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NTC ORLANDO
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WORK PLAN FOR GROUNDWATER SAMPLING REVISION 2 AT STUDY AREA 2, STUDY AREA 3 AND STUDY AREA 52 NTC ORLANDO FL

11/12/1999

TETRA TECH

TETRA TECH NUS, INC.
800 Oak Ridge Tu
(423) 483-991

03.04.03.0004
~~18.12.03.0005~~
ID 00442

99-A201

November 12, 1999

Commanding Officer
SOUTHNAVFACENGCOM
ATTN: Ms. Barbara Nwokike, Code 1873
P.O. Box 190010
2155 Eagle Drive
North Charleston, SC 29419-9010

Reference: CLEAN Contract No. N62467-94-D-0888
Contract Task Order No. 0024

Subject; Work Plan for Groundwater Sampling, Rev. 2
Naval Training Center, Orlando

Dear Ms. Nwokike:

Enclosed is the revised Work Plan for Groundwater Sampling with site-specific appendices addressing Study Areas 2, 3, 52, and Operable Unit 3. The revision includes the following significant changes:

- Sampling for natural attenuation parameters has been added to Appendix A (Study Area 2).
- The new well (OLD-03-05) with a deeper screened interval has been added to the sampling at SA 3.
- Two-inch well OLD-09-19 has been added to the sampling at OU 3.

If you have any questions regarding the plan, please contact me at (423) 220-4730.

Sincerely,

Steven B. McCoy, P.E.
Task Order Manager

SBM:ckf

Enclosure

c: Mr. Allan Aikens, CH2M Hill
Mr. Rick Allen, Harding Lawson Associates
Mr. David Grabka, FDEP
Mr. Wayne Hansel, SOUTHNAVFACENGCOM
Ms. Nancy Rodriguez, USEPA Region IV
Mr. Mark Perry/File, Tetra Tech NUS, (unbound)
Mr. Michael J. Campbell, Tetra Tech NUS
File/Edb

Rev. 2
11/09/99

WORK PLAN FOR GROUNDWATER SAMPLING

Naval Training Center
Orlando, Florida

Southern Division
Naval Facilities Engineering Command
Contract Number N62467-94-D-0888
Contract Task Order 0024

NOVEMBER 1999

R4707995

Rev. 2
11/09/99

WORK PLAN
FOR
GROUNDWATER SAMPLING

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:

Department of the Navy, Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

Submitted by:

Tetra Tech NUS, Inc.
661 Andersen Drive
Foster Plaza 7
Pittsburgh, Pennsylvania 15220

CONTRACT NO. N62467-94-D-0888
CONTRACT TASK ORDER 0024

NOVEMBER 1999

PREPARED UNDER THE SUPERVISON OF:

Steven B. McCoy

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Debbie Wroblewski

DEBBIE WROBLEWSKI
PROGRAM MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

R4707995

PROFESSIONAL GEOLOGIST CERTIFICATION

I hereby certify that this document, *Work Plan for Groundwater Sampling, Naval Training Center, Orlando, Florida,* was prepared under my direct supervision in accordance with acceptable standards of geological practice.

MICHAEL J. CAMPBELL
LICENSE
No. 1981
STATE OF
FLORIDA
PROFESSIONAL GEOLOGIST

Michael J. Campbell 11/9/99

Michael J. Campbell, P.G. / Date
License No. PG 0001981

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FIGURES

NUMBER

1-1 Location of Naval Training Center, Orlando 1-2

ACRONYMS

ABB-ES	ABB Environmental Services, Inc.
B&R Environmental	Brown & Root Environmental
bgs	below ground surface
BRAC	Base Realignment and Closure
BTEX	benzene, toluene, ethylbenzene, and xylenes
CLEAN	Comprehensive Long-Term Environmental Action Navy (CLEAN) Contract
CLP	Contract Laboratory Program
DO	dissolved oxygen
DQO	Data Quality Objective
FDEP	Florida Department of Environmental Protection
GCTL	Groundwater Cleanup Target Level
HLA	Harding Lawson Associates
IDW	investigation-derived waste
IRA	Interim Removal Action
LNAPL	light nonaqueous phase liquid
MCL	Maximum Contaminant Level
MS	matrix spike
MSD	matrix spike duplicate
NA	natural attenuation
NTC	Naval Training Center
NTU	Nephelometric Turbidity Unit
OAFB	Orlando Air Force Base
OPT	Orlando Partnering Team
ORP	oxidation reduction potential
OU	Operable Unit
PAH	polynuclear aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, comparability, and completeness
PCE	tetrachloroethene or perchloroethylene
POP	Project Operations Plan
QA	quality assurance
QC	quality control
SA	Study Area
TCL	Target Compound List
TRPH	total recoverable petroleum hydrocarbon
USAF	U. S. Air Force
USEPA	U. S. Environmental Protection Agency
VOC	volatile organic compound

1.0 INTRODUCTION

1.1 PURPOSE

The Naval Training Center (NTC) located in Orlando, Florida, consists of four areas (the Main Base, Area C, Herndon Annex, and McCoy Annex) as shown in Figure 1-1. The NTC ceased operations in April 1999 as proscribed by the Defense Base Realignment and Closure (BRAC) Act of 1990. As part of the closure process, the Navy initiated a program to identify and remediate environmental contamination at NTC. To ensure that all consultants planned and executed their field activities in a manner consistent with Southern Division, Naval Facilities Engineering Command, and regulatory requirements, the *Project Operations Plan for Site Investigations and Remedial Investigations* [POP] (ABB-ES, 1997) was prepared and implemented.

In the environmental program, certain Study Areas (SAs) and Operable Units (OUs) may require periodic sampling of groundwater until contaminant concentrations decrease below specified levels. This document presents the technical approach for performing the sampling with general requirements and procedures specified in the body of the plan. Site-specific information (site background, wells to be sampled, well construction details, sampling frequency, etc.) is provided in the Appendices. Unless otherwise specified herein, all work will be performed in accordance with the requirements and guidance of the POP.

1.2 HEALTH AND SAFETY

Health and safety aspects of Tetra Tech NUS' work at NTC, Orlando are controlled in accordance with the *Health and Safety Plan for Completion of Investigative Work and Data Sampling* (B&R Environmental, 1997) and addenda.

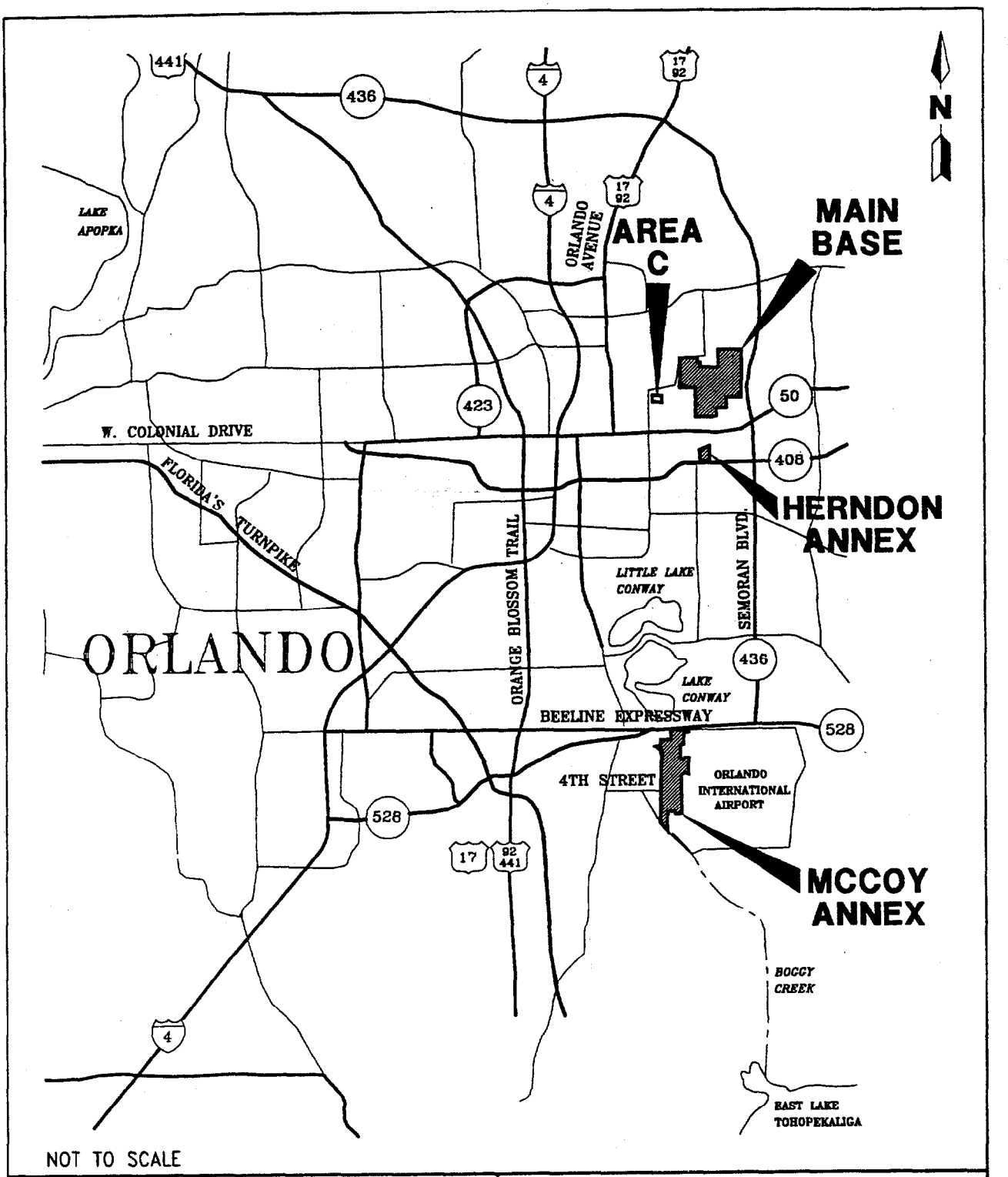

FIGURE 1-1
LOCATION OF NAVAL TRAINING CENTER, ORLANDO

SOURCE: HLA, 1999

WORK PLAN FOR GROUNDWATER SAMPLING

NAVAL TRAINING CENTER ORLANDO, FLORIDA

2.0 PURGING AND SAMPLING

Quarterly sampling will be conducted for one year. After one year, the Orlando Partnering Team will evaluate the data and may change the sampling frequency if appropriate.

2.1 PURGING PROCEDURES FOR MONITORING WELLS

Unless otherwise specified herein, all work will be performed following guidance detailed in the POP (ABB-ES, 1997). In addition, wells will be purged and sampled meeting or exceeding the guidance detailed in *Environmental Investigations, Standard Operating Procedures and Quality Assurance Manual* (USEPA, 1996).

Peristaltic pumps using dedicated Teflon®-lined discharge tubing will be used for both purging and sampling of the wells. Flow-through cells will be used to collect purged groundwater in-line for real-time parameter monitoring.

The newly installed monitoring wells are to be purged using micro-flow purging techniques prior to sampling. The steps listed below are to be followed for the purging procedure.

1. The water level will be measured and recorded prior to placing the tubing into the well.
2. The discharge tubing will be lowered into the well as slowly as possible to minimize disturbance to the water in the well.
3. The end of the tubing will be positioned at the midpoint of the saturated screen length. The end of the tubing will be kept at least 2 feet above the bottom of the well to minimize mobilization of any particulates present (where practical).
4. The water level will be measured and recorded before starting the pump.
5. Purging will begin with the pump at the lowest setting and will slowly increase until discharge occurs.
6. The water level will be checked again.

The following guidance applies to the purging of monitoring wells.

- The pumping rate will be adjusted until there is little or no water level drawdown. Drawdown should be less than 0.3 foot unless site conditions warrant a change. If the least drawdown that can be achieved exceeds 0.3 foot but remains stable, the purging procedure will continue.

- The water level and pumping rate will be monitored and recorded every 3 to 5 minutes (or as appropriate) during purging. Pumping rate adjustments will be recorded (both time and flow rate). Adjustments are best made during the first 15 minutes of pumping to minimize purging time. During pump start-up, drawdown may exceed the 0.3 foot target and then recover as pump flow adjustments are made. Unless site conditions warrant a change, purging will proceed at approximately 100 ml/min.

- Field parameters will be monitored and recorded every 3 to 5 minutes (or as appropriate) for stabilization. Note: During the early phase of purging, emphasis will be placed on minimizing and stabilizing pumping stress and recording those adjustments.

- Purging will be considered complete when temperature, specific conductance, pH, oxidation reduction potential (ORP), and dissolved oxygen (DO) have stabilized and turbidity has stabilized below 10 Nephelometric Turbidity Units (NTUs) (USEPA, 1996).

- Stabilization is considered to be achieved when three consecutive readings, taken at 3- to 5-minute intervals, are within the limits listed below. If turbidity is greater than 10 NTUs and has not decreased significantly after 60 minutes, purging will be discontinued and sample collection will be performed at the discretion of the Project Manager.

Parameter	**Unit**	**Limit**
Temperature	Degrees Fahrenheit (°F)	± 5%
Specific Conductance	Micro-siemens/centimeter (µs/cm)	± 5%
pH	Standard Unit (SU)	± 0.1
Oxidation Reduction Potential (ORP)	Millivolts (mV)	± 5%
Dissolved Oxygen (DO)	Milligrams per liter (mg/L)	± 5%
Turbidity	Nephelometric Turbidity Unit (NTU)	± 5% for values > 7 ± 10% for values < 7

2.2 MONITORING WELL SAMPLING PROCEDURES

When purging is complete, the flow-through cell will be disconnected and sample bottles will be filled directly from the Teflon® or Teflon®-lined tubing prior to its interface with the silastic tubing used in the peristaltic pump head.

Samples for Target Compound List (TCL) volatile organic compounds (VOCs) will be collected using the tube evacuation method. Semi-volatile organic compound (SVOC), polynuclear aromatic hydrocarbon (PAH), pesticide, and herbicide samples will be collected using the vacuum jug assembly method.

Samples will be shipped on a daily basis with accompanying trip blanks to:

Quanterra Environmental Services
4101 Shuffel Drive NW
North Canton, Ohio 44720
Attn: Deborah Hula
Phone: (330) 497-9396

2.2.1 Sample Numbering

The monitoring well samples will be numbered as follows:

NTC02*TWWWRR*

where: NTC = Naval Training Center
02 = two-digit SA designation (02); for OUs the designation will be "U" plus the OU number (e.g., U3 for OU3)
T = sample type ("G" for groundwater, "D" for duplicate)
WWW = well location and screen depth designation (e.g., 17C)
RR = sampling round number (e.g., 10)

For example, the groundwater sample collected from well OLD-02-17C at SA 2 during sampling round 10 will be designated NTC02G17C10. Samples for field duplicates will be identified with a "blind" number (e.g., NTC02D1000). The corresponding environmental sample will be noted in the field logbook. The Task Order Manager will identify the appropriate round number.

