16	DRILLER	Mark Murphy
PROJECT NO.	7292	BORING	CEF-16-GW43S	METHOD:	~~DPT~~ HSA
ELEVATION		DATE		DRILLING	
FIELD GEOLOGIST	Tom Nicotera			DEVELOPMENT:	NA



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: Neat cement grout

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER:

TYPE OF SEAL: 5% Bentonite + neat cement grout

ELEVATION / DEPTH OF SEAL: 17.0'

TYPE OS SEAL: Bentonite

DEPTH TOP OF SAND PACK: 8.0'

ELEVATION / DEPTH TOP OF SCREEN: 10.0'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: .010 / 5.0'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 15.0'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 15.6'

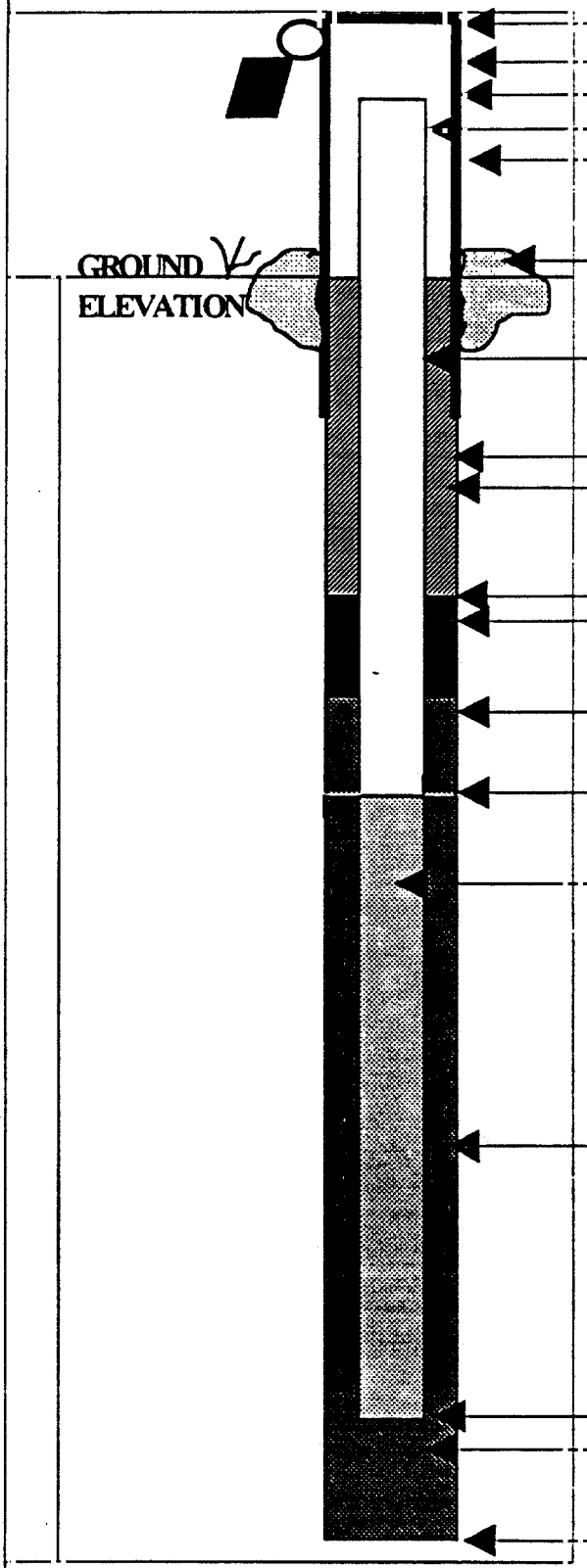
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand

ELEVATION / DEPTH OF HOLE: 15.6'

BORING NO. CEF-16-GW44

OVERBURDEN MONITORING WELL SHEET

PROJECT	NAS Cecil Field	LOCATION:	Site 16	DRILLER	Mark Murphy
PROJECT NO.	7792	BORING	CEF-16-GW44I	METHOD: ~~DPT~~	HSA
ELEVATION		DATE		DRILLING	
FIELD GEOLOGIST	Tom McCoteer			DEVELOPMENT: ~~NA~~	



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: Neat cement Grout

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 6¼"

TYPE OF SEAL: 5% Bentonite + Neat Cement Grout.

ELEVATION / DEPTH OF SEAL: 124.0'

TYPE OS SEAL: Bentonite

DEPTH TOP OF SAND PACK: 25.0'

ELEVATION / DEPTH TOP OF SCREEN: 127.0'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: .010 / 5.0'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 132.0'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 132.1'

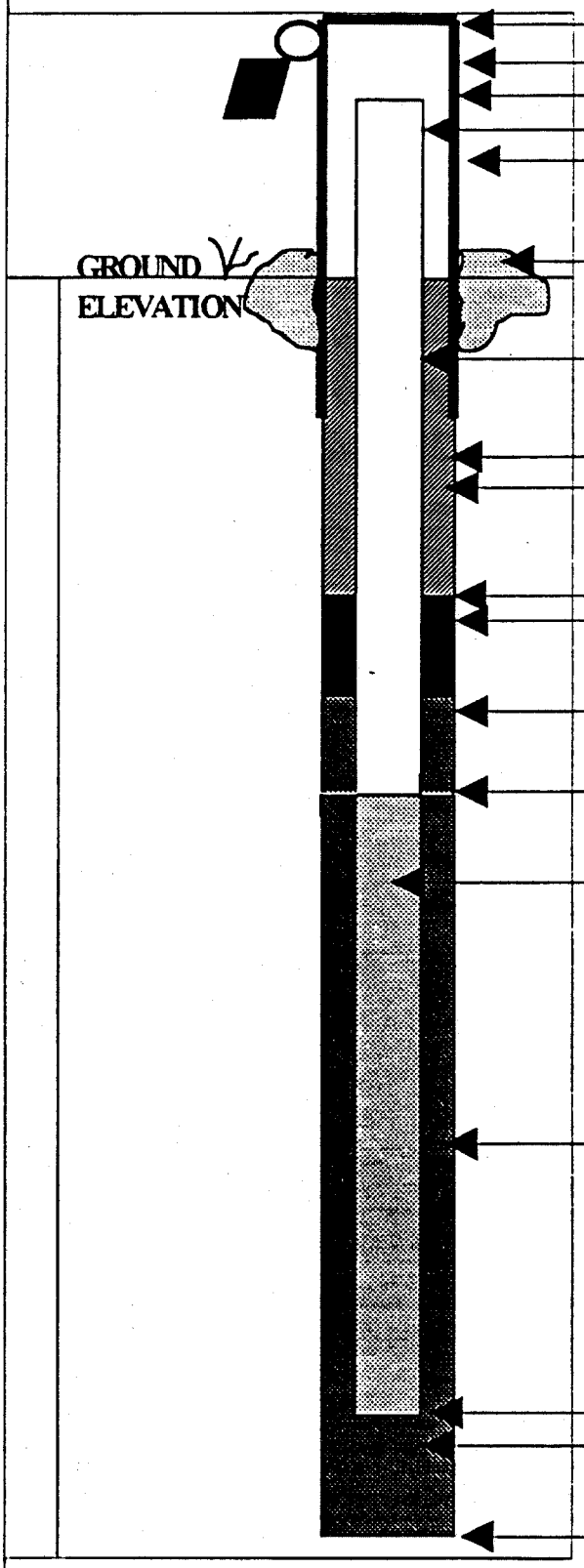
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand

ELEVATION / DEPTH OF HOLE: 132.1'

BORING NO. CEF-16-45I

OVERBURDEN MONITORING WELL SHEET

PROJECT	NAS Cecil Field	LOCATION:	Site 16	DRILLER	MARK MURRAY
PROJECT NO.	2292	BORING	CEF-16-45I	METHOD: ~~DPT~~	HSA
ELEVATION		DATE		DRILLING	
FIELD GEOLOGIST	Tom Nicotera			DEVELOPMENT: ~~NA~~	



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: Neat Cement Grout

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Stainless Steel

BOREHOLE DIAMETER: 6 1/4"

TYPE OF SEAL: Bentonite Slp + Neat Cement Grout

ELEVATION / DEPTH OF SEAL: 124.0'

TYPE OS SEAL: Bentonite

DEPTH TOP OF SAND PACK: 25.0'

ELEVATION / DEPTH TOP OF SCREEN: 127.0'

TYPE OF SCREEN: Stainless Steel

SLOT SIZE X LENGTH: .010 / 5.0'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 132.6'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 132.6'

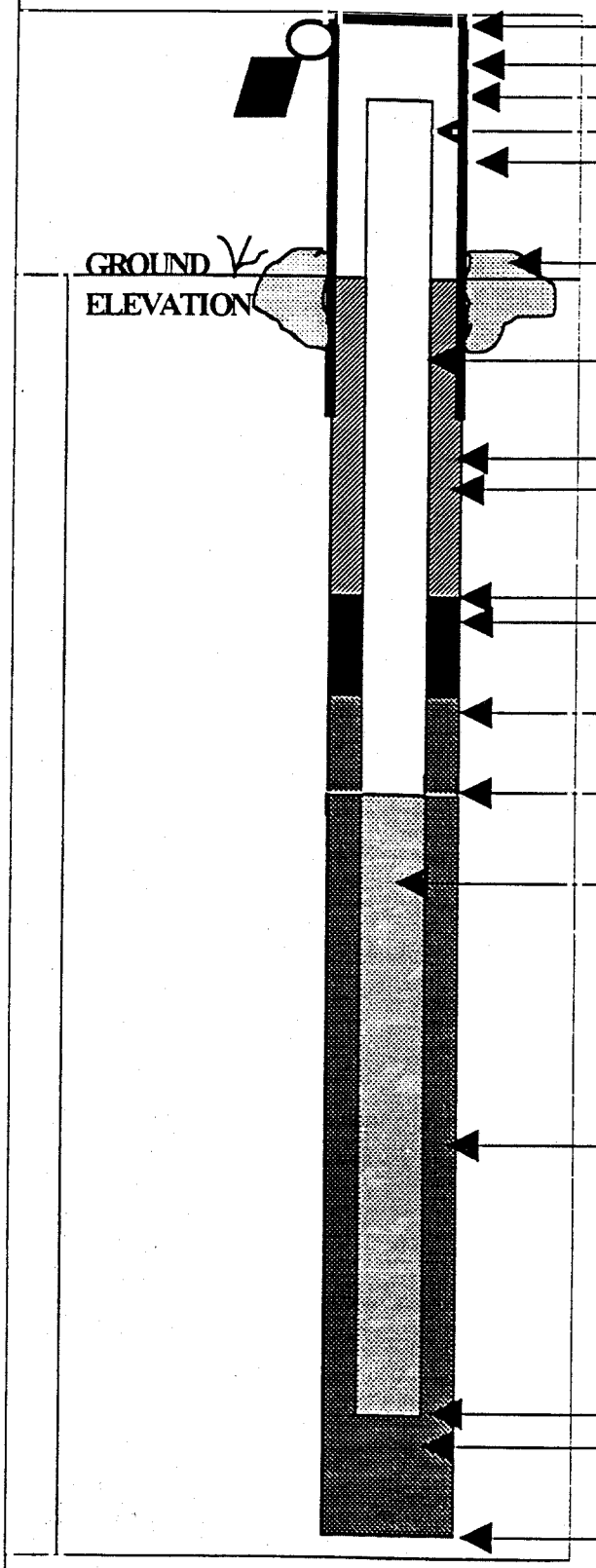
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand

ELEVATION / DEPTH OF HOLE: 132.6'

BORING NO.: EW-1

OVERBURDEN MONITORING WELL SHEET

PROJECT	NAS Cecil Field	LOCATION:	Site 16	DRILLER	Mark Murphy
PROJECT NO.	7792	BORING	EW01	METHOD: ~~DPT~~	HSA
ELEVATION		DATE	8-28-98	DRILLING	
FIELD GEOLOGIST	Tom Nicotera			DEVELOPMENT: ~~NA~~	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE: 1'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: Neat cement Bentonite

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 6¼"

TYPE OF SEAL: Bentonite

ELEVATION / DEPTH OF SEAL: 10.0

TYPE OS SEAL: Bentonite ↑

DEPTH TOP OF SAND PACK: 2.0

ELEVATION / DEPTH TOP OF SCREEN: 13.0

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: .010 / 4'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 17.0

