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August 26, 2004

Commander
Naval Facilities Engineering Command
Atlantic Division
6506 Hampton Blvd., Bldg. A, Room 1124
Norfolk, Virginia 23508

Attention: EV23DC, Mr. David Cleland, P.G.

Re: **FINAL Remedial Action Optimization & Revised Corrective Action Plan**
Building 645
Marine Corps Base
Camp Lejeune, North Carolina

Navy Contract No. N62470-01-D-3009
Delivery Order No. 0079
CATLIN Project No. 203-063

Dear Mr. Cleland,

CATLIN Engineers and Scientists are pleased to submit the FINAL Remedial Action Optimization & Revised Corrective Action Plan for the above referenced site.

CATLIN Engineers and Scientists appreciate the opportunity to continue to provide services to LANTDIV and the MCB on your environmental projects.

Sincerely,

Michael E. Mason, P.E.
CATLIN Program Manager

Steven V. Hudson, P.G., CWD
CATLIN Project Manager

Attachments: Remedial Action Optimization and Revised Corrective Action Plan

cc: Ms. Pamela Argilan - Code AQ11B Contracts (correspondence only)
Commanding General, Attn: Director I&E/EMD/EQB (2 copies)
Mr. Ronald Kenyon, - Shaw Environmental

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REMEDIAL ACTION OPTIMIZATION
&
REVISED CORRECTIVE ACTION PLAN

BUILDING 645

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

AUGUST 26, 2004

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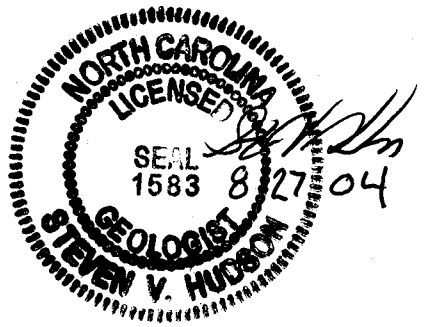

Prepared by:

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LIST OF ACRONYMS

2000 Guidelines	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater
2001 Guidelines	Guidelines for Assessment and Corrective Action, North Carolina Underground Storage Tank Section (Effective July 1, 2001)
2L GWQS	NCAC T15A:02L Groundwater Quality Standards
ARO	Asheville Regional Office
AS	Air Sparge
AST	Aboveground Storage Tank
BDL	Below Detection Limit
BN	Base/Neutral (extractables)
BNA	Base/Neutral/Acid (extractables)
BQL	Below Quantitation Limit
BLS	Below Land Surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
CAP	Corrective Action Plan
CATLIN	CATLIN Engineers and Scientists (Formerly RC&A)
CFR	Code of Federal Regulations
CFM	Cubic Feet per Minute
CFH	Cubic Feet per Hour
Cr	Chromium
CSA	Comprehensive Site Assessment
CNP	Carbon Nitrogen Phosphorous
CPT	Cone Penetrometer Test
DEM	Division of Environmental Management
DIPE	Diisopropyl Ether
DO	Dissolved Oxygen
DOD	Department of Defense
DPT	Direct Push Technology
DWQ	Division of Water Quality
DWM	Division of Waste Management
DTW	Depth to Water
EAD	Environmental Affairs Department
EDB	Ethylene di-bromide
EMD	Environmental Management Division
EPA	Environmental Protection Agency
EPH	Extractable Petroleum Hydrocarbons
EQB	Environmental Quality Branch
Fe	Iron
FID	Flame Ionization Detector
FOD	Foreign Object Debris
FRO	Fayetteville Regional Office
FT	Feet
GCL	Gross Contaminant Level
GIS	Geographic Information System
GPS	Global Positioning System