2.2.2 Quality Control Samples

Quality control samples will be collected at the frequencies listed below.

- One field duplicate per 10 environmental samples.
- One trip blank per cooler containing samples for VOC analysis.
- One matrix spike/matrix spike duplicate (MS/MSD) per 20 environmental samples.

"MS/MSD" will be added to the sample number on the labels and the chain of custody. New sample numbers will not be created for these samples. MS/MSD samples will be collected in the field by the Field Operations Leader and will require 3X sample volume for each set (1X for environmental sample, 1X for MS sample, and 1X for MSD sample).

If any nondisposable sampling equipment is used and decontaminated, the additional quality control samples listed below will be collected.

- One rinsate blank per 10 environmental samples.
- One field blank from each water source used for decontamination.

3.0 DECONTAMINATION

Decontamination of any nondedicated sampling equipment used will be performed in accordance with procedures specified in the POP (ABB-ES, 1997) unless otherwise specified herein.

Dedicated Teflon® or Teflon®-lined tubing will be used for sampling organic parameters and dedicated polyethylene tubing may be used for all other analyte sample collection. Peristaltic pumps will be used for the well purging and for sampling. If redevelopment is required for problematic monitoring wells, centrifugal pumps will be used down hole. All downhole pumps will be decontaminated using the following steps:

1. Decontaminate the outside of the pump using the procedure in the following paragraph.
2. Pump approximately 5 gallons of potable water and Alconox through the pump and discharge tubing.
3. Pump approximately 1 gallon of analyte-free water through the pump and discharge tubing.
4. Wrap decontaminated downhole equipment in aluminum foil to prevent contamination during storage or transport.

All other sampling tools and miscellaneous sampling equipment will be decontaminated using the following steps:

1. Wash with potable water and Alconox.
2. Rinse thoroughly with potable water.
3. Rinse with deionized water or analyte-free water.
4. Rinse with isopropanol.
5. Rinse with analyte-free water and air dry.
6. Wrap with aluminum foil.

4.0 DATA QUALITY

4.1 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are qualitative or quantitative statements developed by the data user to specify the quality of data needed from a particular data activity to support specific decisions. The DQOs are the starting point in the design of an investigation. The DQO development process matches sampling and analytical capabilities to the data targeted for specific uses and ensures that the quality of the data satisfies project requirements.

The DQOs for laboratory analyses [other than for natural attenuation (NA) parameters] will be those set by the Contract Laboratory Program (CLP) for Level IV DQOs. Level IV DQOs are characterized by rigorous quality assurance/quality control (QA/QC) protocols and documentation, providing qualitative and quantitative analytical data. Field test kit analyses (Level II DQOs) are sufficiently reliable for NA parameters. Fixed-base laboratory analyses are used for NA parameters that cannot be easily or accurately performed in the field.

The objective of the hydrogeologic and analytical data collected will be to evaluate groundwater migration, flow gradients, and stratigraphy to determine if exposure potential from contaminant plumes exists and to predict if contaminant migration will occur in the future. NA parameters are collected to provide an accurate estimate of the potential for natural biodegradation to reduce contaminant concentrations in groundwater.

4.2 DATA VALIDATION

The approach to providing reliable data that meet the DQOs will include QA/QC requirements for each of the analytical data types generated during the field investigation. The QA/QC efforts for laboratory analyses will include collection and submittal of QC samples and the assessment and validation of data from the subcontract laboratory. Analytical data will be subjected to rigorous data validation.

Data quality indicators include the precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters. These parameters will be used within the data validation process to evaluate data quality. The achievable limits for these parameters vary with the DQO level of the data. The limits used for laboratory analytical data in this program will be those set by the CLP for Level IV DQOs. The data will be validated in accordance with the U.S. Environmental Protection Agency's (USEPA's) CLP *National Functional Guidelines for Organic Data Review* (USEPA, 1994) as amended for use in USEPA Region 4.

5.0 INVESTIGATION-DERIVED WASTE (IDW) MANAGEMENT

Soil cuttings from monitoring well installation will be temporarily stored in a roll-off bin or drums. Drilling mud from monitoring well installation will be stored in Department of Transportation-approved 55-gallon steel drums or disposed of in a manner approved by the base contact. Each drum will be clearly marked with the following information or as otherwise directed by the base contact:

- Company name (Tetra Tech NUS)
- Base contact (Wayne Hansel) and phone number (407-895-6714)
- Boring or well identification where the IDW originated
- Material contained in the drum
- Date the IDW was produced

Decontamination fluids, well development water, and purge water will be temporarily stored in a poly tank or drums. Fluids will be sampled, analyzed, and disposed of by a licensed waste hauler following completion of monitoring well sampling at the site.

Miscellaneous sampling material (e.g., gloves, tubing, and plastic) will be disposed of in approved dumpsters located in Area C near Building 1056 on Seabee Street.

6.0 LOGBOOKS AND FORMS

The site logbook is a hard-bound, paginated, controlled-distribution record book in which all major on-site activities are documented. The following information will be recorded in the site logbook in real time on a daily basis:

- Study Area, Operable Unit, or tank site
- All field personnel present
- Arrival/departure of site visitors
- Arrival/departure of major equipment
- Start/completion of borehole/monitoring well installation or sampling event
- Weather conditions
- Health and safety issues
- Problems encountered
- Deviations from standard operating procedures and documentation explaining rationale
- Record of pertinent phone calls
- Documentation of decontamination activities
- Documentation of sample storage and shipping information, including the shipper's airbill number used for each shipment
- Signature and date at the completion of daily entries

All pertinent information gathered during the monitoring well installation activities -- including installation, development, purging, and sampling -- will be written in detail on boring logs, well construction logs, and purging/sampling logs. In addition to the general entries placed into the logbook, detailed entries will be made on the purge/sample forms and will include (at a minimum) those items listed below:

- Times, water level, and flow rate during purging (at 3- to 5-minute intervals, or as appropriate)

- Approximate soil sample recovery, if less than 100 percent

- Time and values of field parameters during purging (at 3- to 5-minute intervals after drawdown stabilization, or as appropriate)

- Estimated volume of purge water, time, sample number, and all analytical parameters during sampling.

7.0 CONTACTS

The following personnel are approved contacts for their respective project areas.

Project Area	Responsible Personnel	Phone Number
Base Contact	Wayne Hansel	407-895-6714
Task Order Management	Steve McCoy	423-220-4730
Technical Issues	Michael Campbell or Allan Jenkins	423-220-4714 or -4724
Health & Safety	Matt Soltis	412-921-8912
Procurement	Sandy D'Alessandris	412-921-8435
Laboratory Services	Deborah Hula, Quanterra Souk Inthirajbongsy, Universal Eng. Sciences	330-497-9396 407-423-0504
Analytical Issues	Joe Samchuck	412-921-8510
Drilling Contractor	Todd Fullerton, GPI	407-426-7885

REFERENCES

ABB-ES (ABB Environmental Services, Inc.), 1997. *Project Operations Plan for Site Investigations and Remedial Investigations.* Naval Training Center, Orlando, Florida.

B&R Environmental (Brown & Root Environmental), 1997. *Health and Safety Plan for Completion of Investigative Work and Data Sampling,* and addenda.

HLA (Harding Lawson Associates), 1999. *Base Realignment and Closure Environmental Site Screening Report, Study Area 2, Herndon Annex.* Naval Training Center, Orlando, Florida, July.

USEPA (U.S. Environmental Protection Agency), 1996. *Environmental Investigations, Standard Operating Procedures and Quality Assurance Manual* including 1997 revisions. Region 4 Science and Ecosystem Support Division, Enforcement and Investigation Branch. May

APPENDIX A

STUDY AREA 2
HERNDON ANNEX

STUDY AREA 2

HERNDON ANNEX

1.0 INTRODUCTION

1.1 SITE DESCRIPTION

Study Area 2 is located at Herndon Annex, approximately one and one-half miles south of the Main Base of NTC (see Figure 1-1). The history of Herndon Annex dates to the construction of the original Orlando Municipal Airport, prior to 1940. The construction of Orlando Army Air Base began on this site in August 1940, and it was officially opened on December 1, 1940.

In 1947, the U.S. Air Force (USAF) assumed command of the facilities at Orlando Army Air Base, and the facility became known as Orlando Air Force Base (OAFB). The annex property was used for civilian and military aviation at various times from 1940 to 1968. Herndon Annex was also used on an occasional basis in the 1950s and early 1960s by the USAF as a sanitary landfill site. The Navy acquired the site in 1968 and maintained a supply warehouse there.

1.2 BACKGROUND

Groundwater screening at Herndon Annex was completed in five phases between July 1994 and December 1998. Direct push surveys included cone penetrometer testing at 36 locations to depths of up to 80 feet below ground surface (bgs), and the collection of 156 water and soil samples at 50 locations to depths from 13.5 to 64 feet bgs. Benzene was detected at concentrations exceeding the Florida Groundwater Cleanup Target Level (GCTL) of 1 µg/L at 30 locations in 59 samples at depths ranging from 3 feet bgs (in the deep drainage ditch between Herndon Annex and the Azalea Park neighborhood) to 61 feet bgs. The average depth for benzene detections exceeding the GCTL was 44 feet bgs.

Twenty-one monitoring wells were installed during site screening. Construction data for the monitoring wells are presented in Table A-1. Figures A-1 and A-2 show the groundwater elevation contours for the shallow and deep portions of the surficial aquifer, respectively. Figure A-3 presents the exceedances of the current Florida Department of Environmental Protection (FDEP, 1999) GCTLs in soil and groundwater samples from the monitoring wells.

The final site screening report (HLA, 1999) recommends that a quarterly groundwater monitoring program of selected monitoring wells be implemented with the samples submitted for VOC analysis only. The data

TABLE A-1

WELL CONSTRUCTION DATA
STUDY AREA 2, HERNDON ANNEX
NTC, ORLANDO

Well Number	Date Installed	Well Type	Boring Depth (ft bls)	Boring Diameter (in.)	Well Depth (ft bls)	Top of Casing Elevation (ft)	Well Casing			Screen			Bentonite Seal Interval (ft)	Sand Pack Interval (ft)
							Diameter (in.)	Length (ft)	Interval (ft)	Diameter (in.)	Length (ft)	Interval (ft)		
OLD-02-01A	09/02/94	II	17.5	6.25	16.9	104.70	2.0	7.0	0 - 7	2.0	10.0	7 - 17	3 - 4	4 - 17.5
OLD-02-02A	09/06/94	II	13.5	6.25	13.1	111.27	2.0	3.0	0 - 3	2.0	10.0	3 - 13	1.5 - 2	2 - 13.5
OLD-02-03A	09/06/94	II	13.5	6.25	13.0	117.45	2.0	3.0	0 - 3	2.0	10.0	3 - 13	1.5 - 2	2 - 13.5
OLD-02-04A	09/06/94	II	15.5	6.25	15.1	110.63	2.0	5.0	0 - 5	2.0	10.0	5 - 15	1.5 - 2	2 - 15.5
OLD-02-05A	09/06/94	II	13.5	6.25	12.1	112.89	2.0	3.0	0 - 3	2.0	10.0	3 - 13	1.5 - 2	2 - 13.5
OLD-02-06A	09/07/94	II	13.5	6.25	12.8	109.17	2.0	3.0	0 - 3	2.0	10.0	3 - 13	1.5 - 2	2 - 13.5
OLD-02-07C	02/12/94	II	64.0	6.25	64.0	111.52	2.0	57.0	0 - 57	2.0	5.0	57-62	54 - 55	55 - 64
OLD-02-08C	02/12/95	II	66.0	6.25	66.0	112.31	2.0	60.0	0 - 60	2.0	5.0	60-65	56 - 57	57 - 66
OLD-02-09A	02/22/95	II	16.0	6.25	15.3	112.34	2.0	5.0	0 - 5	2.0	10.0	5 - 15	1.5 - 2	2 - 16
OLD-02-10C	02/23/95	II	58.0	6.25	56.3	106.90	2.0	52.0	0 - 52	2.0	5.0	52 - 57	48 - 49	49 - 58
OLD-02-11A	02/22/95	II	16.0	6.25	12.8	107.14	2.0	5.0	0 - 5	2.0	10.0	5 - 15	1.5 - 2	2 - 16
OLD-02-12C	08/12/97	II	66.0	6.25	58.0	116.04	2.0	53.0	0 - 53	2.0	5.0	53 - 58	49 - 50	50 - 58
OLD-02-13C	08/15/97	II	54.0	6.25	49.1	104.72	2.0	44.0	0 - 44	2.0	5.0	44 - 49	40 - 41	41 - 49
OLD-02-14C	08/14/97	II	50.0	6.25	45.8	102.74	2.0	41.0	0 - 41	2.0	5.0	41 - 46	37 - 38	38 - 47
OLD-02-15A	12/01/97	II	15.5	6.25	14.5	100.05	2.0	10.0	0 - 10	2.0	5.0	10 - 15	2 - 4	4 - 15.5
OLD-02-16B	12/03/97	II	33.5	6.25	32.3	99.97	2.0	28.0	0 - 28	2.0	5.0	28 - 33	23 - 26	26 - 33.5
OLD-02-17C	12/02/97	II	56.0	6.25	49.1	99.82	2.0	45.0	0 - 45	2.0	5.0	45 - 50	40 - 43	43 - 50.25
OLD-02-18B	12/05/97	II	34.5	6.25	33.4	102.17	2.0	29.0	0 - 29	2.0	5.0	29 - 34	24 - 27	27 - 34.5
OLD-02-19C	12/04/97	II	58.0	6.25	51.9	102.32	2.0	49.0	0 - 49	2.0	5.0	49 - 54	44 - 47	47 - 54.5
OLD-02-20B	10/26/98	II	41.0	6.25	41.3	108.26	2.0	36.0	0 - 36	2.0	5.0	36 - 41	31 - 32	32 - 41
OLD-02-21C	10/26/98	II	61.0	6.25	60.4	108.56	2.0	50.0	0 - 50	2.0	5.0	56 - 61	51 - 56	56 - 61