ELEVATION / DEPTH BOTTOM OF SAND PACK: 17.6

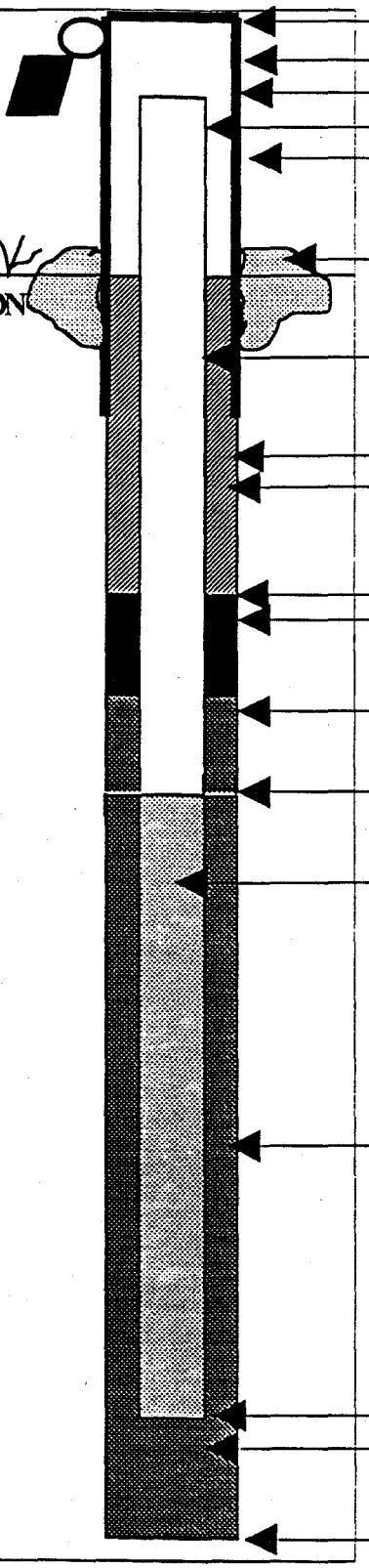
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand

ELEVATION / DEPTH OF HOLE: 17.6

BORING NO.: EW02

OVERBURDEN MONITORING WELL SHEET

PROJECT	NAS Cecil Field	LOCATION:	SITE 16	DRILLER	MARK MURRAY
PROJECT NO.	2292	BORING	EW02	METHOD: ~~BPT~~	HSA
ELEVATION		DATE	8-28-98	DRILLING	
FIELD GEOLOGIST	Tom NICETERA			DEVELOPMENT: ~~NA~~	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE: 1'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: ~~Neat Cement Grout~~ Bentonite

TYPE OF SURFACE SEAL: Portland Cement + Bentonite

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 6 1/4"

TYPE OF SEAL: Bentonite

ELEVATION / DEPTH OF SEAL: 10.0

TYPE OS SEAL: Bentonite

DEPTH TOP OF SAND PACK: 2.0

ELEVATION / DEPTH TOP OF SCREEN: 13.0

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: .010 / 4'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 17.0

ELEVATION / DEPTH BOTTOM OF SAND PACK: 17.6

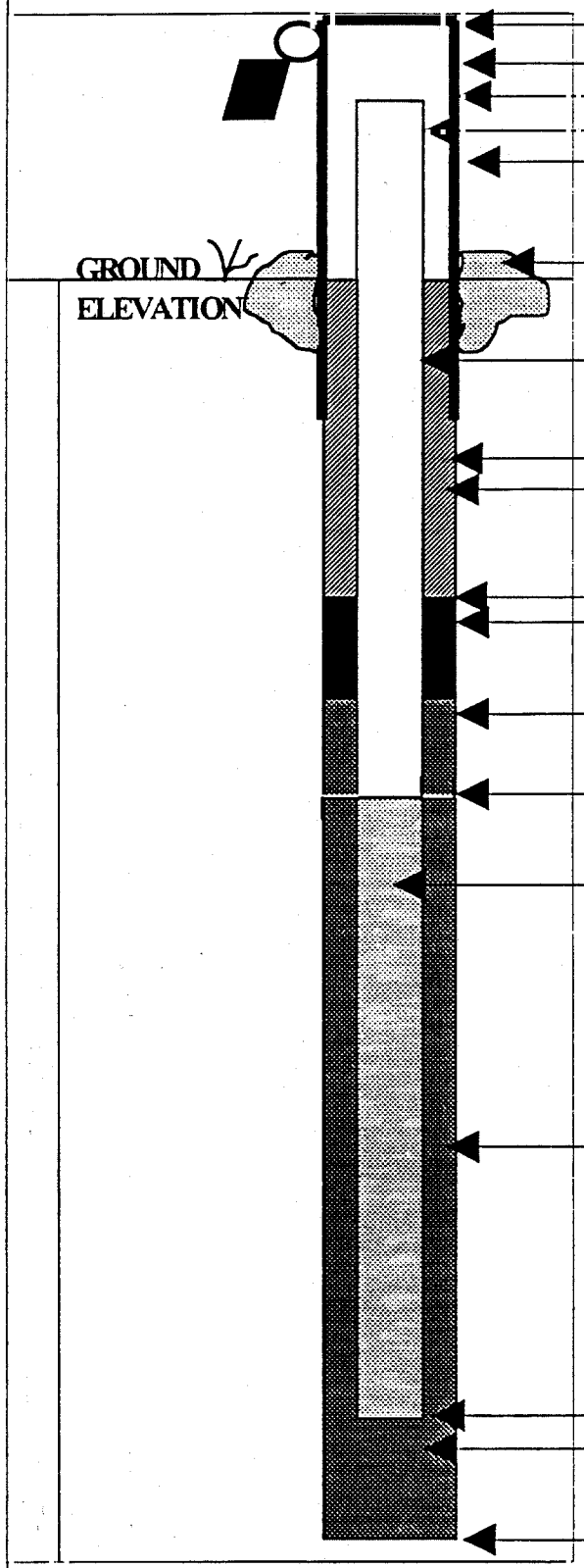
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand

ELEVATION / DEPTH OF HOLE: 17.6

BORING NO.: IW01

OVERBURDEN MONITORING WELL SHEET

PROJECT	NAS Cecil Field	LOCATION:	Site 16	DRILLER	Mark Murray
PROJECT NO.	2792	BORING	IW01	METHOD:	Mud Rotary
ELEVATION		DATE	8-29-98	DRILLING	
FIELD GEOLOGIST	Tom Nicoterra			DEVELOPMENT:	NA



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: NEAT cement Grout

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 6¼"

TYPE OF SEAL: 5% Bentonite + NEAT Cement Grout

ELEVATION / DEPTH OF SEAL: 192.0'

TYPE OS SEAL: Bentonite

DEPTH TOP OF SAND PACK: 9[illegible]'

ELEVATION / DEPTH TOP OF SCREEN: 195.0'

TYPE OF SCREEN: ~~Sch~~ PVC

SLOT SIZE X LENGTH: .010 / 5'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 1100.0'

ELEVATION / DEPTH BOTTOM OF SAND PACK: 1100.6'

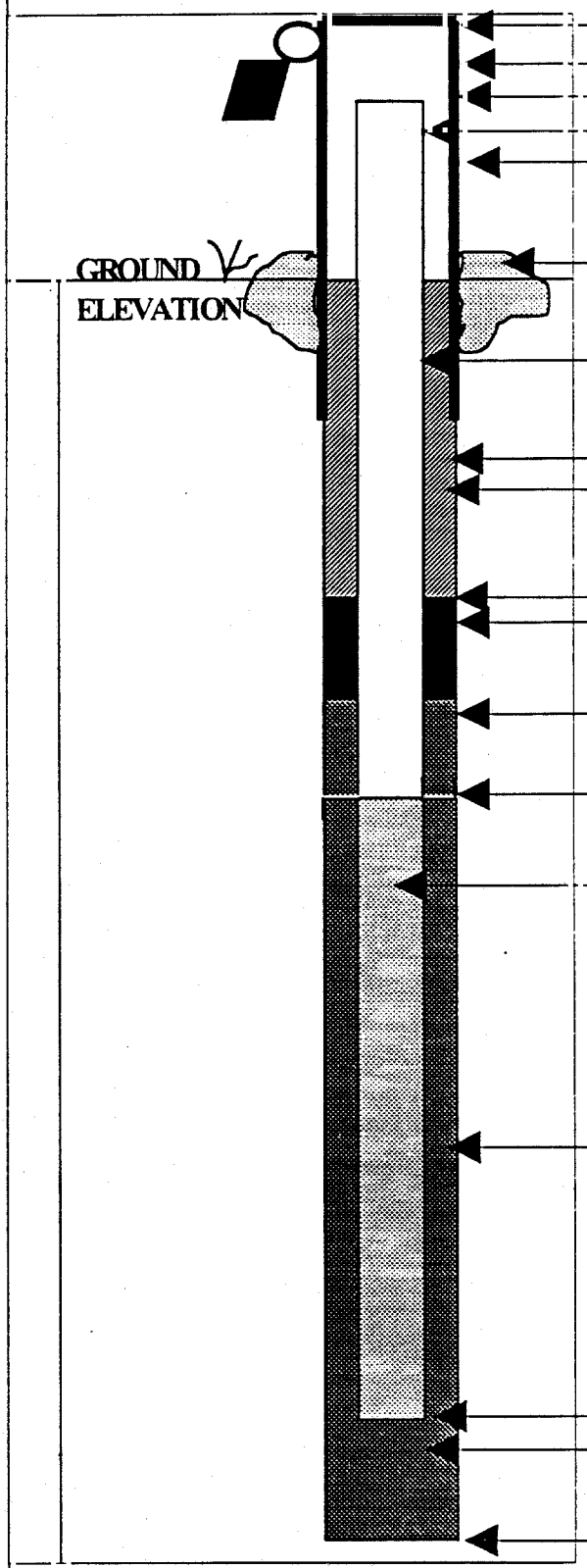
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand

ELEVATION / DEPTH OF HOLE: 1100.6'

BORING NO.: IW02

OVERBURDEN MONITORING WELL SHEET

PROJECT	NAS Cecil Field	LOCATION:	Site 16	DRILLER	Mark Miller
PROJECT NO.	7292	BORING	IW02	METHOD: ~~DPT~~	HSA
ELEVATION		DATE	8-29-98	DRILLING	
FIELD GEOLOGIST	Tom Nicotera			DEVELOPMENT: ~~NA~~	



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: Neat Cement Grout

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 6¼"

TYPE OF SEAL: 5% Bentonite + neat cement Grout

ELEVATION / DEPTH OF SEAL: 151.0'

TYPE OS SEAL: Bentonite

DEPTH TOP OF SAND PACK: 53.0'

ELEVATION / DEPTH TOP OF SCREEN: 155.0'

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: .010 '2'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 157.0

ELEVATION / DEPTH BOTTOM OF SAND PACK: 157.6

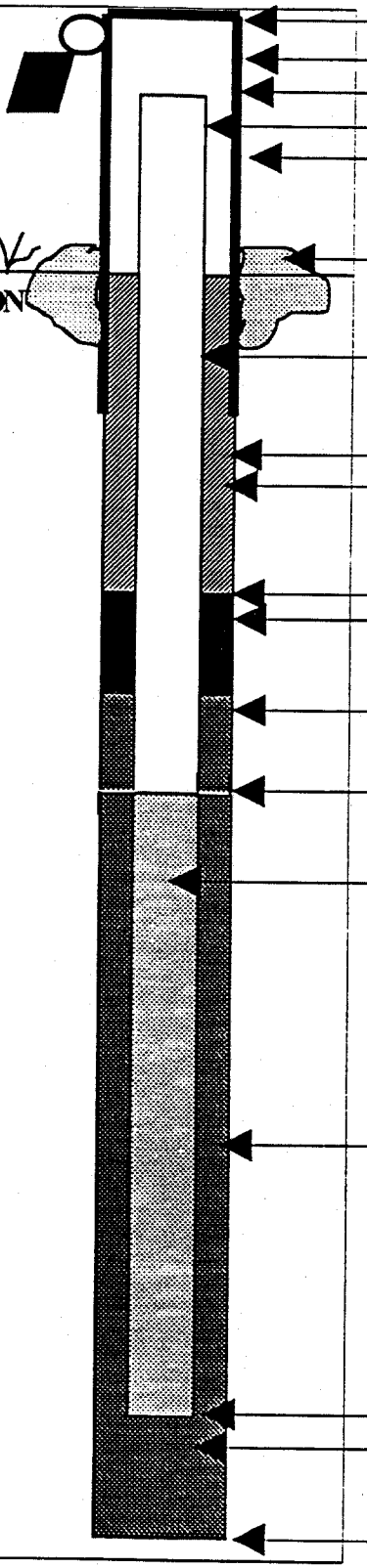
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand

ELEVATION / DEPTH OF HOLE: 157.6

BORING NO.: PW01

OVERBURDEN MONITORING WELL SHEET

PROJECT	NAS Cecil Field	LOCATION:	Site 16	DRILLER	MARK MURPHY
PROJECT NO.	7792	BORING	PW01	METHOD: ~~DPT~~	HSA
ELEVATION		DATE	8-28-98	DRILLING	
FIELD GEOLOGIST	Tom NICOTERA			DEVELOPMENT: ~~NA~~	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE: 1'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING: ~~[illegible]~~

TYPE OF SURFACE SEAL: 1 BAT Cement Grout + Bentonite

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 6 1/4"