BASE MAP: HLA, 1999

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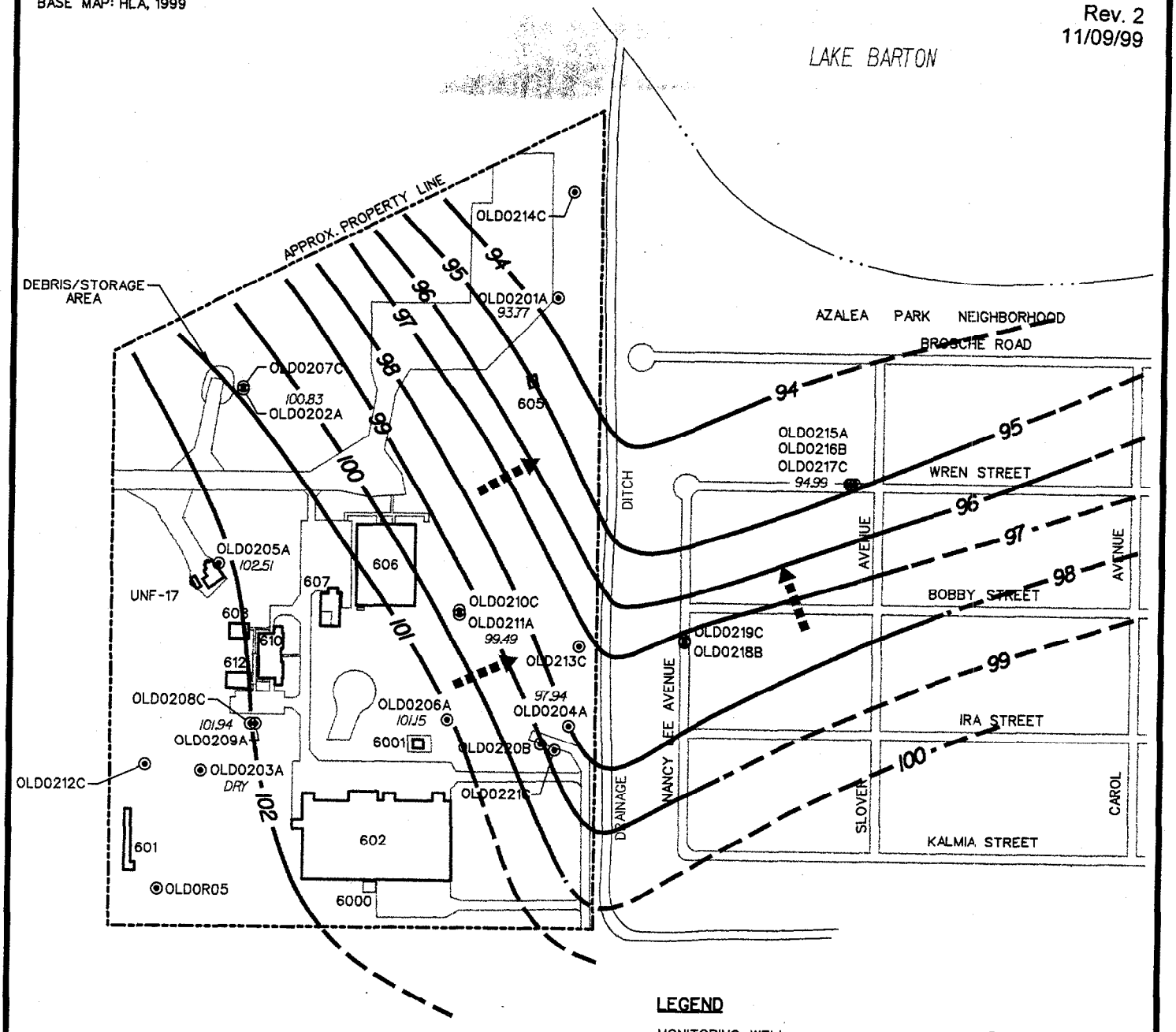


LEGEND

MONITORING WELL ⊙

GROUNDWATER ELEVATION[1] 99.49

POTENTIOMETRIC SURFACE ISOCON[1] (DASHED WHERE APPROX.) ———

GROUNDWATER FLOW DIRECTION (APPROX.) ▪▪▪▪▶

1 - ELEVATION IN FEET ABOVE MEAN SEA LEVEL

-N-

400 0 400

SCALE IN FEET

FIGURE A-1

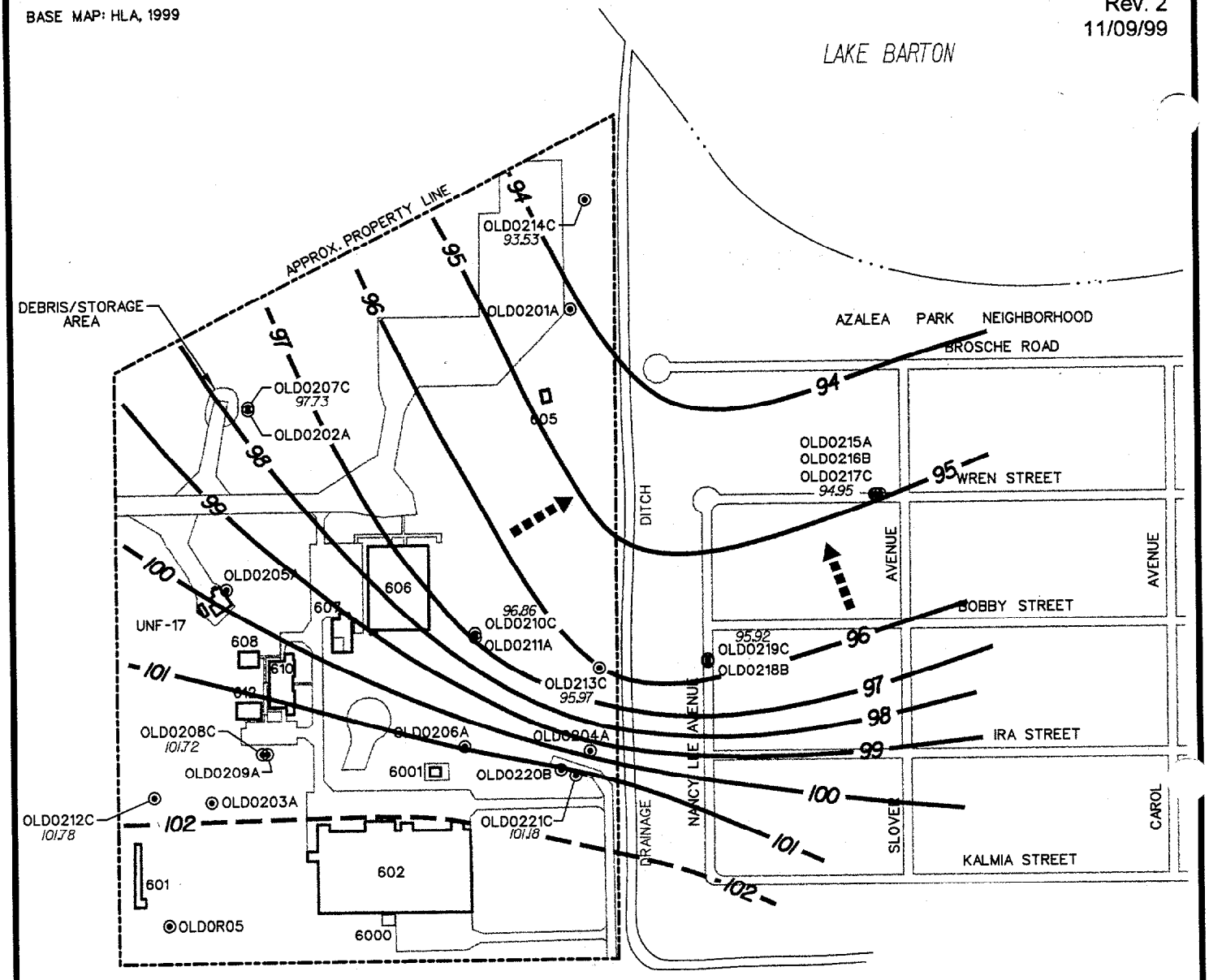
SHALLOW ZONE WATER TABLE ELEVATION MAP - JULY 13, 1999
WORKPLAN FOR GROUNDWATER SAMPLING
STUDY AREA 2 - HERNDON ANNEX

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

n8-5x11v.dgn

BASE MAP: HLA, 1999

Rev. 2
11/09/99



LEGEND

MONITORING WELL ⊙

GROUNDWATER ELEVATION[1] 94.95

POTENTIOMETRIC SURFACE ISOCON[1] (DASHED WHERE APPROX.) ———

GROUNDWATER FLOW DIRECTION (APPROX.) ■■■■▶

1 - ELEVATION IN FEET ABOVE MEAN SEA LEVEL

-N-

400 0 400
SCALE IN FEET

FIGURE A-2

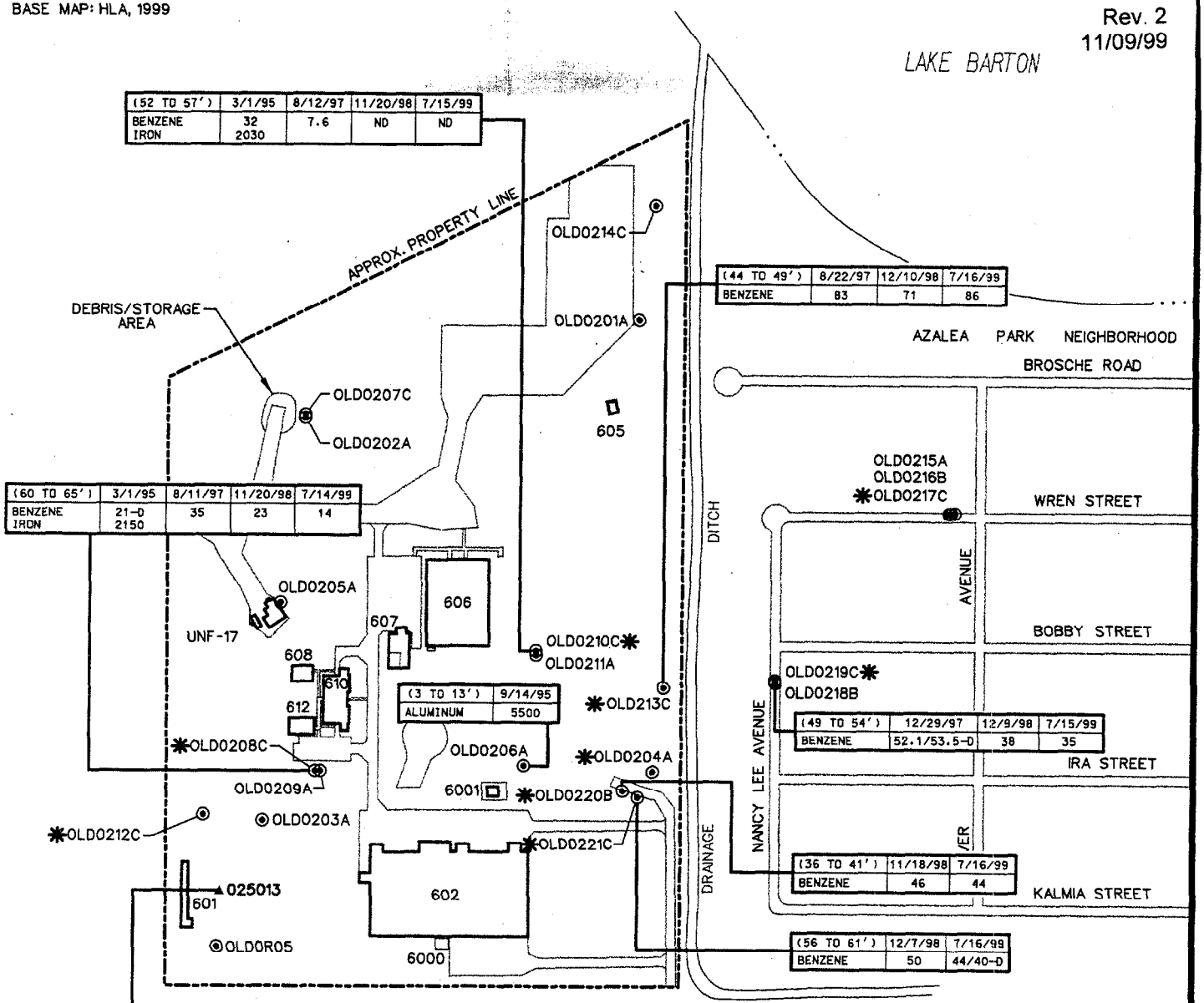
DEEP ZONE POTENTIOMETRIC SURFACE MAP - JULY 13, 1999
WORKPLAN FOR GROUNDWATER SAMPLING
STUDY AREA 2 - HERNDON ANNEX

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

n8-5x11v.dgn

BASE MAP: HLA, 1999

Rev. 2
11/09/99



(52 TO 57')	3/1/95	8/12/97	11/20/98	7/15/99
BENZENE	32	7.6	ND	ND
IRON	2030			

(44 TO 49')	8/22/97	12/10/98	7/16/99
BENZENE	83	71	86

(60 TO 65')	3/1/95	8/11/97	11/20/98	7/14/99
BENZENE	21-D	35	23	14
IRON	2150			

(3 TO 13')	9/14/95
ALUMINUM	5500

(49 TO 54')	12/29/97	12/9/98	7/15/99
BENZENE	52.1/53.5-D	38	35

(36 TO 41')	11/18/98	7/16/99
BENZENE	46	44

(56 TO 61')	12/7/98	7/16/99
BENZENE	50	44/40-D

SOIL SAMPLE	6/9/95
BENZO(a)PYRENE	700
DIBENZ(a)ANTHRACENE	190J

LEGEND

ASTERISK INDICATES WELL TO BE SAMPLED — OLD0210C

MONITORING WELL

SURFACE SOIL SAMPLE

SAMPLE DEPTH — SAMPLE COLLECTION DATE

(56 TO 61')	12/7/98	7/16/99
BENZENE	50	44/40-D

ANALYTE — ANALYTE CONCENTRATION [1,2]

NOT DETECTED — ND

DUPLICATE — D

ESTIMATED VALUE — J

1-GROUNDWATER CONCENTRATIONS IN MICROGRAMS PER LITER (ug/L)
2-SOIL CONCENTRATIONS IN MICROGRAMS PER KILOGRAM (ug/Kg)

NOTE:
DATA ARE SHOWN FOR LOCATIONS WITH PAST OR CURRENT EXCEEDANCES.

-N-

400 0 400
SCALE IN FEET

FIGURE A-3

GROUNDWATER CONCENTRATIONS
JULY 1999
WORKPLAN FOR
GROUNDWATER SAMPLING
STUDY AREA 2 - HERNDON ANNEX

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

n8-5x11v.dgn

will be evaluated to determine trends in the contaminant concentrations. The monitoring program will also include private wells in the Azalea neighborhood within the benzene plume.

NA parameters were analyzed during Phase IV investigations in the fall of 1998 to evaluate which microbial processes are most active in biodegradation of contaminants. The analyses suggested that subsurface conditions are anaerobic and favor sulfate reduction and methanogenesis (HLA, 1999).

1.3 OBJECTIVES

The objectives of the groundwater monitoring at SA 2 are to:

- Sample selected monitoring wells to evaluate trends in the benzene concentrations and progression of the plume.
- Sample private wells to determine if contamination from SA 2 has impacted these wells.
- Sample selected monitoring wells to evaluate the contribution of biodegradation to the reduction in contaminant mass.

The analytical data from the residential well samples will be considered to be of only qualitative value. If benzene is detected, however, this may indicate that the contaminant plume from SA 2 has impacted the well and further actions may be required. The sampling frequency will be as shown below:

Sample Type	Sampling Frequency
Environmental	Quarterly
NA Parameters	Annually

Note: The sampling frequency is subject to change by the Orlando Partnering Team.

2.0 WELL LIST AND ANALYTICAL PARAMETERS

The wells to be sampled, analytical parameters, and sampling rationale are listed below and well locations are shown in Figure A-3. The list of wells to be sampled will be evaluated periodically by the Orlando Partnering Team and is subject to revision. Samples (other than for NA parameters) are to be collected and analyzed in accordance with U.S. Environmental Protection Agency (USEPA) Level IV DQOs. NA analyses will be performed in accordance with Level II DQOs.

Well Number*	Analytical Parameters	Rationale
OLD-02-04A	TCL VOCs (Method 8260)	Downgradient well (monitor for discharge to the drainage ditch)
OLD-02-08C	TCL VOCs (Method 8260)	Historical positive detections
OLD-02-10C	TCL VOCs (Method 8260)	Historical positive detections
OLD-02-12C	TCL VOCs (Method 8260)	Positive field screening detection
OLD-02-13C	TCL VOCs (Method 8260)	Historical positive detections
OLD-02-17C	TCL VOCs (Method 8260)	Downgradient well
OLD-02-19C	TCL VOCs (Method 8260)	Historical positive detections
OLD-02-20B	TCL VOCs (Method 8260)	Historical positive detections
OLD-02-21C	TCL VOCs (Method 8260)	Historical positive detections

*Note: Well OLD-02-14C has been dropped from the sampling program based upon the July 1999 results.

Contaminant of Concern	Cleanup Criterion
Benzene	1 µg/L (GCTL)

Five wells (OLD-02-10C, OLD-02-12C, OLD-02-13C, OLD-02-17C, and OLD-02-19C) to be sampled for NA parameters were selected during the Orlando Partnering Team meeting on October 18-19, 1999. The rationale for selection of wells is shown in the following table.

Well Number	Rationale
OLD-02-10C	Clean deep well, previously contaminated.
OLD-02-12C	Clean deep well upgradient not affected by plume; background.
OLD-02-13C	Deep well at center of plume at most contaminated portion of aquifer.
OLD-02-17C	Clean deep well downgradient from dissolved contaminant plume
OLD-02-19C	Intermediate well at leading edge of plume, downgradient from source area, in the dissolved contaminant plume.

The NA parameters to be analyzed for are indicated in Table A-2.

TABLE A-2

**NATURAL ATTENUATIONS PARAMETERS
AND METHODS FOR GROUNDWATER SAMPLING
STUDY ARE 2, HERNDON ANNEX
NAVAL TRAINING CENTER, ORLANDO, FLORIDA**

ANALYTICAL PARAMETER	METHOD	GUIDANCE
Alkalinity	Laboratory	USEPA Method E310.1
Biogenic gases: H, DO, CO_2, N, Ethene, Ethane, Methane	Field gas extraction; laboratory analysis of fixed gases and light hydrocarbons	Extraction and analysis using MICROSEEPS propriety methodology
Anions: NO_2, NO_3, Cl, PO_4,	Laboratory	USEPA 300 series; 48-hour hold time for nitrate and nitrite
Carbon dioxide	Field Test Kit	HACH kit CA-DT; to confirm biogenic gas results
Dissolved Organic Carbon (DOC)	Laboratory	SW-846 Method 9060; sample from one or more clean, upgradient well(s)
Dissolved Oxygen (DO)	Field Meter and Field Test Kit	Previous data show D.O. <1 mg/L; will verify with CHEMetrics field kits K-7501 (<1 mg/L) and K7512 (>1 mg/L); to confirm biogenic gas results
$Iron^{+2}$ (ferrous)	Field Test Kit	Filter in the field if NTU >20 HACH kit IR-18C
Iron and Manganese	Laboratory	Filter in the field (0.45µ)
pH, conductivity, ORP, temperature, turbidity	Field Flow-through Cell	Recorded during well purging
Sulfate	Laboratory	USEPA Method 8051
Sulfide	Field Test Kits for Hydrogen Sulfide and Total Sulfide	HACH kits HS-C and HS-WR
Total Organic Nitrogen	Laboratory	Total Kjeldahl N

3.0 SAMPLING PROCEDURES

Monitoring Wells - Monitoring wells will be sampled as described in Section 2.0 of the Work Plan.

Residential Wells - Potentially affected residential wells with in-place plumbing will be sampled following the FDEP Standard Operating Procedures (FDEP 1992) which are included as Attachment 1 to this appendix.

4.0 REFERENCES

FDEP (Florida Department of Environmental Protection), 1992. Standard Operating Procedures for Laboratory Operations and Sample Collection Activities, DEP-QA-001/92, Tallahassee, FL.

FDEP, 1999. *Development of Soil Cleanup Target Levels (SCTLs) for Chapter 62-777, F.A.C.*, CEHT/TR-99-01, May.

HLA (Harding Lawson Associates), 1999. *Base Realignment and Closure Environmental Site Screening Report, Study Area 2, Herndon Annex*, Naval Training Center, Orlando, Florida, Unit Identification Code N65928, Contract No. N62467-89-D-0317/107, July.

HLA (Harding Lawson Associates), 1999. Draft *Natural Attenuation Monitoring Work Plan. Study Area 2. Herndon Annex*, Naval Training Center, Orlando, Florida. Unit Identification Code N65920, Contract No. N62467-89-D-0317/107, September.

ATTACHMENT 1

FDEP SOP
for
RESIDENTIAL WELL SAMPLING

DEPARTMENT OF ENVIRONMENTAL PROTECTION

STANDARD OPERATING PROCEDURES

FOR

LABORATORY OPERATIONS AND SAMPLE COLLECTION ACTIVITIES

DEP - QA-001/92

Florida Department of Environmental Protection

2600 Blair Stone Road

Tallahassee, Florida 32399-2400

QUALITY ASSURANCE SECTION

September 30, 1992

a. A disposable, high capacity, .45 um filter is an acceptable filter for most applications. See Fig. 4.2 and Table 4.1 for allowable equipment setups.
b. In field use, the filter must first be flushed with 30 - 50 mls of deionized water or an inert gas to remove atmospheric oxygen.
c. The filter must be inserted on the high pressure side (i.e. on the delivery side) of the peristaltic pump. VACUUM FILTRATION IS NOT ACCEPTABLE.
d. The sample delivery tube must be long enough (greater than 2 feet) such that back-diffusion of oxygen to the filter is negligible.
e. New or precleaned silastic tubing shall be installed in the pump at each monitor well.

3. In situations where the static water level in the well is too deep for a peristaltic pump to be used directly, there are several alternatives:
a. Groundwater may be sampled with an appropriately constructed bailer. The intake tube of the peristaltic pump is inserted into the full bailer and water pumped through a filter as described above.
b. Any submersible pump of appropriate construction for which the flow rate can be adjusted may be used for water levels below 20'-25'.
c. Pressurized HDPE and Teflon bailers may also be used.
d. See the specific section concerning field filtration in Table 4.1 for all acceptable alternatives.

4. It is important that this operation is carried out as rapidly as possible and in such a way that sample agitation and exposure to atmospheric oxygen is minimized. It is for this reason that pouring the sample into any intermediate vessel for subsequent filtration IS NOT allowed. This includes barrel or syringe filters. Once the sample is collected into a sample container, preservation and pH checks should be completed.

4.2.6 <u>Wells with In-Place Plumbing</u>

Wells with in-place plumbing are generally encountered at wellfields, industrial facilities and private residences. See separate discussions below on sampling potable water wells.

4.2.6.1 Purging

a. The volume to be purged depends on several factors: the depth and diameter of the well, whether the pumps are running continuously or intermittently, how close to the source the sample can be collected, and the presence of any

storage/pressure tanks between the sampling point and the pump.

b. If storage/pressure tanks are present, an adequate volume must be purged to totally exchange the volume of water in the tank (EPA, 1986).

c. Continuously Running Pumps

1. If the pump runs continuously and the sample can be collected prior to a storage/pressure tank, no purging is required, other than opening a valve and allowing it to flush at maximum velocity for at least 15 minutes.

2. If the pump runs continuously, and a storage/pressure tank is located ahead of the sample location, the purge must include the entire storage volume to ensure that a sample representative of the groundwater will be collected.

d. Intermittently Running Pumps

1. If the pump runs intermittently it is necessary to determine the volume to be purged, including storage pressure tanks that are located ahead of the sampling location.

2. The pump should then run continuously until the required volume has been purged.

3. When the well depth or diameter is unknown (as is frequently the case with in-place plumbing) purging should be carried out by pumping the well for 15 minutes and until the pH, specific conductance and temperature stabilize.

a. In practice, stable sample chemistry is indicated when the purging parameter values remain within 5% over two successive samples taken at least 5 minutes apart.

4.2.6.2 Sampling

All samples must be collected from the closest spigot to the well head, with all screens or aerators removed, and with the flow rate reduced to no more than 500 ml/min.

4.2.7 <u>Potable Well Sampling</u>

The following procedures describe generalized drinking water sampling from private potable wells. If the samples are collected for compliance with the drinking water regulations (Chapters 17-524, 17-550 or 17-555, F.A.C.), the samples must be analyzed by a laboratory with Drinking Water Certification. If the samples are being analyzed in response to other programs (contamination assessment, consent order, etc.), the laboratory shall meet the requirements of the specified Category.

4.2.7.1 General Concerns

a. Appropriate containers and preservatives must be selected prior to sampling.
1. Containers and preservatives shall comply with Tables 4.2, 4.3, 4.4 and 4.5.
2. Containers and preservatives may be obtained from a laboratory with appropriate credentials (see discussion above).
3. It is recommended that the laboratory add the appropriate preservative to the container.

b. The laboratory may include special handling instructions with the sample containers. These must be read carefully and must comply with the generalized instructions listed below.

4.2.7.2 Sampling Drinking Water Wells

a. As a general rule, purging and sample should be from a spigot closest to the well head.
1. If possible, the spigot should be before the holding tank and filters. If this this not possible, the contents of the holding tank must also be purged.
2. Remove all aerators and filters (if possible).

b. Depending on the running schedule of the well and the placement of the pressure tank, purge the system as described in Section 4.2.6.1.

c. If the capacity of the pressure tank is not known, purge for at least 15 - 20 minutes at maximum velocity.

d. Reduce flow to approximately 500 ml/minute (a 1/8" stream).

e. Sample Containers with no preservatives:
1. Remove the screw cap from the bottle. Do not touch the interior of the cap or the container with hand or the spigot.
2. Fill approximately 1/4 full, rinse the interior of the container and discard the water.
3. DO NOT RINSE CONTAINERS IF collecting samples for oil and grease, total recoverable hydrocarbons, volatile organics (including trihalomethanes) or microbiologicals.
4. Tilt the container so that flow falls onto the interior surface. DO NOT AGITATE OR SHAKE CONTAINER WHILE FILLING.

5. Fill the bottle to almost to capacity (if collecting VOC or trihalomethane samples, see 4.2.7.2.i below).
6. Replace the screw cap securely on the bottle.

f. Sample containers with preservatives.
1. Follow the same protocol outlined above, deleting the rinse.
2. Since some of the preservatives may react with the sample water, hold the open end of the container away from you while filling.
3. After replacing the cap, gently tip the container several times to mix the preservatives.

g. Affix a sample label and seal (if required), and complete the chain-of-custody form.

h. Place the sample bottle in a plastic sample bag and cool to 4 C on wet ice.

i. Special Sampling Protocols
The special precautions for the types of samples discussed in Section 4.2.2 shall be followed.

4.2.7.3 Sampling Drinking Water Sources for Lead and Copper
a. Selection of the sampling point is dependent on whether the sample is being taken to verify compliance with the Drinking Water Regulations. If so, the sample must be collected from a COLD WATER tap in either the kitchen or bathroom.
b. Samples must be collected after the water HAS NOT been used for at least SIX HOURS.
c. DO NOT FLUSH OR PURGE THE SYSTEM.
d. Collect the first flush into the sample container for trace metals. DO NOT RINSE SAMPLE CONTAINER.
e. Tilt the container so that the initial flow falls onto the interior surface. DO NOT AGITATE.
f. If the container was prepreserved, hold the open end of the container away from you while filling.
g. Add preservatives (if needed).
h. Replace screw cap and gently tip the container several times to mix the preservatives.
i. Affix a sample label and seal (if required), and complete the chain-of-custody form.
j. Place the sample bottle in a plastic sample bag.

4.2.8 <u>Drinking Water Supply System Sampling</u>

The following protocols shall be followed:
1. When sampling for drinking water compliance, the sampling spigot is normally designated by permit or municipal authorities.

The location may be near the supply line or may be an outside spigot on a private residence.

2. Procedures to sample drinking water directly from the supply system is the same as above, except for treatment of residual chlorine.

a. Lines shall be flushed for 2 to 5 minutes before collecting any samples.

b. Reduce the flow rate to less than 500 ml/min (1/8" stream) before collecting samples.

3. In many instances, the water supply to residences may be treated with chlorine which may cause interference with certain types of analyses (ex: VOC; Semi-Volatiles and some bacteriological samples). Residual chlorine must be treated with the addition of sodium thiosulfate ($Na_2S_2O_3$).

4. Utilizing chemical kits (such as HACH), test the water in a separate container for residual chlorine. If residual chlorine is present, collect the sample in the appropriate sample container(s) using the required preservatives.

a. Immediately upon sample collection add 0.008% $Na_2S_2O_3$ or 100 mg of $Na_2S_2O_3$ per 1 liter of sample water directly into the sample container.

b. After replacing the cap, tip the container several times to mix the preservative.

5. Affix a sample label, seal and transport on wet ice.

6. Lead and copper shall be sampled according to protocols outlined in 4.2.7.3.

4.2.9 Temporary Well Points

Temporary well points include those drilled with augers as well as those pushed with "direct push" or DPT devices. These types of wells are not permanently installed.

4.2.9.1 Use

a. Temporary well points may be used for PRELIMINARY INVESTIGATIONS and as a SCREENING TOOL.