TYPE OF SEAL: Bentonite

ELEVATION / DEPTH OF SEAL: 10.0

TYPE OS SEAL: Bentonite

DEPTH TOP OF SAND PACK: 2.0

ELEVATION / DEPTH TOP OF SCREEN: 13.0

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: .010 / 5'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 18.0

ELEVATION / DEPTH BOTTOM OF SAND PACK: 18.6

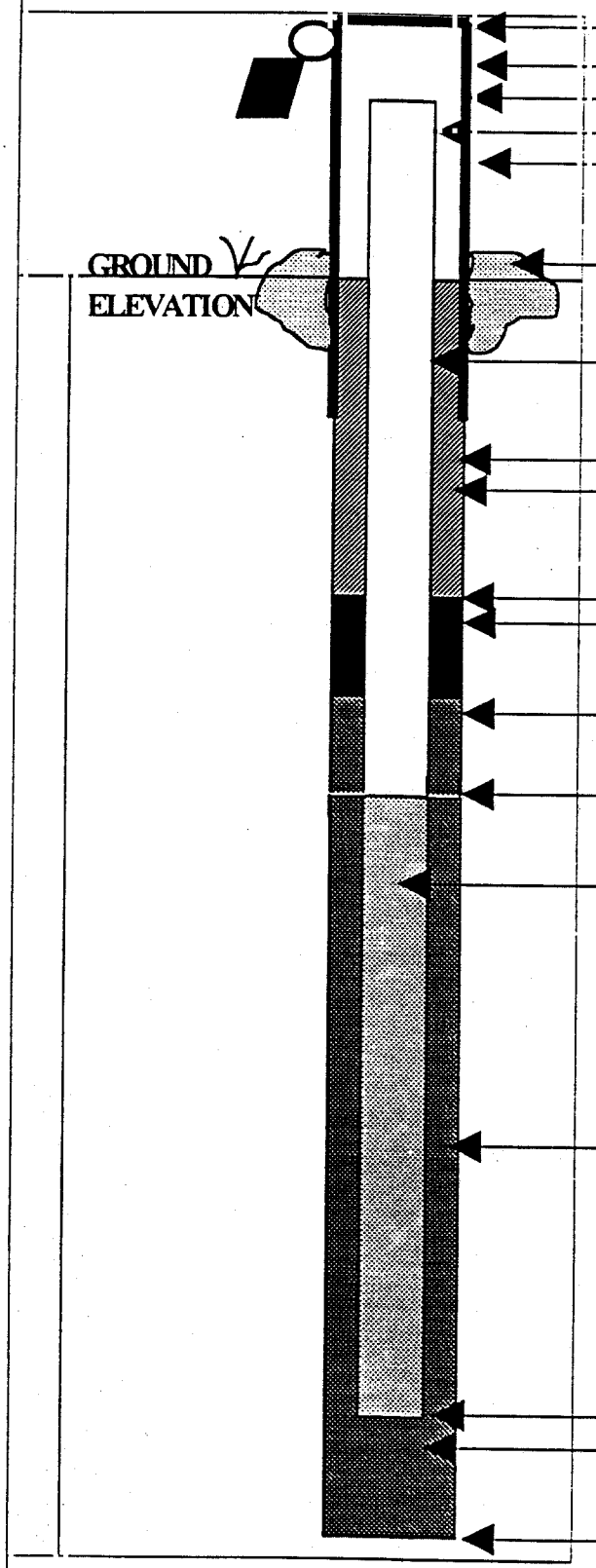
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand

ELEVATION / DEPTH OF HOLE: 18.6

BORING NO.: PW02

OVERBURDEN MONITORING WELL SHEET

PROJECT	NAS Cecil Field	LOCATION:	Site 16	DRILLER	Mark Murphy
PROJECT NO.	7292	BORING	PW02	METHOD: ~~DPT~~	HSA
ELEVATION		DATE	8-28-98	DRILLING	
FIELD GEOLOGIST	Tom McOtera			DEVELOPMENT: ~~NA~~	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE: 1'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: Neat Cement Grout + Bentonite

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 6 1/4"

TYPE OF SEAL: Bentonite

ELEVATION / DEPTH OF SEAL: 10.0

TYPE OS SEAL: Bentonite

DEPTH TOP OF SAND PACK: 2.0

ELEVATION / DEPTH TOP OF SCREEN: 13.0

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: .010 / 5'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 18.0

ELEVATION / DEPTH BOTTOM OF SAND PACK: 18.6

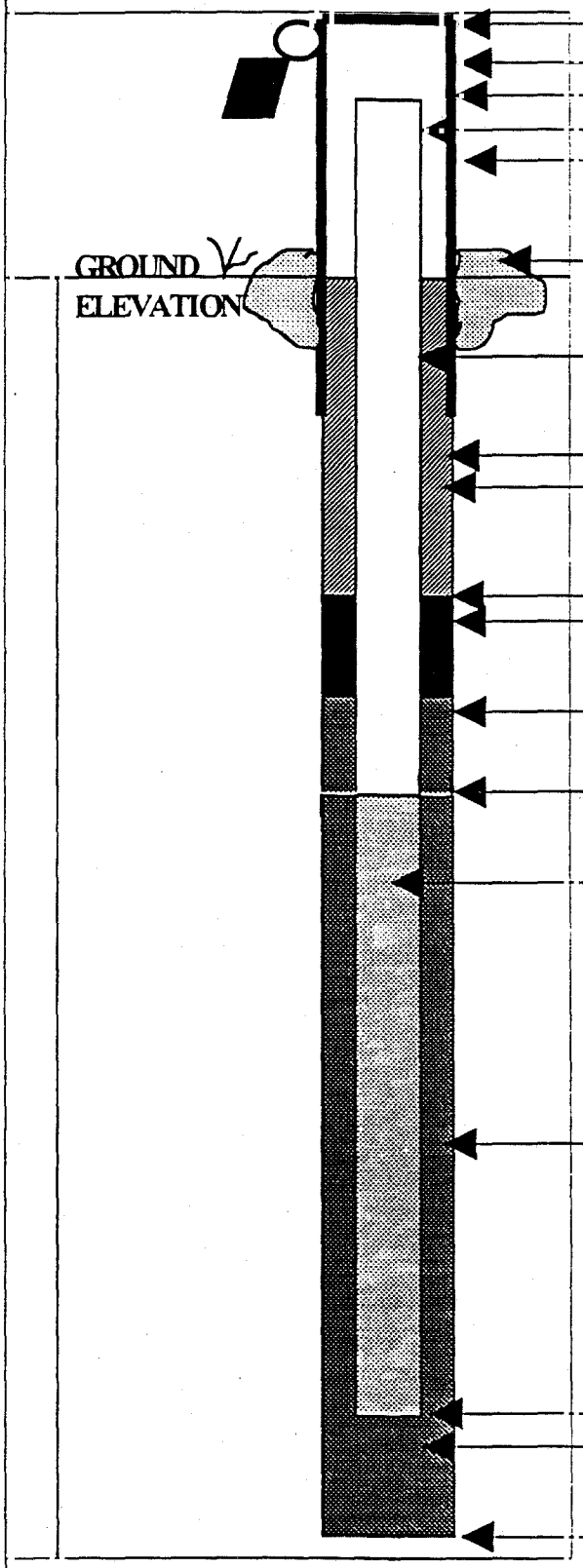
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand

ELEVATION / DEPTH OF HOLE: 18.6

BORING NO.: PW 03

OVERBURDEN MONITORING WELL SHEET

PROJECT	NAS Cecil Field	LOCATION:	Site 16	DRILLER	MARK MURRAY
PROJECT NO.	7792	BORING	PW 03	METHOD: ~~DPT~~	HSA
ELEVATION		DATE	5-28-98	DRILLING	
FIELD GEOLOGIST	Tom McCORA			DEVELOPMENT: ~~NA~~	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE: 1'

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: Neat Cement Grout + Bentonite

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC

BOREHOLE DIAMETER: 6¼"

TYPE OF SEAL: Bentonite

ELEVATION / DEPTH OF SEAL: 10.0

TYPE OS SEAL: Bentonite

DEPTH TOP OF SAND PACK: 2.0

ELEVATION / DEPTH TOP OF SCREEN: 13.0

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: .010 / 5'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 18.0

ELEVATION / DEPTH BOTTOM OF SAND PACK: 18.6

TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 Sand

ELEVATION / DEPTH OF HOLE: 18.6

WELL DEVELOPMENT SHEET

PROJECT SITE NAME:	NAS Cecil Field	SITE/LOCATION	Site 16
PROJECT NUMBER:	7792	WELL ID.:	EW-01
WEATHER:		DATE:	8-28-98
STATIC WATER LEVEL:	6.01	PERSONNEL:	
TOTAL WELL DEPTH:	7.61	WELL TYPE:	(PVC), (S.S.), or OTHER
ONE CASING VOLUME:	0.103		
START TIME:	16:55	MEASURING DEVICE:	Horiba U-10
END TIME:	17:25	ADJUSTMENT FACTOR:	

( ) DOMESTIC WELL, ( ) MONITORING WELL, (X) OTHER Vapor extraction

METHOD & REMARKS

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
Initial	17:00	Lt. Brown	6.5	.58	260	3.7	32.0	0.0
2 gal	17:25	cloudy	6.5	.61	230	3.7	35.0	0.0

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS:

SIGNATURE(s): Tom Nicholson

PAGE 1 OF 1

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: NAS Cecil Field
PROJECT NUMBER: 7092
WEATHER:
STATIC WATER LEVEL: 6.0'
TOTAL WELL DEPTH: 7.0'
ONE CASING VOLUME: 0.163
START TIME: 16:13
END TIME: 16:56

SITE/LOCATION: Site 16
WELL ID.: EW-02
DATE: 8-28-98
PERSONNEL:
WELL TYPE: (PVC), (S.S.), or OTHER
MEASURING DEVICE: Horiba u-10
ADJUSTMENT FACTOR:

( ) DOMESTIC WELL, ( ) MONITORING WELL, (X) OTHER VAPOR EXTRACTION

METHOD & REMARKS

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
Initial	16.15	Dk Brown	6.2	1.0	999	1.7	30.0	0.0
5 gal	16:30	Dk Brown	6.5	.78	999	2.0	30.0	0.0
10 gal	16:35	Brown	6.5	.73	999	2.5	29.0	0.0
15 gal	16:40	Brown	6.5	.73	999	3.0	28	0.0
20 gal	16:45	Lt. Brown	6.5	.73	300	0.7	28	0.0
25 gal	16:50	Lt. Brown	6.5	.73	290	0.6	28	0.0

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS:

SIGNATURE(s): Tom Nicoter

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: NAS cecil Field
SITE/LOCATION: Site 16
PROJECT NUMBER:
WELL ID.: IW-01
WEATHER: partly cloudy / Temp = 88°F / wind calm
DATE: 8-30-98
STATIC WATER LEVEL: 8.41 Toc.
PERSONNEL: Tom Nicotera
TOTAL WELL DEPTH: 102.00 Toc.
WELL TYPE: (PVC), (S.S.), or OTHER
ONE CASING VOLUME:
START TIME: 10:30
MEASURING DEVICE: Horiba-U10
END TIME:
ADJUSTMENT FACTOR:

( ) DOMESTIC WELL, (X) MONITORING WELL, ( ) OTHER

METHOD & REMARKS ~~Submersible pump~~ Surface pump (Briggs & Stratton 2cl 5hp) did not work. Used small submersible pump.

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
10 gal	10:35	cloudy	10.7	1.8	40	5.3	28	0.1

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS:

SIGNATURE(s): Tom Nicotera

PAGE 1 OF 1

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: NAS cecil field
PROJECT NUMBER:
WEATHER:
STATIC WATER LEVEL: 9.81 TOC
TOTAL WELL DEPTH: 58.00 TOC
ONE CASING VOLUME:
START TIME: 09:45
END TIME: 10:10

SITE/LOCATION: Site 16
WELL ID.: IW02
DATE: 8-30-98
PERSONNEL: Tom Nicotera
WELL TYPE: (PVC), (S.S.), or OTHER
MEASURING DEVICE: Horiba-U-10
ADJUSTMENT FACTOR:

( ) DOMESTIC WELL, (X) MONITORING WELL, ( ) OTHER

METHOD & REMARKS: RATE = 4.5 gal/min.

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
20 gal	09:50	cloudy	5.4	.08	630	0.9	25°	0.0
40 gal	09:55	cloudy	5.4	.06	990	10.0	25°	0.0
60 gal.	10:00	cloudy	5.3	.06	90	1.5	25°	0.0
80 gal.	10:05	clear	5.3	.06	40	1.4	25°	0.0
100 gal	10:10	clear	5.3	.06	30	1.4	25°	0.0

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted.

ADDITIONAL COMMENTS:

SIGNATURE(s): Tom Nicotera

PAGE 1 OF 1

APPENDIX G

COST ESTIMATE

OU 7/Site 16 – Groundwater Remedial Design
NAS Cecil Field, Jacksonville, Florida
CTO 0051

Report Format Information

The cost estimate was developed utilizing SUCCESS Estimating Software, Version 3.1.

The Tri-Services Work Breakdown Structure (WBS) has been used to construct the estimate.

Costs shown under category heading "OTHER1" are subcontracted items.

Markups are summarized on SUCCESS report D.

Cost Estimate Assumptions

System installation will require 9 weeks, based on the tasks identified below.

Mobilization/Concrete Demolition/Survey	1 week
Concrete Foundation	3 days (+14 days cure time)
Well Installation [1]	3 weeks
The vapor barrier will also be installed at this time.	
System Installation (including piping) [2]	3 weeks
Electrical [2]	3 weeks
System Startup/Testing [3]	1 week
Replace concrete [3]	1 week
Demobilization/Vegetation/Site Survey	1 week

1. Well installation will begin while concrete foundation cures.
2. Tasks will be performed concurrently.
3. Tasks will be performed concurrently.

Time and costs associated with development and submission of pre- and post-construction documents are not included in the estimated project duration and cost.

The following markups have been added to the estimated project costs within the SUCCESS estimate to arrive at a Total Direct Cost for each line item. Note that these markups are shown as "Prime Contract PRIME Markups" on Report E.

Labor - 40% (30% Overhead, 10% G&A)
Material - 10% (G&A)
Subcontractor - 15% (10% G&A, 5% Profit)

The following markups have been added to the Total Direct Cost of each line item (Subtotal plus Prime Contractor Markups). These markups are compounded and are shown as Level Markups on Report E.

Labor - 85% (75% Indirects, 10% Profit)
Material and Equipment - 10% (Profit)
Labor, Material, Equipment - 3% (Health and Safety Monitoring)

Florida State sales tax in the amount of 6% was added to material costs.

It was assumed that the RAC would not incur any costs for site utilities that will be used during project construction (i.e., electricity, phone, and water).

The RAC will utilize in-house personnel for the project oversight (Field - Site Supervisor, Job Foreman, Field Geologist) (Office - Project Manager, Project Engineer). Field crew members will be hired locally. The Site Supervisor and Job Foreman are dedicated to the project full time (9 weeks). The remaining personnel are dedicated half time (4.5 weeks). The Field Geologist will be on site only during well installation (3 weeks).

Per diem will be paid to field oversight personnel for the entire project. The Project Manager and Project Engineer will each visit the site twice during the project (2 days each visit), and will be paid per diem for this time.

Field work will be performed in standard construction clothing (hard hat, steel toed work boots, coveralls).

No permits are required to perform the work necessary for this project.

Two of the air sparging wells will be installed to 100 feet, two to 60 feet bgs. The mud rotary drilling method will be used to install the sparging wells. Two existing sparging wells from the pilot-study will also be used, with some minor modifications.

Nineteen new extraction wells will be installed by hollow stem auger (HSA) to 7 feet bgs. Two existing extraction wells from the pilot-study will also be used, with some minor modifications.

Sufficient water of suitable quality is available nearby for drilling.

Underground PVC piping will be installed 2 feet bgs. Select fill (material < 1 inch diameter) will be used for bedding. Material excavated from the trench that meets this requirement may be used as bedding. Backfill will be placed in 12-inch lifts and compacted.

Mud and drill cuttings will be generated during sparging and extraction well installation. All cuttings and mud will be containerized and disposed off site.

Air sparging wells will be developed, and development water will be collected and containerized for off-site disposal.

The drill rig will be decontaminated between wells with a pressure washer. Water will be allowed to evaporate out of decon pad area. No off-site disposal of decon water is anticipated.

Three new piezometers with flush-mount protective casings will be installed in the concrete area adjacent to Building 313. The 3 existing piezometers will be cut so that they are below ground surface and fitted with a cap and flush-mount protective casing.

A 30-mil vapor barrier will be installed in the grass-covered area north of Building 313. The vapor barrier will be installed 2 feet bgs, overlain by a geonet/geotextile to facilitate drainage. The area will be slopped towards a perforated PVC pipe that will drain the area to a nearby stormwater pipe.

All electrical work will be subcontracted. Electric is available from the nearby building.

The RAC is responsible for operation and maintenance for the first year only. This necessitates two full-time laborers for the first week during system startup, weekly system checks for the remainder of the first month (one laborer for 2 days), and monthly system checks for the remainder of the year (one laborer for 2 days). Material costs for system maintenance during the first year were assumed to equal 5 percent of the system installation cost. The labor and material costs include costs associated with soil vapor and off-gas sample collection.

Generation of hazardous water from the moisture separator, compressor receiver tanks, and filters was assumed at 15 gallons per day.

The 3 permanent piezometers will be sampled once per week during the first month of system operation. Six additional samples at start-up and 2 additional samples during each month of operation will be collected from temporary piezometers. Samples will be collected in summa canisters and analyzed at a fixed-based laboratory for TCE; TCA; 1,2-DCE; 1,1-DCE; Vinyl Chloride.

Twelve off-gas samples will be collected during the first week of system operation, from various locations pre- and post-treatment. Two samples will collected each month thereafter. Samples will be collected in summa canisters and analyzed at a fixed-based laboratory for TCE; TCA; 1,2-DCE; 1,1-DCE; Vinyl Chloride.

Electrical usage cost for the first year was included in the cost estimate as an operation and maintenance item. There will be no cost associated with the water supply necessary for the off-gas treatment system.

Carbon usage for the first year of operation was estimated at 18, 2000 pound units, or 36,000 pounds of carbon.

All environmental sampling and analysis for natural attenuation parameters will be performed by Tetra Tech NUS. Costs have not been included in the estimate.

A--SUMMARY REPORT
SUBMITTAL: FINAL
SOFTWARE VERSION: SUCCESS 3.1
REPORT WRITER VERSION: R&R 6.0
C:\SC31\SYSTEM\NAVFAC01.RP5 REPORT REVISION 23 MARCH 1998

CONSTRUCTION CONTRACT:
DATABASE USED:
PRINTING DATE: 11 March 1999
Page No. 1
ESTIMATE NAME: FINAL DESIGN ESTIMATE

PROJECT: SITE 16/OU7 - AIR SPARGING/VAPOR EXTRACTION SYSTE
LOCATION: NAS CECIL FIELD, JACKSONVILLE, FLORIDA
ESTIMATOR:
PROJECT SIZE: 1.00 LS
CONSTRUCTION FUNDS AVAILABLE: 0 USD
CURRENCY: DOLLARS

CAT CODE:
UIC:
PROJECT #: CTO 051
DATE OF ESTIMATE: 3/12/99
BID DATE:

WBS CODE	DESCRIPTION	COST/WBS BASED ON 1 LS	COST/ WBS UNIT	TOTAL MARKED UP COSTS MATL	LABOR	EQUIP	OTHER1	TOTAL
	SITE 16/OU7 - AIR SPARGING/VAPOR EXTRACTION SYSTEM , PROJECT TOTALS							**712,000**
	PROJECT SUBTOTALS			202,948	316,511	12,963	179,687	712,109
MOBILIZATION				**623**	**11,676**	**2,075**	**2,688**	**17,062**
3301---MOBILIZE CONSTRUCTION EQUIPMENT/FACILITIES				0	297	647	575	1,519
3301---MOBILIZE PERSONNEL				0	9,337	0	0	9,337
3301---SETUP/CONSTRUCT TEMPORARY FACILITIES				623	2,041	1,020	0	3,684
3301---TEMPORARY UTILITIES				0	0	408	0	408
3301---CONSTRUCTION LAYOUT				0	0	0	2,113	2,113
MONITORING, SAMPLING, TESTING, AND ANALYSIS				**0**	**0**	**0**	**1,714**	**1,714**
3302---MONITORING WELLS				0	0	0	1,714	1,714
SITE WORK				**3,008**	**11,564**	**5,890**	**0**	**20,463**
3303---DEMOLITION				203	7,043	3,630	0	10,876
3303---EARTHWORK				2,805	4,521	2,260	0	9,587
PHYSICAL TREATMENT				**148,915**	**72,821**	**3,313**	**78,127**	**303,176**
3313---AIR SPARGING SYSTEM INSTALLATION				52,649	19,707	0	9,338	81,694
3313---VAPOR EXTRACTION SYSTEM INSTALLATION				87,026	39,539	0	5,967	132,532
3313---SYSTEM ELECTRICAL INSTALLATION				0	0	0	62,822	62,822
3313---EQUIPMENT CONTROL AREA AND SYSTEM STARTUP/TESTING				9,240	13,575	3,313	0	26,128
DISPOSAL (COMMERCIAL)				**0**	**0**	**0**	**4,756**	**4,756**
3319---DISPOSAL				0	0	0	4,756	4,756
SITE RESTORATION				**11,367**	**19,984**	**642**	**0**	**31,993**
3320---REVEGETATION				407	205	92	0	704
3320---RE-ESTABLISH ROADS/STRUCTURES/UTILITIES				10,960	19,778	551	0	31,289
DEMOBILIZATION				**0**	**9,634**	**647**	**575**	**10,856**
3321---DEMOBILIZE CONSTRUCTION EQUIPMENT/FACILITIES				0	297	647	575	1,519
3321---DEMOBILIZE PERSONNEL				0	9,337	0	0	9,337
OTHER				**39,034**	**190,831**	**397**	**91,828**	**322,089**
3390---SUPPORT PERSONNEL				0	152,438	0	0	152,438
3390---SYSTEM OPERATION & MAINTENANCE - YEAR 1				39,034	38,394	397	91,828	169,652

B--SYSTEM REPORT
SUBMITTAL: FINAL
SOFTWARE VERSION: SUCCESS 3.1
REPORT WRITER VERSION: R&R 6.0
C:\SC31\SYSTEM\NAVFAC01.RP5 REPORT REVISION 23 MARCH 1998

CONSTRUCTION CONTRACT:
DATABASE USED:
PRINTING DATE: 03/11/1999

ESTIMATE NAME: FINAL DESIGN ESTIMATE

PROJECT: SITE 16/OU7 - AIR SPARGING/VAPOR EXTRACTION SYSTE
LOCATION: NAS CECIL FIELD, JACKSONVILLE, FLORIDA
ESTIMATOR:
PROJECT SIZE: 1.00 LS
CONSTRUCTION FUNDS AVAILABLE:0 USD
CURRENCY: DOLLARS

CAT CODE:
UIC:
PROJECT #: CTO 051
DATE OF ESTIMATE: 3/12/99
BID DATE:

WBS CODE	DESCRIPTION	COST/PROJECT UOM BASED ON 1 LS	COST/ WBS UNIT	TOTAL MARKED UP COSTS MATL	LABOR	EQUIP	OTHER1	TOTAL
	SITE 16/OU7 - AIR SPARGING/VAPOR EXTRACTION SYSTEM, PROJECT TOTALS							**712,000**
	****PROJECT SUBTOTALS****			202,948	316,511	12,963	179,687	712,109
MOBILIZATION				***623***	***11,676***	***2,075***	***2,688***	***17,062***
	-MOBILIZE CONSTRUCTION			0	297	647	575	1,519
	-MOBILIZE PERSONNEL			0	9,337	0	0	9,337
	-SETUP/CONSTRUCT TEMPORARY FACILITIES			623	2,041	1,020	0	3,684
	-TEMPORARY UTILITIES			0	0	408	0	408
	-CONSTRUCTION LAYOUT			0	0	0	2,113	2,113
MONITORING, SAMPLING, TESTING, AND ANALYSIS				***0***	***0***	***0***	***1,714***	***1,714***
	-MONITORING WELLS			0	0	0	1,714	1,714
SITE WORK				***3,008***	***11,564***	***5,890***	***0***	***20,463***
	-DEMOLITION			203	7,043	3,630	0	10,876
	-EARTHWORK			2,805	4,521	2,260	0	9,587
PHYSICAL TREATMENT				***148,915***	***72,821***	***3,313***	***78,127***	***303,176***
	-AIR SPARGING SYSTEM INSTALLATION			52,649	19,707	0	9,338	81,694
	-VAPOR EXTRACTION SYSTEM INSTALLATION			87,026	39,539	0	5,967	132,532
	-SYSTEM ELECTRICAL INSTALLATION			0	0	0	62,822	62,822
	-EQUIPMENT CONTROL AREA AND SYSTEM			9,240	13,575	3,313	0	26,128
DISPOSAL (COMMERCIAL)				***0***	***0***	***0***	***4,756***	***4,756***
	-DISPOSAL			0	0	0	4,756	4,756

B--SYSTEM REPORT
SUBMITTAL: FINAL
SOFTWARE VERSION: SUCCESS 3.1
REPORT WRITER VERSION: R&R 6.0
C:\SC31\SYSTEM\NAVFAC01.RP5 REPORT REVISION 23 MARCH 1998