[[b. For formal site work (not preliminary or PCAP), temporary well points may only be allowed under emergency situations. These are:

1. DOT right-of-ways,
2. private property where a permanent well cannot be placed, or
3. inside or up against a structure.]]

c. DER will determine whether temporary well points are warranted.

d. If these wells are used to provide formal data, these restrictions apply:

1. Use precleaned equipment as described in Table 4.1;
2. Well must be purged of 3-5 well volumes (or dry);
3. Sampling with a peristaltic pump

a. Extractable organics shall be collected via an all-Teflon and -glass organic trap configuration (see Figure 2.1);
b. VOCs shall not be collected through a pump, but the Teflon pump tubing is allowed to fill via ambient pressure, capped with stopper or gloved finger, carefully withdrawn from the well, and drained into appropriate vials.
c. Refer to protocols listed in 4.2.5.5 and 4.2.5.6 for specific information on sampling and configuration.

4. Sampling with bailers
a. In some cases, sampling may be accomplished with a 3/4" bailer.
b. All equipment construction restrictions shall be followed.
c. Refer to bailer sampling protocols in section 4.2.6.5.

4.2.10 Airstripper and Remedial Treatment System Sampling

a. Collect effluent samples from airstripper units in a similar manner to those described for Drinking Water Supply Systems (Section 4.2.8).
b. Remove any tubing from the sampling port and flush for one to two minutes.
c. Reduce flow rate to less than 500 ml/min. and begin sample collection.

4.2.11 Bioassay Sampling

When collecting samples for bioassays, the sampling protocols outlined in Section 4.2.3 (Surface Water) and 4.2.4 (Wastewater) shall be followed.

The holding time for bioassay samples is 72 hours.

APPENDIX B

STUDY AREA 3
MAIN BASE

STUDY AREA 3

MAIN BASE

1.0 INTRODUCTION

1.1 SITE DESCRIPTION

Study Area (SA) 3 is located west of the intersection of Farragut Avenue and Dahlgren Street in the northwestern part of the Main Base (Figure B-1). Building 73 is a fenced containment facility for hazardous materials (Figure B-2). Buildings 2816 and 2817 are Quonset hut-type storage buildings, formerly associated with Tactical Air Command Matador Missile Training activities, and are also reported to have been used for spray painting and temporary storage of hazardous materials. It has been alleged that solvents used in the maintenance of flight simulators were open-dumped in the area. Aboveground fuel oil storage tanks are located on the north side of Buildings 2816 and 2817 (ABB-ES, 1997).

A review of aerial photographs during preliminary site screening indicated the former missile test cells were located in the area west of SA 3, currently occupied by Buildings 226 and 228. Fueling activities are believed to have been centered in this area. Unidentified support activities appear to have occurred in the surrounding area, to the east, north, and northwest of Buildings 2816 and 2817. No indications of an alleged former septic system were observed during a review of the sanitary sewer blueprints. A 3-inch-diameter polyvinyl chloride plug was noted in the pavement northeast of Building 2817 during the walkover reconnaissance of the site. No other visible indications of a possible septic system were observed. No visible indications of spills or leakage were noted in the vicinity of the buildings or tanks in this study area (ABB-ES, 1997).

1.2 BACKGROUND

During initial screening activities in 1994, tetrachloroethene (PCE) was detected in wells OLD-03-01 and OLD-03-04 at 9 µg/L and 12 µg/L, respectively (Figure B-2), exceeding the Florida Maximum Contaminant Level (MCL) of 3 µg/L and the Federal MCL of 5 µg/L (ABB-ES, 1997). The current FDEP GCTL is 3 µg/L (FDEP, 1999). The Orlando Partnering Team (OPT) approved a groundwater restriction near wells OLD-03-01 and OLD-03-04 and groundwater monitoring for one year or until the GCTL is achieved. The site was approved for monitoring only in August 1997. Sampling of well OLD-03-04 was discontinued in December 1998 as PCE concentrations had fallen below the Florida MCL for consecutive

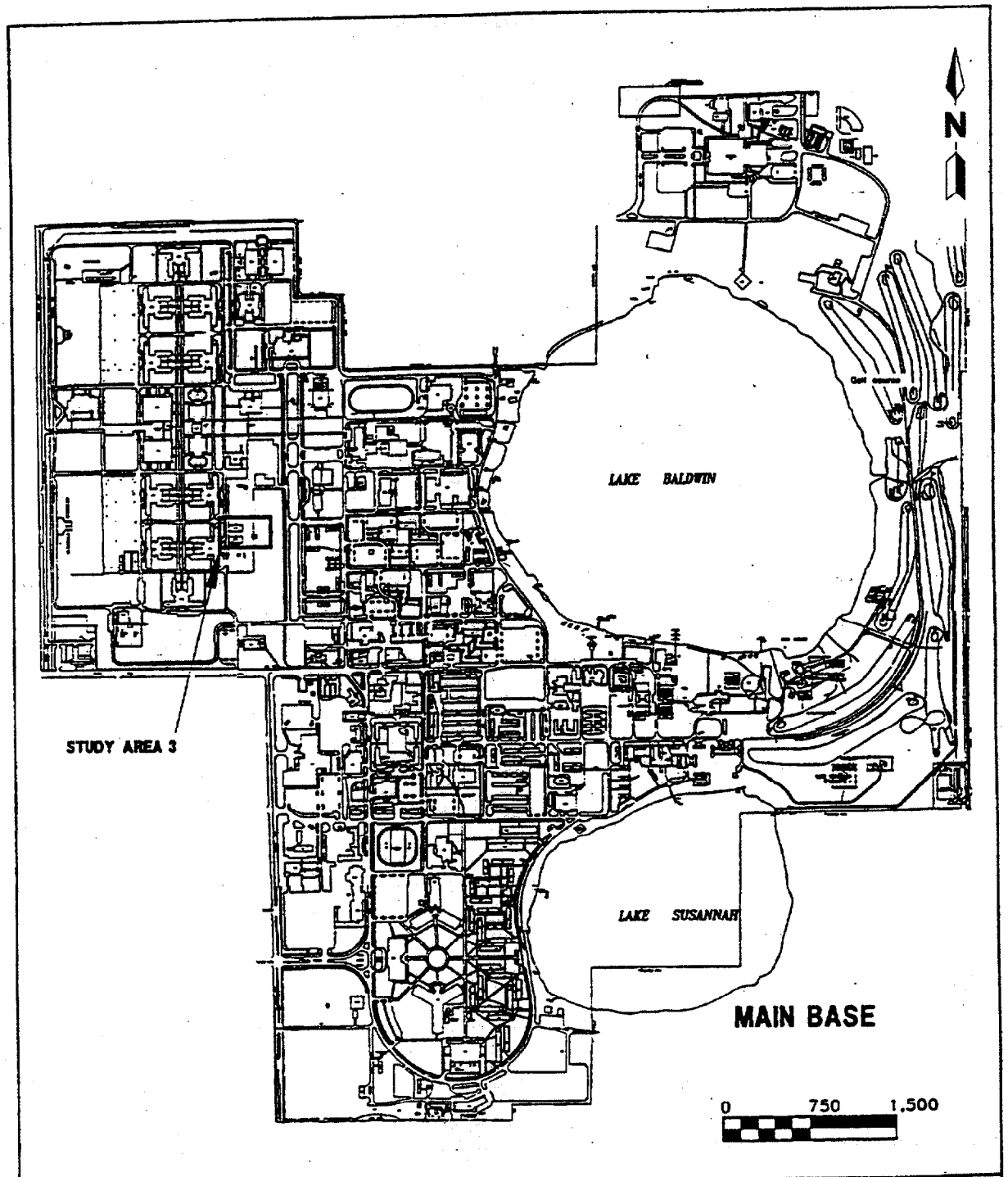
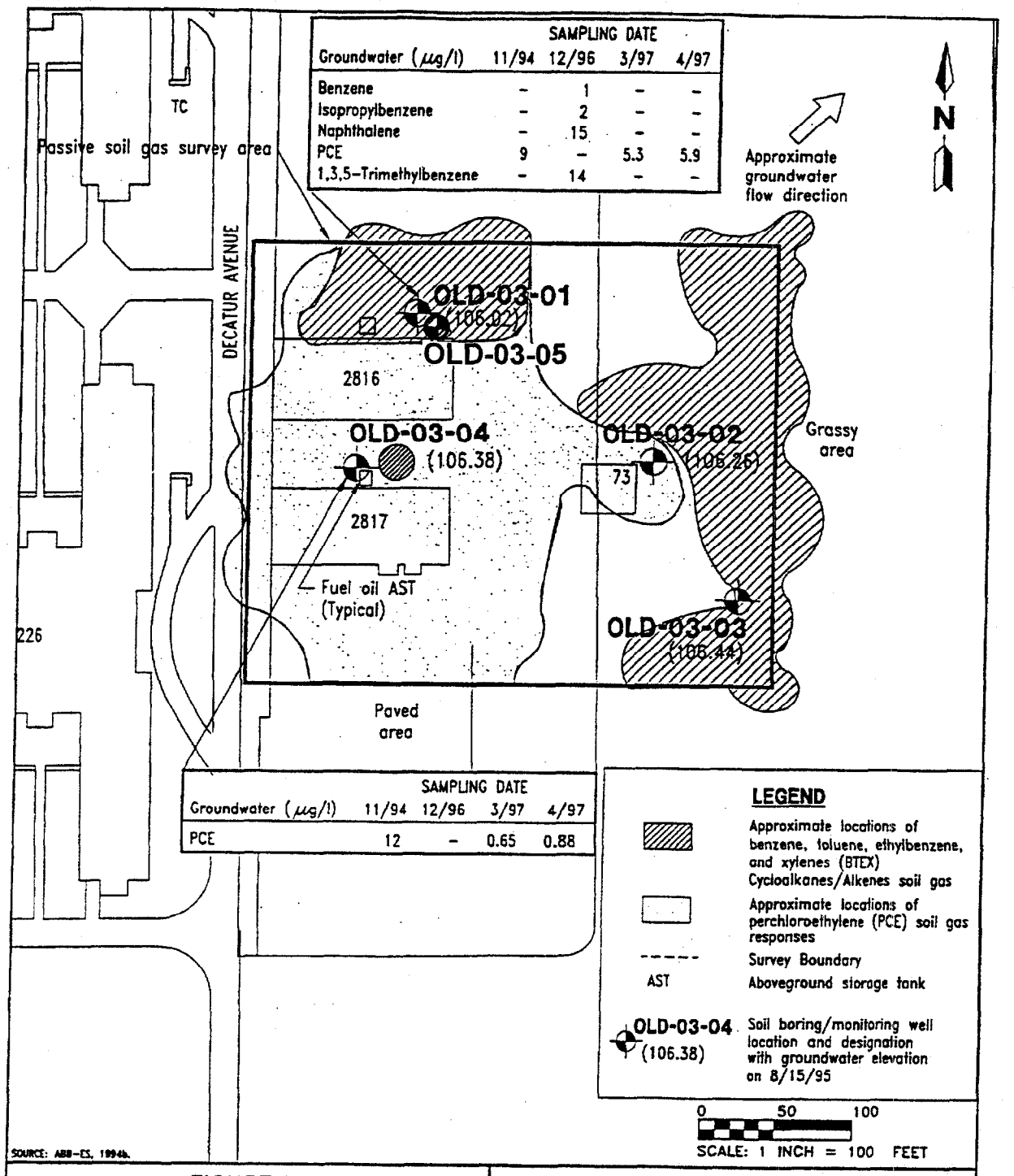


FIGURE B-1
SITE LOCATION MAP - MAIN BASE

STUDY AREA 3
SOURCE: ABB-ES, 1997

WORK PLAN FOR
GROUNDWATER SAMPLING

NAVAL TRAINING CENTER
ORLANDO, FLORIDA



Groundwater (µg/l)	SAMPLING DATE 11/94	12/96	3/97	4/97
Benzene	-	1	-	-
Isopropylbenzene	-	2	-	-
Naphthalene	-	15	-	-
PCE	9	-	5.3	5.9
1,3,5-Trimethylbenzene	-	14	-	-

Groundwater (µg/l)	SAMPLING DATE 11/94	12/96	3/97	4/97
PCE	12	-	0.65	0.88

FIGURE B-2
SOIL GAS SURVEY AREAS, SOIL BORING, AND MONITORING WELL LOCATIONS

STUDY AREA 3
SOURCE: ABB-ES, 1997

WORK PLAN FOR GROUNDWATER SAMPLING

NAVAL TRAINING CENTER ORLANDO, FLORIDA

sampling events. The most recent round of sampling (February 23, 1999) showed that PCE in well OLD-03-01 had decreased to 2.9 µg/L. Sampling of the well was attempted in May and again in July 1999 but the well was dry on both attempts; the sampling has been rescheduled for later in 1999.

1.3 OBJECTIVES

The objective of the groundwater monitoring at SA 3 is to:

- Sample monitoring well OLD-03-01 until the PCE concentration decreases to less than the GCTL of 3 µg/L for two consecutive sampling events.

The samples will be collected and analyzed in accordance with USEPA Level IV DQOs. The sampling frequency will be evaluated following each sampling event and a recommendation will be provided to the OPT.

2.0 WELL LIST AND ANALYTICAL PARAMETERS

Well locations are shown on Figure B-2. Well construction details are summarized on Table B-1. The wells to be sampled, analytical parameters, rationale for sampling, contaminant of concern, and cleanup criterion are presented in the following tables.

Well Number	Analytical Parameters	Rationale
OLD-03-01	TCL VOCs (Method 8260)	Historical positive detections
OLD-03-05	TCL VOCs (Method 8260)	Deeper screened interval at sampling location

Contaminant of Concern	Cleanup Criterion
Tetrachloroethene (PCE)	3 µg/L GCTL

3.0 REFERENCES

ABB-ES (ABB Environmental Services), 1997. *Base Realignment and Closure Environmental Site Screening Report*, Study Area 3, Naval Training Center, Orlando, Florida, Unit Identification Code N65928, Contract No. N62467-89-D-0317/107, June.

FDEP (Florida Department of Environmental Protection) 1999. *Development of Soil Cleanup Target Levels (SCTLs) for Chapter 62-777, F.A.C.*, May.

TABLE B-1

WELL CONSTRUCTION DATA
STUDY AREA 3, MAIN BASE
NTC, ORLANDO

PAGE 1 OF 1

Well Number	Date Installed	Well Type	Boring Depth (ft bls)	Boring Diameter (in.)	Well Depth (ft bls)	Top of Casing Elevation (ft)	Well Casing			Screen			Bentonite Seal Interval (ft)	Sand Pack Interval (ft)
							Diameter (in.)	Length (ft)	Interval (ft)	Diameter (in.)	Length (ft)	Interval (ft)		
OLD-03-01	10/20/94	II	18.0	6.25	18.0	119.49	2.0	7.0	0 - 7	2.0	10.0	7 - 17	3 - 4	4 - 18
OLD-03-02	10/20/94	II	18.0	6.25	18.0	117.89	2.0	7.0	0 - 7	2.0	10.0	7 - 17	3 - 4	4 - 18
OLD-03-03	10/21/94	II	18.0	6.25	18.0	118.15	2.0	7.0	0 - 7	2.0	10.0	7 - 17	3 - 4	4 - 18
OLD-03-04	10/21/94	II	18.0	6.25	18.0	119.22	2.0	7.0	0 - 7	2.0	10.0	7 - 17	3 - 4	4 - 18
OLD-03-05	09/10/99	II	24.0	6.25	24.0	119.46	2.0	14.0	0 - 14	2.0	10.0	14 - 24	None	10-24

APPENDIX C

STUDY AREA 52
McCOY ANNEX

STUDY AREA 52

McCOY ANNEX, NTC, ORLANDO

1.0 INTRODUCTION

1.1 SITE DESCRIPTION

Study Area (SA) 52 is located in the west-central part of the McCoy Annex (Figure C-1). The site screening investigation of this Study Area (HLA, 1999) focused on the area in the vicinity of Building 7261 (Figure C-2). Available drawings indicate that Building 7261 was built between 1956 and 1962 and was demolished in the early 1980s. It was 1,616 square feet in size and was constructed with a concrete foundation, concrete floor, and wood walls. At various times, Building 7261 was used for mixing pesticides, covered storage, and as a maintenance shop.

1.2 BACKGROUND

Site screening investigations, completed in May 1996, confirmed that soil and groundwater contained pesticides above screening levels (HLA, 1999). An Interim Removal Action (IRA) (soil removal) was completed in September 1997 with 1,300 tons of soil excavated and the excavated area backfilled with clean soil. Three monitoring wells were installed after the IRA. Well OLD-52-13, located in the area of the most contaminated soil, contained dieldrin above the GCTL (FDEP, 1999). The Orlando Partnering Team (OPT) recommended groundwater restrictions and quarterly groundwater monitoring. The most recent sampling (September 9, 1998) indicated that the dieldrin concentration in OLD-52-13 remains above the Florida GCTL (0.08 µg/L vs. GCTL 0.005 µg/L) (Figure C-2). The Final Report, recommending continued groundwater monitoring and institutional controls, was approved by FDEP in May 1999 (HLA, 1999).

1.3 OBJECTIVES

The objective of this groundwater monitoring only event at SA 52 is to:

- Sample the appropriate monitoring wells until the concentrations of dieldrin in groundwater fall below the FDEP GCTL in two consecutive events.

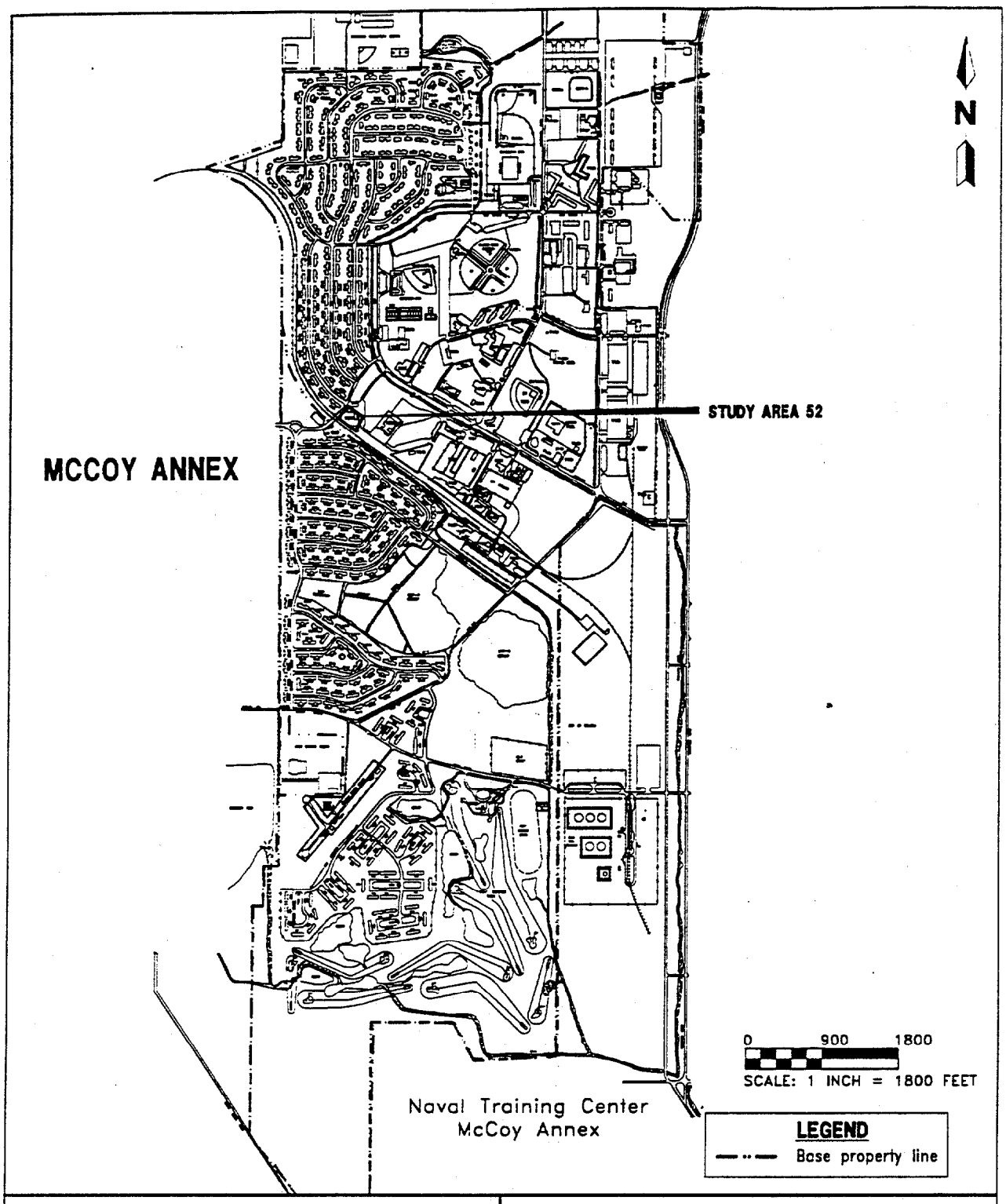
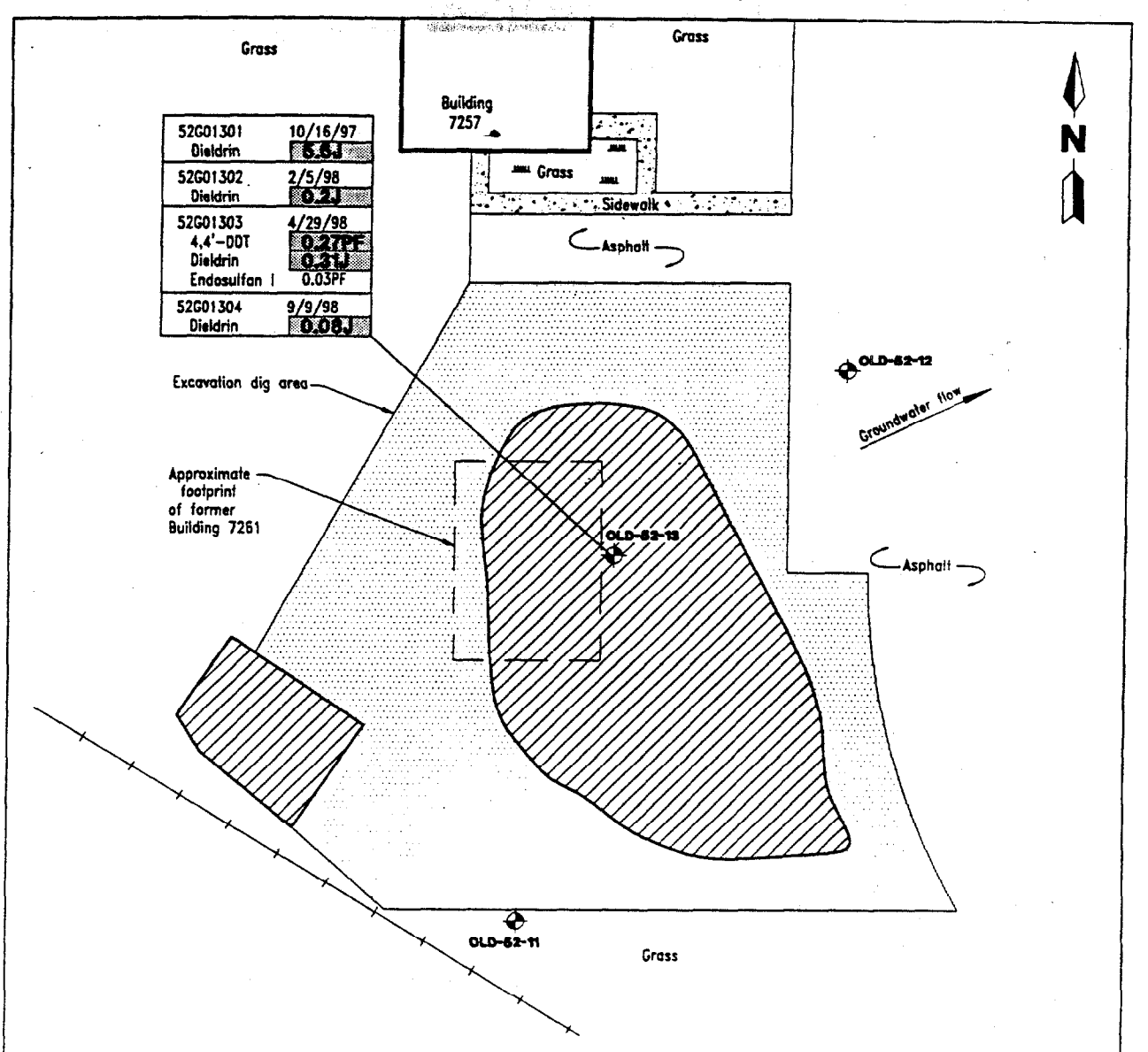


FIGURE C-1
SITE LOCATION MAP – MCCOY ANNEX

STUDY AREA 52
SOURCE: HLA, 1999

WORK PLAN FOR GROUNDWATER SAMPLING

NAVAL TRAINING CENTER ORLANDO, FLORIDA



LEGEND

OLD-52-11 Monitoring well location and designation	Area of excavation - approximately 4 feet deep
GCTL Groundwater cleanup target level	Area of excavation - approximately 2 feet deep
PF Percent difference between orginal and confirmation analyses is greater than 50 percent	J Estimated concentration
DDT Dichlorodiphenyltrichloroethane	Railroad line

NOTES:
All concentrations are in micrograms per kilogram.
Exceedances of GTCLs in chembox are bolded and shaded.

0 15 30
SCALE: 1 INCH = 30 FEET

FIGURE C-2
SUMMARY OF POSITIVE DETECTIONS IN GROUNDWATER - FIRST YEAR OF GROUNDWATER MONITORING
STUDY AREA 52
SOURCE: HLA, 1999

WORK PLAN FOR GROUNDWATER SAMPLING

NAVAL TRAINING CENTER ORLANDO, FLORIDA

Samples will be collected and analyzed in accordance with USEPA Level IV DQOs. The sampling frequency will be evaluated following each sampling event and a recommendation will be provided to the OPT.

2.0 WELL LIST AND ANALYTICAL PARAMETERS

Well construction details are summarized on Table C-1 and well locations are shown on Figure C-2. The wells to be sampled, analytical parameters, rationale for sampling, contaminant of concern, and cleanup criterion are presented in the following tables.

Well Number	Analytical Parameters	Rationale
OLD-52-11	Pesticides (Method 8181)	Upgradient well
OLD-52-12	Pesticides (Method 8181)	Downgradient well
OLD-52-13	Pesticides (Method 8181)	Source well

Contaminant of Concern	Cleanup Criterion	
Dieldrin	0.005 µg/L	GCTL

3.0 REFERENCES

FDEP (Florida Department of Environmental Protection), 1999. *Development of Soil Cleanup Target Levels (SCTLs) for Chapter 62-777, F.A.C.*, May.

HLA (Harding Lawson Associates), 1999. *Base Realignment and Closure Environmental Site Screening Report Interim Remedial Action, Study Area 52*, Naval Training Center, Orlando, Florida, Unit Identification Code N65928, Contract No. N62467-89-D-0317/107, March.

TABLE C-1

WELL CONSTRUCTION DATA
STUDY AREA 52, McCOY ANNEX
NTC, ORLANDO

Well Number	Date Installed	Well Type	Boring Depth (ft bls)	Boring Diameter (in.)	Well Depth (ft bls)	Top of Casing Elevation (ft)	Well Casing			Screen			Bentonite Seal Interval (ft)	Sand Pack Interval (ft)
							Diameter (in.)	Length (ft)	Interval (ft)	Diameter (in.)	Length (ft)	Interval (ft)		
OLD-52-06	12/17/96	II	10.0	2.00	10.0	94.22	0.5	4.0	0 - 4	0.5	6.0	6 - 10	1 - 2	2 - 10
OLD-52-11	10/13/97	II	14.0	10.00	14.0	93.14	2.0	4.0	0 - 4	2.0	10.0	4 - 14	1 - 2	2 - 10
OLD-52-12	10/13/97	II	13.0	10.00	13.0	91.73	2.0	3.0	0 - 3	2.0	10.0	3 - 13	1 - 2	2 - 10
OLD-52-13	10/13/97	II	13.0	10.00	13.0	91.36	2.0	3.0	0 - 3	2.0	10.0	3 - 13	1 - 2	2 - 10

N/A - Not available.

APPENDIX D

OPERABLE UNIT 3
MAIN BASE

OPERABLE UNIT 3

MAIN BASE, NTC, ORLANDO

1.0 INTRODUCTION

1.1 SITE DESCRIPTION

OU 3 consists of Study Areas (SAs) 8 and 9, which are both former pesticide handling areas. These areas are located in the southeast corner of the NTC Main Base, between Lake Baldwin and the former golf course (Figure D-1). SA 8, the former Golf Course Greens Keeper's Storage Area, has not been used for chemical storage since June 1998. It is located at the end of Trident Lane, and until recently consisted of several small storage buildings within a fenced area. Pesticides and herbicides, along with equipment used to maintain the golf course, were stored in this area for 20 to 30 years (HLA, 1999b).

SA 9, the former Pesticide Handling and Storage Area, was the primary pesticide handling facility for the Main Base in the late 1960s and early 1970s. Pesticide mixing reportedly did not occur at this location after 1972, although chemicals may have been stored there up until the buildings were demolished in 1981. This area is located adjacent to Trident Lane, south and west of SA 8. All structures have been removed from both SAs 8 and 9.