CONSTRUCTION CONTRACT:
DATABASE USED:
PRINTING DATE: 03/11/1999

ESTIMATE NAME: FINAL DESIGN ESTIMATE

PROJECT: SITE 16/OU7 - AIR SPARGING/VAPOR EXTRACTION SYSTE
LOCATION: NAS CECIL FIELD, JACKSONVILLE, FLORIDA
ESTIMATOR:
PROJECT SIZE: 1.00 LS
CONSTRUCTION FUNDS AVAILABLE:0 USD
CURRENCY: DOLLARS

CAT CODE:
UIC:
PROJECT #: CTO 051
DATE OF ESTIMATE: 3/12/99
BID DATE:

WBS CODE	DESCRIPTION	COST/PROJECT UOM BASED ON 1 LS	COST/ WBS UNIT	TOTAL MARKED UP COSTS MATL	LABOR	EQUIP	OTHER1	TOTAL
SITE RESTORATION				***11,367***	***19,984***	***642***	***0***	***31,993***
-REVEGETATION				**407**	**205**	**92**	**0**	**704**
-RE-ESTABLISH ROADS/STRUCTURES/UTILITIES				**10,960**	**19,778**	**551**	**0**	**31,289**
DEMOBILIZATION				***0***	***9,634***	***647***	***575***	***10,856***
-DEMOBILIZE CONSTRUCTION				**0**	**297**	**647**	**575**	**1,519**
-DEMOBILIZE PERSONNEL				**0**	**9,337**	**0**	**0**	**9,337**
OTHER				***39,034***	***190,831***	***397***	***91,828***	***322,089***
-SUPPORT PERSONNEL				**0**	**152,438**	**0**	**0**	**152,438**
-SYSTEM OPERATION & MAINTENANCE - YEAR 1				**39,034**	**38,394**	**397**	**91,828**	**169,652**

C--ASSEMBLY CATEGORY REPORT
SUBMITTAL: FINAL
SOFTWARE VERSION: SUCCESS 3.1
REPORT WRITER VERSION: R&R 6.0
NAVFAC01.RP5 REPORT REVISION 23 MARCH 1998

CONSTRUCTION CONTRACT:
DATABASE USED:
PRINTING DATE: 03/11/1999

ESTIMATE NAME: FINAL DESIGN ESTIMATE

PROJECT: SITE 16/OU7 - AIR SPARGING/VAPOR EXTRACTION SYSTE
LOCATION: NAS CECIL FIELD, JACKSONVILLE, FLORIDA
ESTIMATOR:
PROJECT SIZE: 1.00LS
CONSTRUCTION FUNDS AVAILABLE: 0 USD
CURRENCY: DOLLARS

CAT CODE:
UIC:
PROJECT #: CTO 051
DATE OF ESTIMATE: 3/12/99
BID DATE:

WBS CODE	DESCRIPTION	COST/PROJECT UOM BASED ON 1 LS	COST/ WBS UNIT	TOTAL MARKED UP COSTS MATL	LABOR	EQUIP	OTHER1	TOTAL
	SITE 16/OU7 - AIR SPARGING/VAPOR EXTRACTION SYSTEM, PROJECT TOTALS							**712,000**
	*****PROJECT SUBTOTALS****			202,948	316,511	12,963	179,687	712,109
MOBILIZATION				**623**	**11,676**	**2,075**	**2,688**	**17,062**
-MOBILIZE CONSTRUCTION EQUIPMENT/FACILITIES				0	297	647	575	1,519
-MOBILIZE PERSONNEL				0	9,337	0	0	9,337
-SETUP/CONSTRUCT TEMPORARY FACILITIES				623	2,041	1,020	0	3,684
-TEMPORARY UTILITIES				0	0	408	0	408
-CONSTRUCTION LAYOUT				0	0	0	2,113	2,113
MONITORING, SAMPLING, TESTING, AND AN				**0**	**0**	**0**	**1,714**	**1,714**
-MONITORING WELLS				0	0	0	1,714	1,714
SITE WORK				**3,008**	**11,564**	**5,890**	**0**	**20,463**
-DEMOLITION				203	7,043	3,630	0	10,876
-EARTHWORK				2,805	4,521	2,260	0	9,587
PHYSICAL TREATMENT				**148,915**	**72,821**	**3,313**	**78,127**	**303,176**
-AIR SPARGING SYSTEM INSTALLATION				52,649	19,707	0	9,338	81,694
-VAPOR EXTRACTION SYSTEM INSTALLATION				87,026	39,539	0	5,967	132,532
-SYSTEM ELECTRICAL INSTALLATION				0	0	0	62,822	62,822
-EQUIPMENT CONTROL AREA AND SYSTEM STARTUP/TESTING				9,240	13,575	3,313	0	26,128
DISPOSAL (COMMERCIAL)				**0**	**0**	**0**	**4,756**	**4,756**
-DISPOSAL				0	0	0	4,756	4,756
SITE RESTORATION				**11,367**	**19,984**	**642**	**0**	**31,993**
-REVEGETATION				407	205	92	0	704
-RE-ESTABLISH ROADS/STRUCTURES/UTILITIES				10,960	19,778	551	0	31,289
DEMOBILIZATION				**0**	**9,634**	**647**	**575**	**10,856**
-DEMOBILIZE CONSTRUCTION EQUIPMENT/FACILITIES				0	297	647	575	1,519
-DEMOBILIZE PERSONNEL				0	9,337	0	0	9,337
OTHER				**39,034**	**190,831**	**397**	**91,828**	**322,089**
-SUPPORT PERSONNEL				0	152,438	0	0	152,438
-SYSTEM OPERATION & MAINTENANCE - YEAR 1				39,034	38,394	397	91,828	169,652

D--MARKUP REPORT
SUBMITTAL: FINAL
SOFTWARE VERSION: SUCCESS 3.1
REPORT WRITER VERSION: R&R 6.0
C:\SC31\SYSTEM\NAVFAC01.RP5 REPORT REVISION 2 NOVEMBER 1997

CONSTRUCTION CONTRACT:
DATABASE USED :
PRINTING DATE : 03/11/99
PAGE NUMBER : 1
ESTIMATE NAME : FINAL DESIGN ESTIMATE

PROJECT: SITE 16/OU7 - AIR SPARGING/VAPOR EXTRACTION
LOCATION: NAS CECIL FIELD, JACKSONVILLE, FLORIDA
ESTIMATOR:
PROJECT SIZE: 1.00 LS
AUTHORIZED CONSTRUCTION FUNDS: 0 USD

CAT CODE:
UIC:
PROJECT #: CTO 051
DATE OF ESTIMATE: 3/12/99
BID DATE:

CONTRACTOR	DESCRIPTION	MATERIAL	LABOR	EQUIPMENT	OTHER1
PRIME	**PRIME CONTRACTOR**				
	Overhead and G&A on Labor	0.00	40.00	0.00	0.00
	G&A on Material	10.00	0.00	0.00	0.00
	G&A and Profit on Subcontract	0.00	0.00	0.00	15.00
	COMPOSITE MARKUPS FOR PRIME				
	MATERIAL COMPOSITE MARKUP	**1.1000**			
	LABOR COMPOSITE MARKUP	**1.4000**			
	EQUIPMENT COMPOSITE MARKUP	**1.0000**			
	OTHER1 COMPOSITE MARKUP	**1.1500**			
	Indirects and Profit on Labor	0.00	85.00	0.00	0.00
	Profit on Material and Equipment	10.00	0.00	10.00	0.00
	Health and Safety Monitoring on Labor, Material, E	3.00	3.00	3.00	0.00
	COMPOSITE MARKUPS FOR 16777218				
	MATERIAL COMPOSITE MARKUP	**1.1330**			
	LABOR COMPOSITE MARKUP	**1.9055**			
	EQUIPMENT COMPOSITE MARKUP	**1.1330**			
	OTHER1 COMPOSITE MARKUP	**1.0000**			

E--DETAIL REPORT UNBURDENED
FINAL
SOFTWARE VERSION: SUCCESS 3.1
REPORT WRITER VERSION: R&R 6.0
C:\SC31\SYSTEM\NAVFAC01.RP5 REPORT REVISION 24 MARCH 1998

CONSTRUCTION CONTRACT:
ESTIMATE NAME: FINAL DESIGN ESTIMATE
DATABASE USED:
PRINTING DATE: 03/11/1999

PROJECT: SITE 16/OU7 - AIR SPARGING/VAPOR EXTRACTION SYSTE
LOCATION: NAS CECIL FIELD, JACKSONVILLE, FLORIDA
ESTIMATOR:
PROJECT SIZE: 1.00LS
CONSTRUCTION FUNDS AVAILABLE: 0 USD
CURRENCY: DOLLARS

CAT CODE:
UIC:
PROJECT #: CTO 051
DATE OF ESTIMATE: 3/12/99
BID DATE:

WBS CODE / DBASE SOURCE	DESCRIPTION / Contractor/Crew	QTY UM	TOTAL COSTS MATERIAL	LABOR	EQUIPMENT	OTHER1	TOTAL
33 SITE 16/OU7 - AIR SPARGING/VAPOR EXT							
3301	**MOBILIZATION**						
330101	MOBILIZE CONSTRUCTION EQUIPMENT/FACILITIES	*LEVEL CONTRACTOR ID APPLIED--PRIME*					
	Backhoe - 3/4 cy		0.00	29.00	149.00	0.00	178.00
C/USR	***/*	1.00ls	0	29	149	0	178
	Drill Rig		0.00	0.00	0.00	500.00	500.00
C/USR	SUB/*	1.00ls	0	0	0	500	500
	Construction Trailer		0.00	30.00	150.00	0.00	180.00
C/USR	***/*	1.00ls	0	30	150	0	180
	Crane		0.00	52.50	272.00	0.00	324.50
C/USR	***/*	1.00ls	0	53	272	0	325
	Subtotal Direct Costs		0	112	571	500	1,183
	Prime Contractor PRIME Markups		0	45	0	75	45
	Level Markups		0	141	76	0	217
TOTAL 330101 MOBILIZE CONSTRUCTION EQUIPMENT/FACILITIES			0	297	647	575	1,519
330102	MOBILIZE PERSONNEL	*LEVEL CONTRACTOR ID APPLIED--PRIME*					
	Site Supervisor		0.00	500.00	0.00	0.00	500.00
C/USR	***/*	1.00ea	0	500	0	0	500
	Job Foreman		0.00	500.00	0.00	0.00	500.00
C/USR	***/*	1.00ea	0	500	0	0	500
	Field Geologist		0.00	500.00	0.00	0.00	500.00
C/USR	***/*	1.00ea	0	500	0	0	500
	Project Manager		0.00	500.00	0.00	0.00	500.00
C/USR	***/*	2.00ea	0	1,000	0	0	1,000
	Project Engineer		0.00	500.00	0.00	0.00	500.00
C/USR	***/*	2.00ea	0	1,000	0	0	1,000
	Subtotal Direct Costs		0	3,500	0	0	3,500
	Prime Contractor PRIME Markups		0	1,400	0	0	1,400
	Level Markups		0	4,437	0	0	4,437
TOTAL 330102 MOBILIZE PERSONNEL			0	9,337	0	0	9,337
330104	SETUP/CONSTRUCT TEMPORARY FACILITIES	*LEVEL CONTRACTOR ID APPLIED--PRIME*					
	Construction Trailer		0.00	0.00	145.00	0.00	145.00
C/USR	***/*	3.00mo	0	0	435	0	435
	Construct Temporary Decontamination Pad for Drill Rig		500.00	250.00	0.00	0.00	750.00
C/USR	***/*	1.00ls	500	250	0	0	750
	Pressure Washer for Drill Rig Decon		0.00	171.75	155.00	0.00	326.75
C/USR	***/*	3.00wk	0	515	465	0	980
	Subtotal Direct Costs		500	765	900	0	2,165
	Prime Contractor PRIME Markups		50	306	0	0	356
	Level Markups		73	970	120	0	1,163
TOTAL 330104 SETUP/CONSTRUCT TEMPORARY FACILITIES			623	2,041	1,020	0	3,684
330105	TEMPORARY UTILITIES	*LEVEL CONTRACTOR ID APPLIED--PRIME*					
	Portable Toilets		0.00	0.00	120.00	0.00	120.00
C/USR	***/*	3.00mo	0	0	360	0	360
	Subtotal Direct Costs		0	0	360	0	360
	Level Markups		0	0	48	0	48
TOTAL 330105 TEMPORARY UTILITIES			0	0	408	0	408
330190	CONSTRUCTION LAYOUT	*LEVEL CONTRACTOR ID APPLIED--PRIME*					
	Site Survey		0.00	0.00	0.00	735.00	735.00
C/USR	SUB/*	2.50ac	0	0	0	1,838	1,838
	Subtotal Direct Costs		0	0	0	1,838	1,838
TOTAL 330190 CONSTRUCTION LAYOUT			0	0	0	2,113	2,113