1.2 BACKGROUND

Soil samples had elevated levels of arsenic (up to 577 mg/kg vs. a background screening level of 1 mg/kg). Groundwater had elevated levels of arsenic (up to 425 µg/L vs. 50 µg/L MCL) (HLA, 1999a). A Preliminary Risk Evaluation was conducted indicating no ecological risk, but the risk to human health was higher than 1×10^{-6}. A round of groundwater samples was collected in March 1999 (Tetra Tech NUS, 1999) and additional soil removal actions have been performed. As stated in the Proposed Plan (HLA, 1999b) No Further Action has been proposed for soils, and long-term monitoring has been recommended for groundwater.

Figures D-2 and D-3 show the potentiometric surface contours during the March 1999 sampling event. Figures D-4 and D-5 show groundwater concentrations exceeding Florida GCTLs in March 1999.

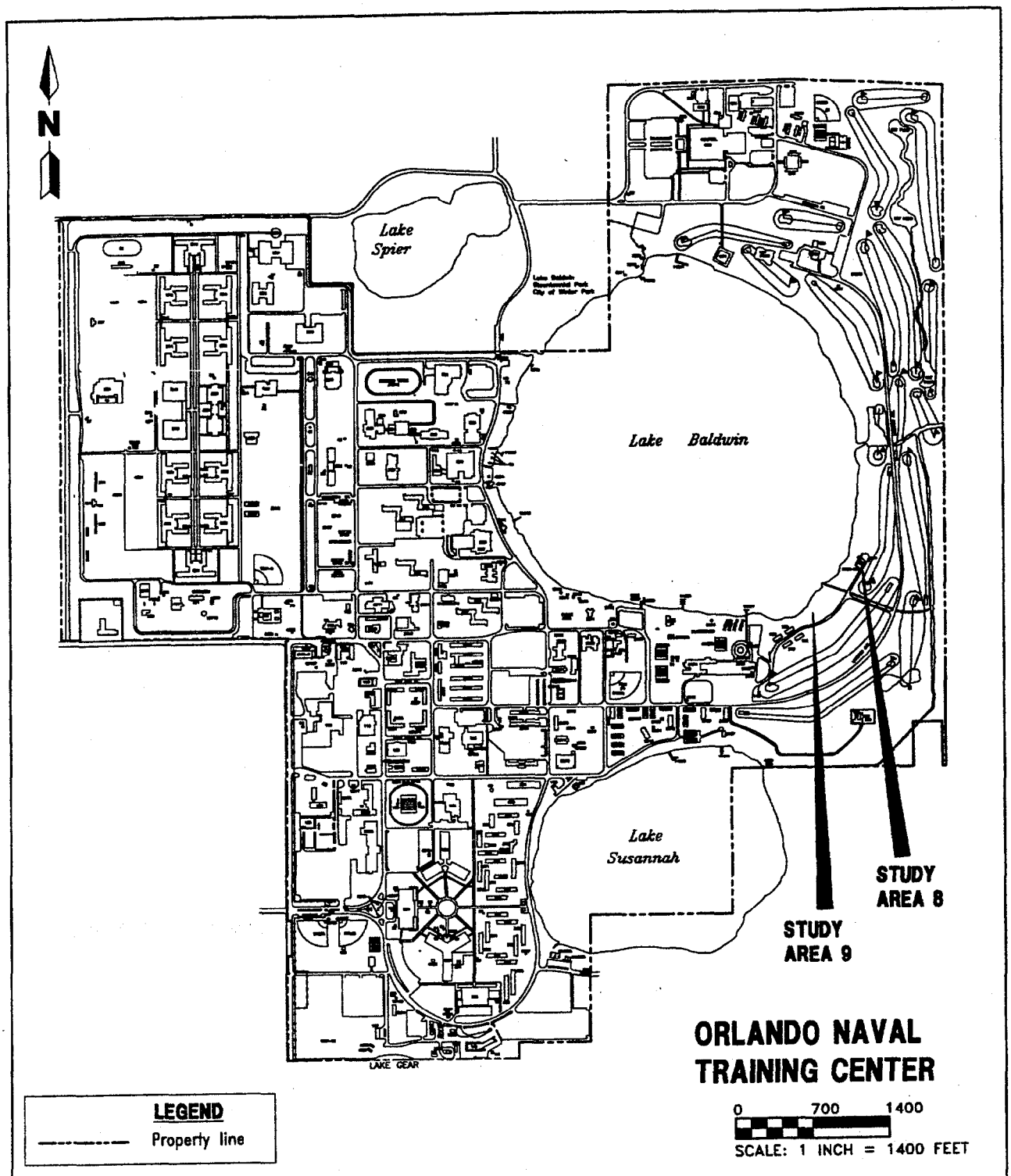
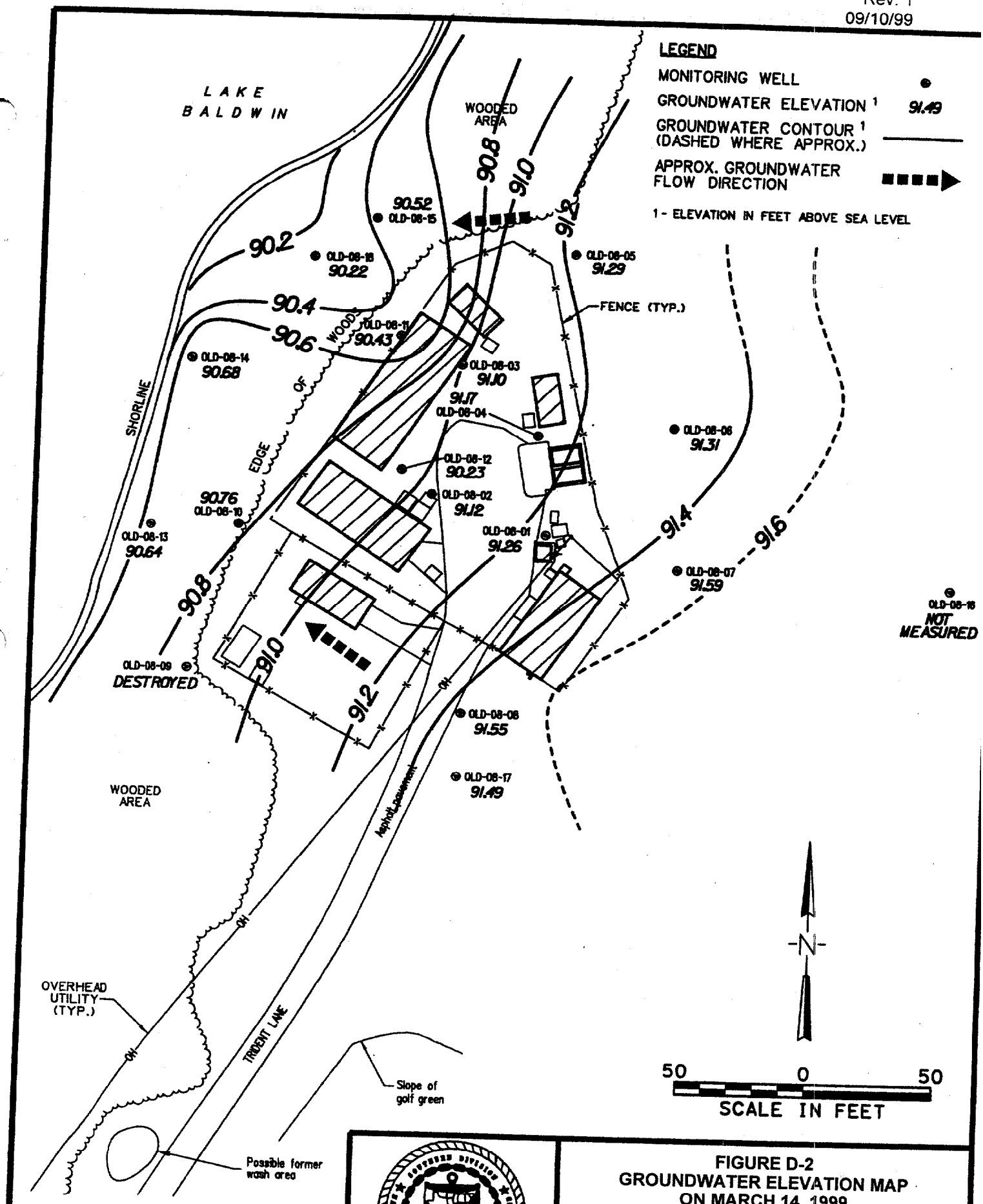


FIGURE D-1
SITE LOCATION MAP – MAIN BASE

OPERABLE UNIT 3
SOURCE: HLA, 1999

WORK PLAN FOR
GROUNDWATER SAMPLING

NAVAL TRAINING CENTER
ORLANDO, FLORIDA



NOTE:
WELL OLD-08-12 NOT INCLUDED IN CONTOURING.

FIGURE D-2
GROUNDWATER ELEVATION MAP ON MARCH 14, 1999
OPERABLE UNIT 3 – STUDY AREA 8
SOURCE: HLA, 1999
NAVAL TRAINING CENTER
ORLANDO, FLORIDA

n8-5x11v.dgn

R4707995

CAD FILE NO./DATE: 7457M002.dgn/4-20-99

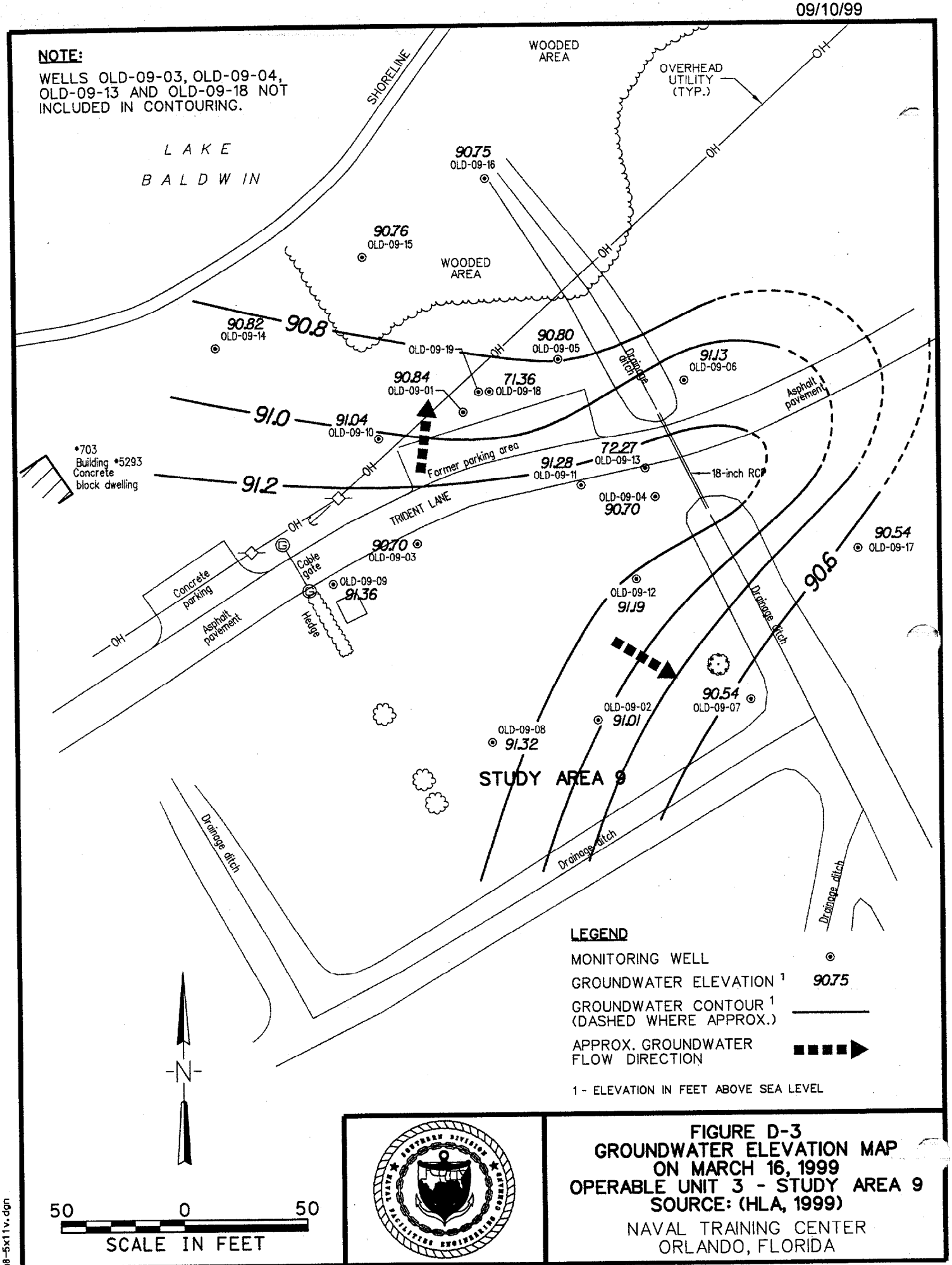


FIGURE D-3
GROUNDWATER ELEVATION MAP ON MARCH 16, 1999
OPERABLE UNIT 3 - STUDY AREA 9
SOURCE: (HLA, 1999)