WBS CODE / DBASE SOURCE	DESCRIPTION / Contractor/Crew	QTY UM	TOTAL COSTS MATERIAL	LABOR	EQUIPMENT	OTHER1	TOTAL
330190 CONSTRUCTION LAYOUT	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	SUBTOTAL 3301 MOBILIZATION		500	4,377	1,831	2,338	162,957
	MARKUP		*1.246*	*2.668*	*1.133*	*1.150*	*0.105*
	TOTAL 3301 MOBILIZATION		623	11,676	2,075	2,688	17,062
3302							
330204 MONITORING WELLS	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	Flush Mount Protective Casing		0.00	0.00	0.00	176.34	176.34
C/USR	SUB/*	6.00 ea	0	0	0	1,058	1,058
	Vapor Monitoring Well Installation- 2" PVC - HSA		0.00	0.00	0.00	18.00	18.00
C/USR	SUB/*	24.00 vf	0	0	0	432	432
	Subtotal Direct Costs		0	0	0	1,490	1,490
TOTAL 330204 MONITORING WELLS			0	0	0	1,714	1,714
	SUBTOTAL 33.02 MONITORING, SAMPLING, TESTING, AND ANALYSIS		0	0	0	1,490	156,250
	MARKUP		*0.000*	*0.000*	*0.000*	*1.150*	*0.011*
	TOTAL 33.02 MONITORING, SAMPLING, TESTING, AND ANALYSIS		0	0	0	1,714	1,714
3303	**SITE WORK**						
330301 DEMOLITION	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	Concrete Removal to 6" thick, hydraulic hammer		0.00	3.70	3.90	0.00	7.60
C/USR	***/*	600.00 sy	0	2,220	2,340	0	4,560
	Cut Concrete for Removal 6" thick		2.04	2.40	1.80	0.00	6.24
C/USR	***/*	80.00 lf	163	192	144	0	499
	Concrete Disposal (5 mile haul)		0.00	2.28	7.20	0.00	9.48
C/USR	***/*	100.00 cy	0	228	720	0	948
	Subtotal Direct Costs		163	2,640	3,204	0	6,007
	Prime Contractor PRIME Markups		16	1,056	0	0	1,072
	Level Markups		24	3,347	426	0	3,797
TOTAL 330301 DEMOLITION			203	7,043	3,630	0	10,876
330303 EARTHWORK	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	Excavation, Backfill, and Compaction - Trenches/Grassed Area		0.00	220.40	285.00	0.00	505.40
C/USR	***/*	7.00 day	0	1,543	1,995	0	3,538
	30 mil Polyethylene		0.71	0.03	0.00	0.00	0.74
C/USR	***/*	2,250.00 sf	1,598	68	0	0	1,665
	Geonet/Geotextile		0.34	0.03	0.00	0.00	0.37
C/USR	***/*	1,700.00 sf	577	51	0	0	628
	4" Perforated Polyethylene Pipe w/ silt sock		0.64	0.28	0.00	0.00	0.92
C/USR	***/*	120.00 lf	76	34	0	0	110
	Subtotal Direct Costs		2,251	1,695	1,995	0	5,941
	Prime Contractor PRIME Markups		225	678	0	0	903
	Level Markups		329	2,149	265	0	2,743
TOTAL 330303 EARTHWORK			2,805	4,521	2,260	0	9,587
	SUBTOTAL 3303 SITE WORK		2,414	4,335	5,199	0	168,197
	MARKUP		*1.246*	*2.668*	*1.133*	*0.000*	*0.122*
	TOTAL 3303 SITE WORK		3,008	11,564	5,890	0	20,463
3313	**PHYSICAL TREATMENT**						
331323							
33132301 AIR SPARGING SYSTEM INSTALLATION	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	Air Sparging Compressor (20 hp)		18789.56	450.00	0.00	0.00	19,239.56
C/USR	***/*	1.00 ls	18,790	450	0	0	19,240
	Freight - Air Sparging Compressors		0.00	0.00	0.00	266.80	266.80
C/USR	***/*	1.00 ls	0	0	0	267	267
	Wastewater Storage Tank - 250 gallons		530.00	0.00	0.00	0.00	530.00
C/USR	***/*	1.00 ea	530	0	0	0	530
	2" Steel Pipe		2.88	2.88	0.00	0.00	5.76
C/USR	***/*	100.00 lf	288	288	0	0	576
	2" Steel Butterfly Valve		121.90	44.55	0.00	0.00	166.45
C/USR	***/*	6.00 ea	731	267	0	0	999
	2" Steel Pressure Regulators		61.48	29.70	0.00	0.00	91.18
C/USR	***/*	8.00 ea	492	238	0	0	729
	2" Steel Gate Valve		91.69	50.49	0.00	0.00	142.18
C/USR	***/*	8.00 ea	734	404	0	0	1,137

WBS CODE / DBASE SOURCE	DESCRIPTION / Contractor/Crew	QTY UM	TOTAL COSTS MATERIAL	LABOR	EQUIPMENT	OTHER1	TOTAL
331323							
33132301	AIR SPARGING SYSTEM INSTALLATION	*LEVEL CONTRACTOR ID APPLIED--PRIME*					
	2" Steel Pressure Relief Valve		397.50	6.83	0.00	0.00	404.33
C/USR	***/*	1.00ea	398	7	0	0	404
	2" Steel Flow Meters		1452.20	104.76	0.00	0.00	1,556.96
C/USR	***/*	6.00ea	8,713	629	0	0	9,342
	2" Steel 90's		6.57	14.77	0.00	0.00	21.34
C/USR	***/*	16.00ea	105	236	0	0	341
	2" Steel T's		9.82	21.86	0.00	0.00	31.68
C/USR	***/*	7.00ea	69	153	0	0	222
	Misc. Steel Fittings		530.00	250.00	0.00	0.00	780.00
C/USR	***/*	1.00ls	530	250	0	0	780
	2" PVC Pipe		2.52	0.62	0.00	0.00	3.14
C/USR	***/*	800.00lf	2,018	496	0	0	2,514
	2" PVC Couplers		10.06	9.57	0.00	0.00	19.63
C/USR	***/*	40.00ea	402	383	0	0	785
	Vault Boxes - 2'x2'x2' w/ Locking Cover		371.00	265.00	0.00	0.00	636.00
C/USR	***/*	9.00ea	3,339	2,385	0	0	5,724
	2" PVC Ball Valves		105.68	31.81	0.00	0.00	137.49
C/USR	***/*	6.00ea	634	191	0	0	825
	2" PVC Pressure Regulator Valves		445.20	68.31	0.00	0.00	513.51
C/USR	***/*	6.00ea	2,671	410	0	0	3,081
	2" Pressure Gauges		60.95	14.85	0.00	0.00	75.80
C/USR	***/*	10.00ea	610	149	0	0	758
	2" PVC 90's		13.64	16.89	0.00	0.00	30.53
C/USR	***/*	6.00ea	82	101	0	0	183
	2" PVC T's		18.16	16.89	0.00	0.00	35.05
C/USR	***/*	6.00ea	109	101	0	0	210
	Misc. PVC Fittings		1000.00	250.00	0.00	0.00	1,250.00
C/USR	***/*	1.00ls	1,000	250	0	0	1,250
	Mud Rotary 2" PVC Sparging Well Installation		0.00	0.00	0.00	22.75	22.75
C/USR	SUB/*	320.00vf	0	0	0	7,280	7,280
	Well Development		0.00	0.00	0.00	40.00	40.00
C/USR	SUB/*	4.00ea	0	0	0	160	160
	55 gallon drums for mud/drill cuttings/development water		0.00	0.00	0.00	68.30	68.30
C/USR	SUB/*	4.00ea	0	0	0	273	273
	Containerize IDW		0.00	0.00	0.00	35.00	35.00
C/USR	SUB/*	4.00ea	0	0	0	140	140
	Subtotal Direct Costs		42,244	7,387	0	8,120	57,752
	Prime Contractor PRIME Markups		4,224	2,955	0	1,218	7,179
	Level Markups		6,180	9,365	0	0	15,545
TOTAL 33132301 AIR SPARGING SYSTEM INSTALLATION			52,649	19,707	0	9,338	81,694
33132302	VAPOR EXTRACTION SYSTEM INSTALLATION	*LEVEL CONTRACTOR ID APPLIED--PRIME*					
	Extraction Pump		16960.00	450.00	0.00	0.00	17,410.00
C/USR	***/*	1.00ls	16,960	450	0	0	17,410
	Moisture Separator		530.00	250.00	0.00	0.00	780.00
C/USR	***/*	1.00ls	530	250	0	0	780
	Freight - Vacuum Extraction Pump		0.00	0.00	0.00	200.00	200.00
C/USR	SUB/*	1.00ls	0	0	0	200	200
	4" Steel Pipe		5.62	2.97	0.00	0.00	8.59
C/USR	***/*	75.00lf	421	223	0	0	644
	4" Steel Butterfly Valves		129.32	62.37	0.00	0.00	191.69
C/USR	***/*	7.00ea	905	437	0	0	1,342
	4" Steel Gate Valves		742.00	62.37	0.00	0.00	804.37
C/USR	***/*	9.00ea	6,678	561	0	0	7,239
	Vault Boxes - 2'x2'x2' w/ Locking Cover		371.00	265.00	0.00	0.00	636.00
C/USR	***/*	24.00ea	8,904	6,360	0	0	15,264
	4" PVC Pipe		1.56	4.41	0.00	0.00	5.97
C/USR	***/*	350.00lf	545	1,544	0	0	2,089
	4" x 2" PVC Tees		24.45	45.53	0.00	0.00	69.98
C/USR	***/*	19.00ea	465	865	0	0	1,330
	2" PVC Pipe		0.65	2.05	0.00	0.00	2.70
C/USR	***/*	325.00lf	210	666	0	0	876
	2" PVC 90's		1.54	14.77	0.00	0.00	16.31
C/USR	***/*	21.00ea	32	310	0	0	342
	2" PVC Vacuum Gauges		60.95	14.85	0.00	0.00	75.80
C/USR	***/*	21.00ea	1,280	312	0	0	1,592
	2" PVC Ball Valves		324.36	33.56	0.00	0.00	357.92