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

n8-5x11v.dgn

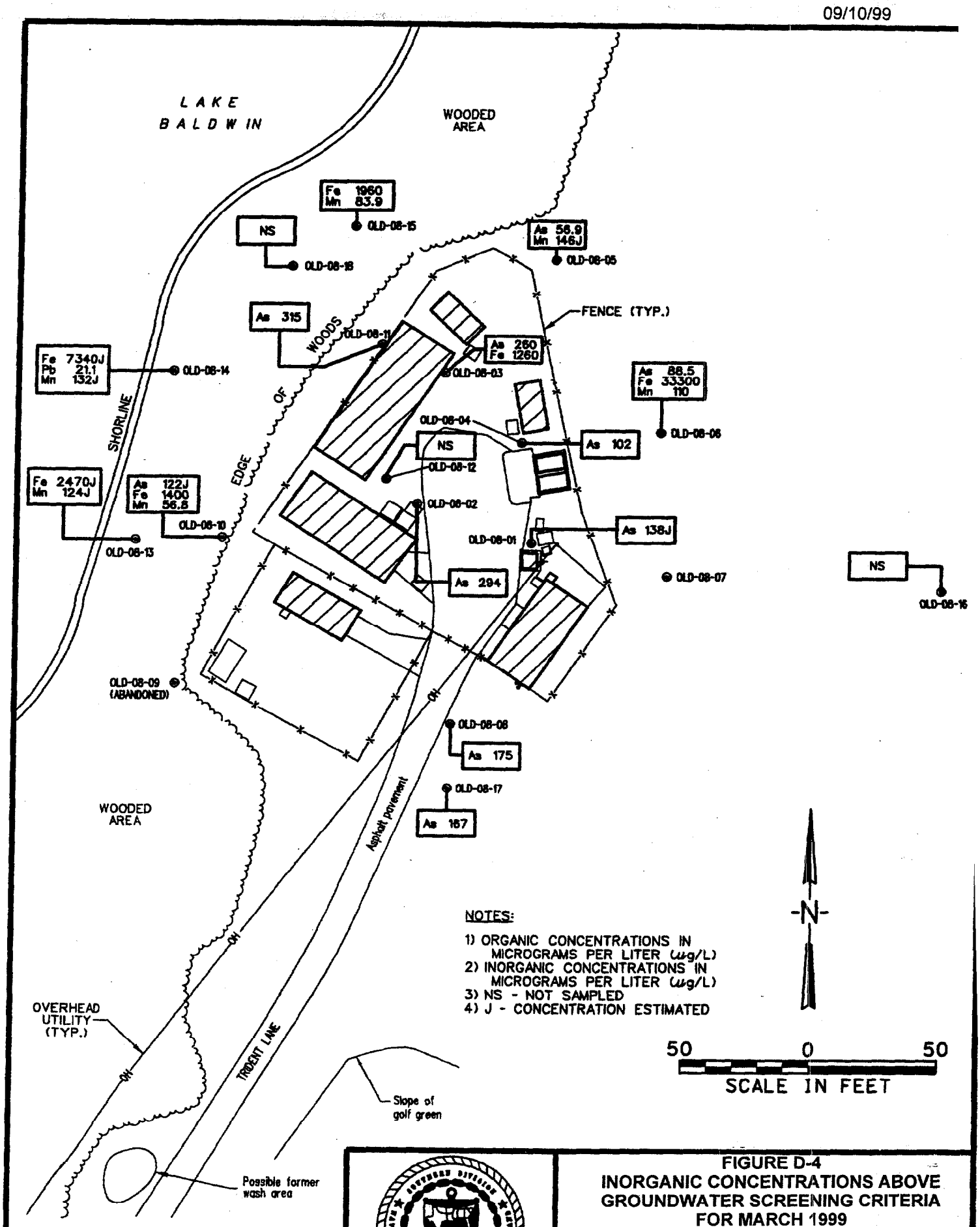
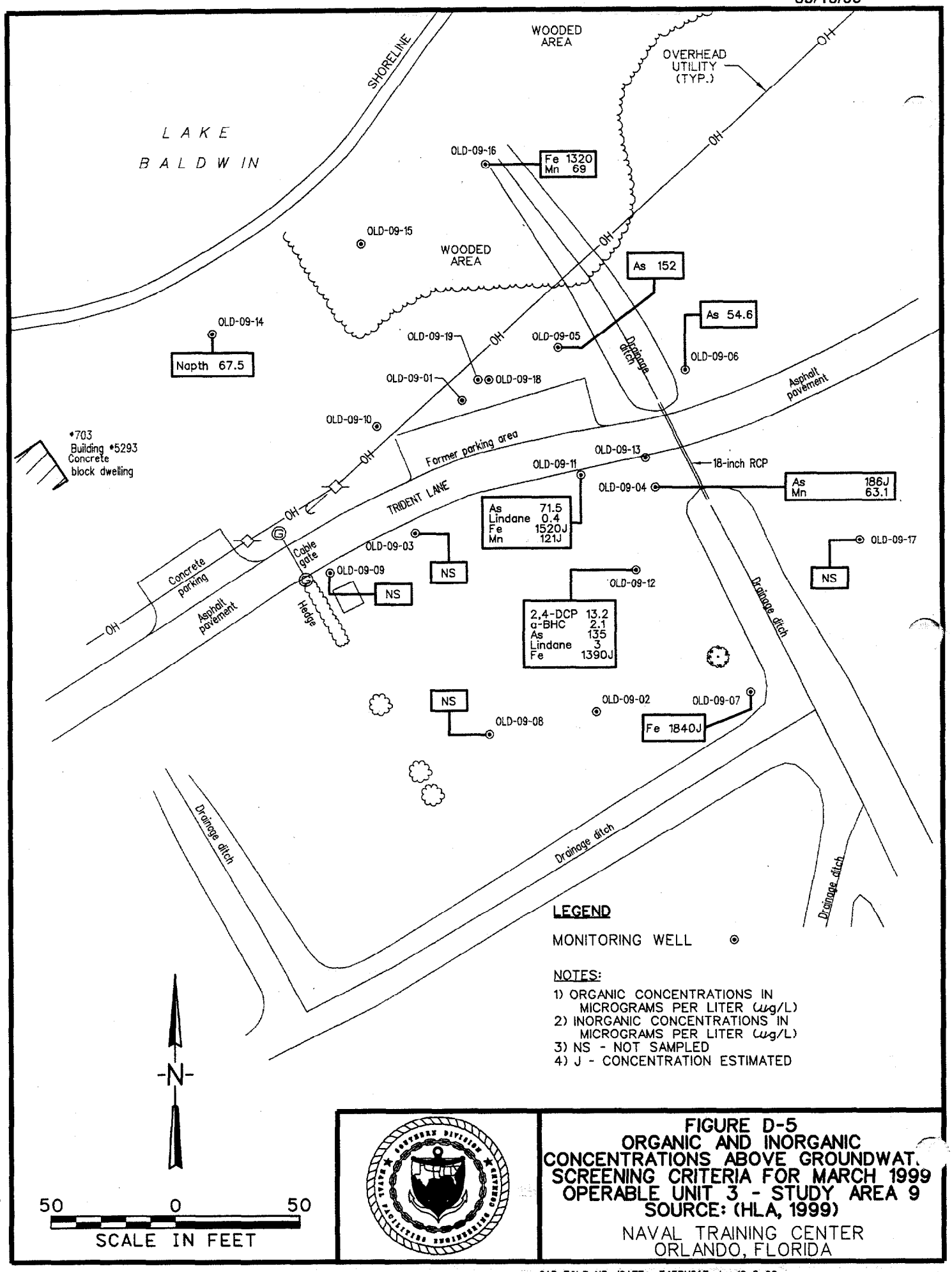


FIGURE D-4
INORGANIC CONCENTRATIONS ABOVE GROUNDWATER SCREENING CRITERIA FOR MARCH 1999
OPERABLE UNIT 3 – STUDY AREA 8
SOURCE: (HLA, 1999)
NAVAL TRAINING CENTER
ORLANDO, FLORIDA

n8-5x11v.dgn



LEGEND

MONITORING WELL ⊙

NOTES:

1) ORGANIC CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L)
2) INORGANIC CONCENTRATIONS IN MICROGRAMS PER LITER (µg/L)
3) NS - NOT SAMPLED
4) J - CONCENTRATION ESTIMATED

FIGURE D-5
ORGANIC AND INORGANIC CONCENTRATIONS ABOVE GROUNDWAT. SCREENING CRITERIA FOR MARCH 1999
OPERABLE UNIT 3 - STUDY AREA 9
SOURCE: (HLA, 1999)

NAVAL TRAINING CENTER
ORLANDO, FLORIDA

n8-5x11v.dgn

1.3 OBJECTIVES

The objectives of this groundwater monitoring only event are to:

- Sample monitoring wells as appropriate based on historical positive detections and downgradient placement of wells.
- Sample selected monitoring wells for a one-time confirmation that target analytes are not present at these locations.

The samples will be collected and analyzed in accordance with USEPA Level IV DQOs. Samples will be collected and analyzed in accordance with USEPA Level IV DQOs. The sampling frequency will be evaluated following each sampling event and a recommendation will be provided to the OPT.

2.0 WELL LIST AND ANALYTICAL PARAMETERS

The wells to be sampled, analyses to be performed, and the rationale for selecting the wells and analyses are presented in Table D-1. Table D-2, which was taken from the Remedial Investigation and Feasibility Study report (HLA, 1999a) provides information on the well installation. The well locations are shown on Figures D-2 and D-3, and the contaminants of concern and cleanup criteria are listed below.

Contaminant of Concern	Cleanup Criteria	
Arsenic	50 µg/L	GCTL
Naphthalene	20 µg/L	GCTL
2,4-Dichlorophenol	4 µg/L	GCTL

3.0 REFERENCES

HLA (Harding Lawson Associates), 1999a. *Remedial Investigation and Feasibility Study, Operable Unit 3*, Naval Training Center, Orlando, Florida, Unit Identification Code N65928, Contract No. N62467-89-D-0317/136, June.

HLA, 1999b. *Proposed Plan, Operable Unit 3*, Former Naval Training Center, Florida, July.

Tetra Tech NUS, 1999. *Monitor Well Sampling at Operable Unit 3*, Main Base, Naval Training Center, Orlando, Florida, June.

TABLE D-1

**SELECTION OF WELLS AND ANALYTICAL PARAMETERS
OPERABLE UNIT 3, MAIN BASE
NTC, ORLANDO**

Well Number	Analytical Parameters	Rationale
OLD-08-01	TAL Inorganics	Historical positive detections
OLD-08-02	TAL Inorganics	Historical positive detections
OLD-08-03	TAL Inorganics	Historical positive detections
OLD-08-04	TAL Inorganics	Historical positive detections
OLD-08-05	TAL Inorganics	Historical positive detections
OLD-08-06	TAL Inorganics	Historical positive detections
OLD-08-08	TAL Inorganics, Herbicides (8151A)	Historical positive detections
OLD-08-10	TAL Inorganics, Herbicides (8151A)	Historical positive detections
OLD-08-11	TAL Inorganics, Herbicides (8151A)	Historical positive detections
OLD-08-13	TAL Inorganics	Historical positive detections
OLD-08-14	TAL Inorganics, Herbicides (8151A)	Historical positive detections
OLD-08-15	TAL Inorganics, Herbicides (8151A)	Historical positive detections
OLD-08-17	TAL Inorganics	Historical positive detections
OLD-08-18	TAL Inorganics, Herbicides (8151A)	Downgradient well
OLD-09-01	TAL Inorganics, Pesticides (8181), Herbicides (8151A)	Confirmation (one time)
OLD-09-02	TAL Inorganics, Pesticides (8181), Herbicides (8151A)	Confirmation (one time)
OLD-09-03	TAL Inorganics, SVOCs (8270), Pesticides (8181), Herbicides (8151A)	Confirmation (one time)
OLD-09-04	TAL Inorganics, SVOCs (8270), Pesticides (8181), Herbicides (8151A)	Historical positive detections
OLD-09-05	TAL Inorganics, Pesticides (8181), Herbicides (8151A)	Historical positive detections
OLD-09-06	TAL Inorganics, Pesticides (8181), Herbicides (8151A)	Historical positive detections
OLD-09-07	TAL Inorganics, Pesticides (8181), Herbicides (8151A)	Historical positive detections
OLD-09-10	TAL Inorganics, Pesticides (8181), Herbicides (8151A)	Confirmation (one time)
OLD-09-11	TAL Inorganics, Pesticides (8181), Herbicides (8151A)	Historical positive detections
OLD-09-12	TAL Inorganics, SVOCs (8270), Pesticides (8181), Herbicides (8151A)	Historical positive detections
OLD-09-14	TAL Inorganics, SVOCs (8270), Pesticides (8181), Herbicides (8151A)	Historical positive detections
OLD-09-15	TAL Inorganics, SVOCs (8270), Pesticides (8181), Herbicides (8151A)	Downgradient well
OLD-09-16	TAL Inorganics, Pesticides (8181), Herbicides (8151A)	Historical positive detections
OLD-09-17	TAL Inorganics, Pesticides (8181), Herbicides (8151A)	Downgradient well
OLD-09-19	TAL Inorganics, Pesticides (8181), Herbicides (8151A)	Confirmation (one time)

Note: Confirmation (1 time) – If target analytes are not detected during the July 1999 sampling event, the monitoring well will be removed from the sampling schedule.

TABLE D-2

MONITORING WELL CONSTRUCTION SUMMARY
OPERABLE UNIT 3, MAIN BASE
NTC, ORLANDO

Well	Type/Diameter (inches)	Date Installed	Total Depth (ft bls)	Screened Interval (ft bls)
OLD-08-01	MW/2.0	09/01/94	13.5	3 to 13
OLD-08-02	MW/2.0	08/31/94	13.5	3 to 13
OLD-08-03	MW/2.0	08/31/94	13.5	3 to 13
OLD-08-04	MW/2.0	09/01/94	13.5	3 to 13
OLD-08-05	microwell/0.5	10/08/97	10	1 to 10
OLD-08-06	microwell/0.5	10/08/97	10	1 to 10
OLD-08-07	microwell/0.5	10/08/97	10	1 to 10
OLD-08-08	microwell/0.5	10/08/97	10	1 to 10
OLD-08-09	microwell/0.5	10/08/97	10	1 to 10
OLD-08-10	microwell/0.5	10/10/97	10	1 to 10
OLD-08-11	microwell/0.5	10/10/97	10	1 to 10
OLD-08-12	microwell/0.5	10/09/97	29	23 to 29
OLD-08-13	microwell/0.5	11/24/97	7.14	1.13 to 7.13
OLD-08-14	microwell/0.5	11/24/97	7.13	1.12 to 7.12
OLD-08-15	microwell/0.5	11/24/97	7.23	1.22 to 7.22
OLD-08-16	microwell/0.5	02/04/98	10	1 to 10
OLD-08-17	microwell/0.5	02/04/98	9.9	0.9 to 9.9
OLD-08-18	microwell/0.5	02/06/98	11	1.5 to 10.5
OLD-09-01	MW/2.0	08/30/94	13.5	3 to 13
OLD-09-02	MW/2.0	1986	12	7 to 12
OLD-09-03	MW/2.0	1986	12	7 to 12
OLD-09-04	MW/2.0	1986	12	7 to 12
OLD-09-05	microwell/0.5	10/06/97	10	1 to 10
OLD-09-06	microwell/0.5	10/06/97	10	1 to 10
OLD-09-07	microwell/0.5	10/06/97	12	3 to 12
OLD-09-08	microwell/0.5	10/06/97	11	2 to 11
OLD-09-09	microwell/0.5	10/06/97	10	1 to 10
OLD-09-10	microwell/0.5	10/07/97	10	1 to 10
OLD-09-11	microwell/0.5	10/07/97	10	1 to 10
OLD-09-12	microwell/0.5	10/07/97	10	1 to 10
OLD-09-13	microwell/0.5	10/07/97	29	23 to 29
OLD-09-14	microwell/0.5	11/25/97	7.40	1.39 to 7.39
OLD-09-15	microwell/0.5	11/25/97	7.19	1.18 to 7.18
OLD-09-16	microwell/0.5	11/25/97	7.12	1.11 to 7.11
OLD-09-17	microwell/0.5	02/04/98	10.1	0.93 to 9.93
OLD-09-18	microwell/0.5	02/05/98	30.10	23.6 to 29.6
OLD-09-19	MW/2.0	07/30/99	30.5	25.5 to 30.5

Notes: bls = below land surface.
MW – monitoring well.
SVOC = semivolatile organic compound.
PCB = polychlorinated biphenyl.
TAL = target analyte list.
TOC = total organic carbon.
TSS = total suspended solids.