WBS CODE / DBASE SOURCE	DESCRIPTION / Contractor/Crew	QTY UM	TOTAL COSTS MATERIAL	LABOR	EQUIPMENT	OTHER1	TOTAL
331323							
33132302 VAPOR EXTRACTION SYSTEM INSTALLATION	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
C/USR	***/*	21.00ea	6,812	705	0	0	7,516
	2" PVC Gate Valves		415.52	29.70	0.00	0.00	445.22
C/USR	***/*	21.00ea	8,726	624	0	0	9,350
	Misc. PVC Fittings		500.00	250.00	0.00	0.00	750.00
C/USR	***/*	1.00ls	500	250	0	0	750
	HSA 2" PVC Extraction Well Installation		0.00	0.00	0.00	22.75	22.75
C/USR	SUB/*	133.00lf	0	0	0	3,026	3,026
	55 gallon drums for mud/drill cuttings/development water		0.00	0.00	0.00	68.30	68.30
C/USR	SUB/*	19.00ea	0	0	0	1,298	1,298
	Containerize IDW		0.00	0.00	0.00	35.00	35.00
C/USR	SUB/*	19.00ea	0	0	0	665	665
	GAC Units - 2000 pounds each		7414.70	500.00	0.00	0.00	7,914.70
C/USR	***/*	2.00ea	14,829	1,000	0	0	15,829
	Transfer Pump - 1 hp		2029.90	265.48	0.00	0.00	2,295.38
C/USR	***/*	1.00ea	2,030	265	0	0	2,295
	Subtotal Direct Costs		69,828	14,821	0	5,188	89,838
	Prime Contractor PRIME Markups		6,983	5,929	0	778	12,911
	Level Markups		10,216	18,789	0	0	29,005
TOTAL 33132302 VAPOR EXTRACTION SYSTEM INSTALLATION			87,026	39,539	0	5,967	132,532
33132303 SYSTEM ELECTRICAL INSTALLATION	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	20-foot Wooden Utility Poles		0.00	0.00	0.00	525.00	525.00
C/USR	SUB/*	1.00ea	0	0	0	525	525
	25' High Aerial Lift		0.00	0.00	0.00	735.00	735.00
C/USR	SUB/*	1.00day	0	0	0	735	735
	10' Ground Rods		0.00	0.00	0.00	116.00	116.00
C/USR	SUB/*	5.00ea	0	0	0	580	580
	#2 AWG Bare Copper Ground Cable		0.00	0.00	0.00	134.00	134.00
C/USR	SUB/*	1.00Clf	0	0	0	134	134
	480 V-120 V/100 KVa Transformer		0.00	0.00	0.00	2950.00	2,950.00
C/USR	SUB/*	1.00ea	0	0	0	2,950	2,950
	Load Center, 3W, 120/240V, Single Phase, 20 Circuits		0.00	0.00	0.00	310.00	310.00
C/USR	SUB/*	1.00ea	0	0	0	310	310
	Meter Center - 4 terminals, 200 Amp		0.00	0.00	0.00	40.00	40.00
C/USR	SUB/*	1.00ea	0	0	0	40	40
	30 amp fused disconnect switch		0.00	0.00	0.00	149.00	149.00
C/USR	SUB/*	3.00ea	0	0	0	447	447
	100 amp fused disconnect switch		0.00	0.00	0.00	335.00	335.00
C/USR	SUB/*	1.00ea	0	0	0	335	335
	200 Amp Outdoor Disconnect Switch (4 wire) fused		0.00	0.00	0.00	1950.00	1,950.00
C/USR	SUB/*	1.00ea	0	0	0	1,950	1,950
	Number 1, FVNR Starter, NEMA 12		0.00	0.00	0.00	700.00	700.00
C/USR	SUB/*	4.00ea	0	0	0	2,800	2,800
	3/4" Conduit		0.00	0.00	0.00	1.55	1.55
C/USR	SUB/*	500.00lf	0	0	0	775	775
	1-1/2" Conduit		0.00	0.00	0.00	3.35	3.35
C/USR	SUB/*	100.00lf	0	0	0	335	335
	1" PVC Conduit		0.00	0.00	0.00	0.90	0.90
C/USR	SUB/*	300.00lf	0	0	0	270	270
	500 KCMIL 1/c XHHW		0.00	0.00	0.00	465.00	465.00
C/USR	SUB/*	8.00Clf	0	0	0	3,720	3,720
	#2 AWG XHHW		0.00	0.00	0.00	26.00	26.00
C/USR	SUB/*	4.00Clf	0	0	0	104	104
	#12 AWG THHN		0.00	0.00	0.00	7.40	7.40
C/USR	SUB/*	30.00Clf	0	0	0	222	222
	4-lamp Fluorescent Fixture, Rapid Start		0.00	0.00	0.00	2950.00	2,950.00
C/USR	SUB/*	8.00ea	0	0	0	23,600	23,600
	Duplex Receptacle, Industrial Grade		0.00	0.00	0.00	5.95	5.95
C/USR	SUB/*	6.00ea	0	0	0	36	36
	Labor - 4 electricians		0.00	0.00	0.00	4920.00	4,920.00
C/USR	SUB/*	3.00wks	0	0	0	14,760	14,760
	Subtotal Direct Costs		0	0	0	54,628	54,628
TOTAL 33132303 SYSTEM ELECTRICAL INSTALLATION			0	0	0	62,822	62,822
33132304 EQUIPMENT CONTROL AREA AND SYSTEM STARTUP/TESTING	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	12 x 20 Canopy		4070.40	748.00	180.00	0.00	4,998.40
C/USR	***/*	1.00ls	4,070	748	180	0	4,998

WBS CODE / DBASE SOURCE	DESCRIPTION / Contractor/Crew	QTY UM	TOTAL COSTS MATERIAL	LABOR	EQUIPMENT	OTHER1	TOTAL
331323							
33132304 EQUIPMENT CONTROL AREA AND SYSTEM STARTUP/TESTING	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	6' Chain Link Fence		10.28	2.80	1.80	0.00	14.88
C/USR	***/*	106.00lf	1,090	297	191	0	1,577
	8' Double Swing Gate		503.50	235.00	169.00	0.00	907.50
C/USR	***/*	1.00ea	504	235	169	0	908
	6" Concrete Slab on Grade, Reinforced		2.67	3.05	1.00	0.00	6.72
C/USR	***/*	300.00sf	801	915	300	0	2,016
	Security Lighting on Pole		948.70	215.50	0.00	0.00	1,164.20
C/USR	***/*	1.00ls	949	216	0	0	1,164
	Crane to offload Equipment		0.00	249.20	217.00	0.00	466.20
C/USR	***/*	2.00days	0	498	434	0	932
	Fork lift		0.00	0.00	575.00	0.00	575.00
C/USR	***/*	2.00wk	0	0	1,150	0	1,150
	Pipe Testing		0.00	500.00	250.00	0.00	750.00
C/USR	***/*	1.00ls	0	500	250	0	750
	System Startup and Testing - First week of Operation		0.00	1680.00	250.00	0.00	1,930.00
C/USR	***/*	1.00ls	0	1,680	250	0	1,930
	Subtotal Direct Costs		7,414	5,089	2,924	0	15,426
	Prime Contractor PRIME Markups		741	2,035	0	0	2,777
	Level Markups		1,085	6,451	389	0	7,924
TOTAL 33132304 EQUIPMENT CONTROL AREA AND SYSTEM STARTUP/TESTING			9,240	13,575	3,313	0	26,128
	SUBTOTAL 3313 PHYSICAL TREATMENT		119,486	27,297	2,924	67,936	305,957
	MARKUP		*1.246*	*2.668*	*1.133*	*1.150*	*0.991*
	TOTAL 3313 PHYSICAL TREATMENT		148,915	72,821	3,313	78,127	303,176
3319	**DISPOSAL (COMMERCIAL)**						
331903 DISPOSAL	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	Transport and Dispose of Mud/Drill Cuttings		0.00	0.00	0.00	112.00	112.00
C/USR	SUB/*	23.00drum	0	0	0	2,576	2,576
	Transport and Dispose of Well Development Water		0.00	0.00	0.00	112.00	112.00
C/USR	SUB/*	5.00drum	0	0	0	560	560
	Waste Characterization/Application Fee		0.00	0.00	0.00	1000.00	1,000.00
C/USR	SUB/*	1.00ls	0	0	0	1,000	1,000
	Subtotal Direct Costs		0	0	0	4,136	4,136
TOTAL 331903 DISPOSAL			0	0	0	4,756	4,756
	SUBTOTAL 3319 DISPOSAL (COMMERCIAL)		0	0	0	4,136	156,250
	MARKUP		*0.000*	*0.000*	*0.000*	*1.150*	*0.030*
	TOTAL 3319 DISPOSAL (COMMERCIAL)		0	0	0	4,756	4,756
3320	**SITE RESTORATION**						
332004 REVEGETATION	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	Hydroseed/Mulch Area		29.68	7.00	7.35	0.00	44.03
C/USR	***/*	11.00msf	326	77	81	0	484
	Subtotal Direct Costs		326	77	81	0	484
	Prime Contractor PRIME Markups		33	31	0	0	63
	Level Markups		48	98	11	0	156
TOTAL 332004 REVEGETATION			407	205	92	0	704
332003 RE-ESTABLISH ROADS/STRUCTURES/UTILITIES	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	Fine Grading		0.00	0.59	0.81	0.00	1.40
C/USR	***/*	600.00sy	0	354	486	0	840
	Install concrete - 6" thick w/ wire mesh		1.58	1.14	0.00	0.00	2.72
C/USR	***/*	5,400.00sf	8,529	6,156	0	0	14,685
	Construction joints		1.77	10.95	0.00	0.00	12.72
C/USR	***/*	80.00lf	142	876	0	0	1,018
	Expansion joint/seal		2.47	0.56	0.00	0.00	3.03
C/USR	***/*	50.00lf	123	28	0	0	151
	Subtotal Direct Costs		8,794	7,414	486	0	16,694
	Prime Contractor PRIME Markups		879	2,966	0	0	3,845
	Level Markups		1,287	9,399	65	0	10,750
TOTAL 332003 RE-ESTABLISH ROADS/STRUCTURES/UTILITIES			10,960	19,778	551	0	31,289

WBS CODE / DBASE SOURCE	DESCRIPTION / Contractor/Crew	QTY UM	TOTAL COSTS MATERIAL	LABOR	EQUIPMENT	OTHER1	TOTAL
332003 RE-ESTABLISH ROADS/STRUCTURES/UTILITIES	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	SUBTOTAL 3320 SITE RESTORATION		9,120	7,491	567	0	173,428
	MARKUP		*1.246*	*2.668*	*1.133*	*0.000*	*0.184*
	TOTAL 3320 SITE RESTORATION		11,367	19,984	642	0	31,993
3321	**DEMOBILIZATION**						
332104 DEMOBILIZE CONSTRUCTION EQUIPMENT/FACILITIES	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	Backhoe - 3/4 cy		0.00	29.00	149.00	0.00	178.00
C/USR	***/*	1.00ls	0	29	149	0	178
	Drill Rig		0.00	0.00	0.00	500.00	500.00
C/USR	SUB/*	1.00ls	0	0	0	500	500
	Construction Trailer		0.00	30.00	150.00	0.00	180.00
C/USR	***/*	1.00ls	0	30	150	0	180
	Crane		0.00	52.50	272.00	0.00	324.50
C/USR	***/*	1.00ls	0	53	272	0	325
	Subtotal Direct Costs		0	112	571	500	1,183
	Prime Contractor PRIME Markups		0	45	0	75	45
	Level Markups		0	141	76	0	217
TOTAL 332104 DEMOBILIZE CONSTRUCTION EQUIPMENT/FACILITIES			0	297	647	575	1,519
332105 DEMOBILIZE PERSONNEL	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	Site Supervisor		0.00	500.00	0.00	0.00	500.00
C/USR	***/*	1.00ea	0	500	0	0	500
	Job Foreman		0.00	500.00	0.00	0.00	500.00
C/USR	***/*	1.00ea	0	500	0	0	500
	Field Geologist		0.00	500.00	0.00	0.00	500.00
C/USR	***/*	1.00ea	0	500	0	0	500
	Project Manager		0.00	500.00	0.00	0.00	500.00
C/USR	***/*	2.00ea	0	1,000	0	0	1,000
	Project Engineer		0.00	500.00	0.00	0.00	500.00
C/USR	***/*	2.00ea	0	1,000	0	0	1,000
	Subtotal Direct Costs		0	3,500	0	0	3,500
	Prime Contractor PRIME Markups		0	1,400	0	0	1,400
	Level Markups		0	4,437	0	0	4,437
TOTAL 332105 DEMOBILIZE PERSONNEL			0	9,337	0	0	9,337
	SUBTOTAL 3321 DEMOBILIZATION		0	3,612	571	500	160,432
	MARKUP		*0.000*	*2.668*	*1.133*	*1.150*	*0.068*
	TOTAL 3321 DEMOBILIZATION		0	9,634	647	575	10,856
3390	**OTHER**						
339001 SUPPORT PERSONNEL	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	Site Supervisor		0.00	1285.00	0.00	0.00	1,285.00
C/USR	***/*	9.00wk	0	11,565	0	0	11,565
	Job Foreman		0.00	1210.00	0.00	0.00	1,210.00
C/USR	***/*	9.00wk	0	10,890	0	0	10,890
	Field Geologist		0.00	840.00	0.00	0.00	840.00
C/USR	***/*	3.00wk	0	2,520	0	0	2,520
	Project Manager		0.00	1600.00	0.00	0.00	1,600.00
C/USR	***/*	4.50wk	0	7,200	0	0	7,200
	Project Engineer		0.00	1600.00	0.00	0.00	1,600.00
C/USR	***/*	4.50wk	0	7,200	0	0	7,200
	Per Diem		0.00	109.00	0.00	0.00	109.00
C/USR	***/*	163.00mndy	0	17,767	0	0	17,767
	Subtotal Direct Costs		0	57,142	0	0	57,142
	Prime Contractor PRIME Markups		0	22,857	0	0	22,857
	Level Markups		0	72,439	0	0	72,439
TOTAL 339001 SUPPORT PERSONNEL			0	152,438	0	0	152,438
339002 SYSTEM OPERATION & MAINTENANCE - YEAR 1	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	Weekly System Checks/Sampling for Remainder of First Month		125.00	1028.00	25.00	0.00	1,178.00
C/USR	***/*	3.00ea	375	3,084	75	0	3,534
	Monthly System Checks/Sampling for Remainder of First Year		375.00	1028.00	25.00	0.00	1,428.00
C/USR	***/*	11.00ea	4,125	11,308	275	0	15,708
	Electrical Usage		0.06	0.00	0.00	0.00	0.06
C/USR	***/*	447,000.00kWh	26,820	0	0	0	26,820

WBS CODE / DBASE SOURCE	DESCRIPTION / Contractor/Crew	QTY UM	TOTAL COSTS MATERIAL	LABOR	EQUIPMENT	OTHER1	TOTAL
339002 SYSTEM OPERATION & MAINTENANCE - YEAR 1	*LEVEL CONTRACTOR ID APPLIED--PRIME*						
	Vapor and Offgas Sample Analysis		0.00	0.00	0.00	250.00	250.00
C/USR	SUB/*	74.00 ea	0	0	0	18,500	18,500
	Carbon Usage		0.00	0.00	0.00	1.40	1.40
C/USR	SUB/*	36,000.00 lbs	0	0	0	50,400	50,400
	Hazardous Water from Moisture Sep, Filters - 15 gallons per day		0.00	0.00	0.00	2.00	2.00
C/USR	SUB/*	5,475.00 gal	0	0	0	10,950	10,950
	Subtotal Direct Costs		31,320	14,392	350	79,850	125,912
	Prime Contractor PRIME Markups		3,132	5,757	0	11,978	8,889
	Level Markups		4,582	18,245	47	0	22,873
TOTAL 339002 SYSTEM OPERATION & MAINTENANCE - YEAR 1			39,034	38,394	397	91,828	169,652
	SUBTOTAL 3390 OTHER		31,320	71,534	350	79,850	259,454
	MARKUP		*1.246*	*2.668*	*1.133*	*1.150*	*1.241*
	TOTAL 3390 OTHER		39,034	190,831	397	91,828	322,089

126 DETAIL LINE ITEMS

CODE	DESCRIPTION	UM	MATERIAL	LABOR	EQUIP	OTHER1
33						
33010 MOBILIZE CONSTRUCTION EQUIPMENT/FACILITIES						
	Backhoe - 3/4 cy	ls	0.00	29.00	149.00	0.00
	Drill Rig	ls	0.00	0.00	0.00	500.00
	Construction Trailer	ls	0.00	30.00	150.00	0.00
	Crane	ls	0.00	52.50	272.00	0.00
33010 MOBILIZE PERSONNEL						
	Site Supervisor	ea	0.00	500.00	0.00	0.00
	Job Foreman	ea	0.00	500.00	0.00	0.00
	Field Geologist	ea	0.00	500.00	0.00	0.00
	Project Manager	ea	0.00	1,000.00	0.00	0.00
	Project Engineer	ea	0.00	1,000.00	0.00	0.00
33010 SETUP/CONSTRUCT TEMPORARY FACILITIES						
	Construction Trailer	mo	0.00	0.00	435.00	0.00
	Construct Temporary Decontamination Pad for Drill Rig	ls	500.00	250.00	0.00	0.00
	Pressure Washer for Drill Rig Decon	wk	0.00	515.25	465.00	0.00
33010 TEMPORARY UTILITIES						
	Portable Toilets	mo	0.00	0.00	360.00	0.00
33019 CONSTRUCTION LAYOUT						
	Site Survey	ac	0.00	0.00	0.00	1,837.50
33020 MONITORING WELLS						
	Flush Mount Protective Casing	ea	0.00	0.00	0.00	1,058.04
	Vapor Monitoring Well Installation- 2" PVC - HSA	vf	0.00	0.00	0.00	432.00
33030 DEMOLITION						
	Concrete Removal to 6" thick, hydraulic hammer	sy	0.00	2,220.00	2,340.00	0.00
	Cut Concrete for Removal 6" thick	lf	153.60	192.00	144.00	0.00
	Concrete Disposal (5 mile haul)	cy	0.00	228.00	720.00	0.00
33030 EARTHWORK						
	Excavation, Backfill, and Compaction - Trenches/Grassed Area	day	0.00	1,542.80	1,995.00	0.00
	30 mil Polyethylene	sf	1,507.50	67.50	0.00	0.00
	Geonet/Geotextile	sf	544.00	51.00	0.00	0.00
	4" Perforated Polyethylene Pipe w/ silt sock	lf	72.00	33.60	0.00	0.00
33132 AIR SPARGING SYSTEM INSTALLATION						
	Air Sparging Compressor (20 hp)	ls	17,726.00	450.00	0.00	0.00
	Freight - Air Sparging Compressors	ls	0.00	0.00	0.00	266.80
	Wastewater Storage Tank - 250 gallons	ea	500.00	0.00	0.00	0.00
	2" Steel Pipe	lf	272.00	288.00	0.00	0.00
	2" Steel Butterfly Valve	ea	690.00	267.30	0.00	0.00
	2" Steel Pressure Regulators	ea	464.00	237.60	0.00	0.00
	2" Steel Gate Valve	ea	692.00	403.92	0.00	0.00
	2" Steel Pressure Relief Valve	ea	375.00	6.83	0.00	0.00
	2" Steel Flow Meters	ea	8,220.00	628.56	0.00	0.00
	2" Steel 90's	ea	99.20	236.32	0.00	0.00
	2" Steel T's	ea	64.82	153.02	0.00	0.00
	Misc. Steel Fittings	ls	500.00	250.00	0.00	0.00
	2" PVC Pipe	lf	1,904.00	496.00	0.00	0.00
	2" PVC Couplers	ea	379.60	382.80	0.00	0.00
	Vault Boxes - 2'x2'x2' w/ Locking Cover	ea	3,150.00	2,385.00	0.00	0.00
	2" PVC Ball Valves	ea	598.20	190.86	0.00	0.00
	2" PVC Pressure Regulator Valves	ea	2,520.00	409.86	0.00	0.00
	2" Pressure Gauges	ea	575.00	148.50	0.00	0.00
	2" PVC 90's	ea	77.22	101.34	0.00	0.00
	2" PVC T's	ea	102.78	101.34	0.00	0.00
	Misc. PVC Fittings	ls	1,000.00	250.00	0.00	0.00
	Mud Rotary 2" PVC Sparging Well Installation	vf	0.00	0.00	0.00	7,280.00

K--HARD COPY PRICING DATABASE
PRINTING DATE: 03/11/1999

CODE	DESCRIPTION	UM	MATERIAL	LABOR	EQUIP	OTHER1
	Well Development	ea	0.00	0.00	0.00	160.00
	55 gallon drums for mud/drill cuttings/development water	ea	0.00	0.00	0.00	273.20
	Containerize IDW	ea	0.00	0.00	0.00	140.00
33132 VAPOR EXTRACTION SYSTEM INSTALLATION						
	Extraction Pump	ls	16,000.00	450.00	0.00	0.00
	Moisture Separator	ls	500.00	250.00	0.00	0.00
	Freight - Vacuum Extraction Pump	ls	0.00	0.00	0.00	200.00
	4" Steel Pipe	lf	397.50	222.75	0.00	0.00
	4" Steel Butterfly Valves	ea	854.00	436.59	0.00	0.00
	4" Steel Gate Valves	ea	6,300.00	561.33	0.00	0.00
	Vault Boxes - 2'x2'x2' w/ Locking Cover	ea	8,400.00	6,360.00	0.00	0.00
	4" PVC Pipe	lf	514.50	1,543.50	0.00	0.00
	4" x 2" PVC Tees	ea	438.33	865.07	0.00	0.00
	2" PVC Pipe	lf	198.25	666.25	0.00	0.00
	2" PVC 90's	ea	30.45	310.17	0.00	0.00
	2" PVC Vacuum Gauges	ea	1,207.50	311.85	0.00	0.00
	2" PVC Ball Valves	ea	6,426.00	704.76	0.00	0.00
	2" PVC Gate Valves	ea	8,232.00	623.70	0.00	0.00
	Misc. PVC Fittings	ls	500.00	250.00	0.00	0.00
	HSA 2" PVC Extraction Well Installation	lf	0.00	0.00	0.00	3,025.75
	55 gallon drums for mud/drill cuttings/development water	ea	0.00	0.00	0.00	1,297.70
	Containerize IDW	ea	0.00	0.00	0.00	665.00
	GAC Units - 2000 pounds each	ea	13,990.00	1,000.00	0.00	0.00
	Transfer Pump - 1 hp	ea	1,915.00	265.48	0.00	0.00
33132 SYSTEM ELECTRICAL INSTALLATION						
	20-foot Wooden Utility Poles	ea	0.00	0.00	0.00	525.00
	25' High Aerial Lift	day	0.00	0.00	0.00	735.00
	10' Ground Rods	ea	0.00	0.00	0.00	580.00
	#2 AWG Bare Copper Ground Cable	Clf	0.00	0.00	0.00	134.00
	480 V-120 V/100 KVa Transformer	ea	0.00	0.00	0.00	2,950.00
	Load Center, 3W, 120/240V, Single Phase, 20 Circuits	ea	0.00	0.00	0.00	310.00
	Meter Center - 4 terminals, 200 Amp	ea	0.00	0.00	0.00	40.00
	30 amp fused disconnect switch	ea	0.00	0.00	0.00	447.00
	100 amp fused disconnect switch	ea	0.00	0.00	0.00	335.00
	200 Amp Outdoor Disconnect Switch (4 wire) fused	ea	0.00	0.00	0.00	1,950.00
	Number 1, FVNR Starter, NEMA 12	ea	0.00	0.00	0.00	2,800.00
	3/4" Conduit	lf	0.00	0.00	0.00	775.00
	1-1/2" Conduit	lf	0.00	0.00	0.00	335.00
	1" PVC Conduit	lf	0.00	0.00	0.00	270.00
	500 KCMIL 1/c XHHW	Clf	0.00	0.00	0.00	3,720.00
	#2 AWG XHHW	Clf	0.00	0.00	0.00	104.00
	#12 AWG THHN	Clf	0.00	0.00	0.00	222.00
	4-lamp Fluorescent Fixture, Rapid Start	ea	0.00	0.00	0.00	23,600.00
	Duplex Receptacle, Industrial Grade	ea	0.00	0.00	0.00	35.70
	Labor - 4 electricians	wks	0.00	0.00	0.00	14,760.00
33132 EQUIPMENT CONTROL AREA AND SYSTEM STARTUP/TESTING						
	12 x 20 Canopy	ls	3,840.00	748.00	180.00	0.00
	6' Chain Link Fence	lf	1,028.20	296.80	190.80	0.00
	8' Double Swing Gate	ea	475.00	235.00	169.00	0.00
	6" Concrete Slab on Grade, Reinforced	sf	756.00	915.00	300.00	0.00
	Security Lighting on Pole	ls	895.00	215.50	0.00	0.00
	Crane to offload Equipment	days	0.00	498.40	434.00	0.00
	Fork lift	wk	0.00	0.00	1,150.00	0.00
	Pipe Testing	ls	0.00	500.00	250.00	0.00
	System Startup and Testing - First week of Operation	ls	0.00	1,680.00	250.00	0.00
33190 DISPOSAL						
	Transport and Dispose of Mud/Drill Cuttings	drum	0.00	0.00	0.00	2,576.00
	Transport and Dispose of Well Development Water	drum	0.00	0.00	0.00	560.00
	Waste Characterization/Application Fee	ls	0.00	0.00	0.00	1,000.00

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PRINTING DATE: 03/11/1999

CODE	DESCRIPTION	UM	MATERIAL	LABOR	EQUIP	OTHER1
33200 REVEGETATION						
	Hydroseed/Mulch Area	msf	308.00	77.00	80.85	0.00
33200 RE-ESTABLISH ROADS/STRUCTURES/UTILITIES						
	Fine Grading	sy	0.00	354.00	486.00	0.00
	Install concrete - 6" thick w/ wire mesh	sf	8,046.00	6,156.00	0.00	0.00
	Construction joints	lf	133.60	876.00	0.00	0.00
	Expansion joint/seal	lf	116.50	28.00	0.00	0.00
33210 DEMOBILIZE CONSTRUCTION EQUIPMENT/FACILITIES						
	Backhoe - 3/4 cy	ls	0.00	29.00	149.00	0.00
	Drill Rig	ls	0.00	0.00	0.00	500.00
	Construction Trailer	ls	0.00	30.00	150.00	0.00
	Crane	ls	0.00	52.50	272.00	0.00
33210 DEMOBILIZE PERSONNEL						
	Site Supervisor	ea	0.00	500.00	0.00	0.00
	Job Foreman	ea	0.00	500.00	0.00	0.00
	Field Geologist	ea	0.00	500.00	0.00	0.00
	Project Manager	ea	0.00	1,000.00	0.00	0.00
	Project Engineer	ea	0.00	1,000.00	0.00	0.00
33900 SUPPORT PERSONNEL						
	Site Supervisor	wk	0.00	11,565.00	0.00	0.00
	Job Foreman	wk	0.00	10,890.00	0.00	0.00
	Field Geologist	wk	0.00	2,520.00	0.00	0.00
	Project Manager	wk	0.00	7,200.00	0.00	0.00
	Project Engineer	wk	0.00	7,200.00	0.00	0.00
	Per Diem	mndy	0.00	17,767.00	0.00	0.00
33900 SYSTEM OPERATION & MAINTENANCE - YEAR 1						
	Weekly System Checks/Sampling for Remainder of First Month	ea	375.00	3,084.00	75.00	0.00
	Monthly System Checks/Sampling for Remainder of First Year	ea	4,125.00	11,308.00	275.00	0.00
	Electrical Usage	kWh	26,820.00	0.00	0.00	0.00
	Vapor and Offgas Sample Analysis	ea	0.00	0.00	0.00	18,500.00
	Carbon Usage	lbs	0.00	0.00	0.00	50,400.00
	Hazardous Water from Moisture Sep, Filters - 15 gallons per day	gal	0.00	0.00	0.00	10,950.00

126 DETAIL LINE ITEMS