Guidelines Vol. I	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume I, Sources Other Than Petroleum Underground Storage Tanks (May 1998)
Guidelines Vol. II	Groundwater Section Guidelines for Investigation and Remediation of Soil and Groundwater, Volume II, Petroleum Underground Storage Tanks (January 2, 1998)
HDPE	High Density Polyethylene
I/C	Industrial/Commercial
ID	Identification
I&E	Installations and Environment Department
IGWQS	Interim Groundwater Quality Standards
IPE	Isopropyl Ether
LANTDIV	Atlantic Division
LSA	Limited Site Assessment
LUST	Leaking Underground Storage Tank
m-	meta
m	meter
MADEP	Massachusetts Department of Environmental Protection
MCALF	Marine Corps Auxiliary Landing Field
MCAS	Marine Corps Air Station
MCB	Marine Corps Base
MCOLF	Marine Corps Outlying Landing Field
MDL	Method Detection Limit
mg/Kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
MRO	Mooresville Regional Office
MSCC	Maximum Soil Contaminant Concentration
MSL	Mean Sea Level
MTBE	Methyl tertiary butyl ether
µg/Kg	Micrograms per Kilogram
µg/L	Micrograms per Liter
NA	Not Analyzed
N/A	Not Applicable
NC	North Carolina
NCAC	North Carolina Administrative Code
NCDENR	North Carolina Department of Environment and Natural Resources
NCDOC	North Carolina Department of Corrections
NCDOT	North Carolina Department of Transportation
NCSP	North Carolina State Plane
NCSPA	North Carolina State Ports Authority
NE	None Established
NM	Not Measured
NMT	No Measurable Thickness
NS	Not Sampled
o-	ortho
OVA	Organic Vapor Analyzer

p-	para
PAH	Polynuclear Aromatic Hydrocarbons
Pb	Lead
PPB	Parts Per Billion
PPM	Parts Per Million
PID	Photo Ionization Detector
PQL	Practical Quantitation Limit
PSI	Pounds per Square Inch
PVC	Polyvinyl chloride
RBCA	Risk-Based Corrective Action
RCRA	Resource Conservation and Recovery Act
Res	Residential
ROI	Radius of Influence
RRO	Raleigh Regional Office
SOW	Scope of Work
STGW	Soil-to-Groundwater
SVE	Soil Vapor Extraction
SVOC	Semi Volatile Organic Compound
TDHF	Toxicologically Defined Hydrocarbons Fractions
TCLP	Toxicity Characteristic Leaching Procedure
TIC	Tentatively Identified Compound
TKN	Total Kjeldahl Nitrogen
TOC	Top of Casing
TPH	Total Petroleum Hydrocarbons
US	United States
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
VPH	Volatile Petroleum Hydrocarbons
WaRO	Washington Regional Office
WiRO	Wilmington Regional Office
WSRO	Winston-Salem Regional Office

REMEDIAL ACTION OPTIMIZATION
&
REVISED CORRECTIVE ACTION PLAN
BUILDING 645

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CATLIN PROJECT NO. 203-063

AUGUST 26, 2004

EXECUTIVE SUMMARY

This report is intended to provide information relevant to address and review the effectiveness of current remedial actions being conducted at the Building 645 project site and make revisions to the CAP in order to achieve site closeout. The site is located approximately 1.5 miles south of the main gate at MCB, Camp Lejeune, North Carolina. The former Building 645 was used as a well house for the former water supply well HP645 that was located on Brewster Boulevard near the intersection of Holcomb Boulevard, approximately 20 feet north of the road. The site is surrounded on the north, west, and south by wooded areas. Brewster Junior High School is located approximately 600 feet southwest of the site.

According to information presented in the CAP prepared by Richard Catlin and Associates (CATLIN) for the site, dated September 25, 1996, the subject site formerly consisted of a pump and pump house (Building 645) utilized for water supply well HP645. The water supply well was part of the Holcomb Boulevard water collection system. Well HP645 was reportedly 245 feet deep and produced approximately 192 gpm (Geophex, 1991). The water supply well has been inactive since 1985, when water samples revealed the well to be impacted by petroleum constituents. A 110-gallon, aboveground steel storage tank (AST) was located adjacent to the structure on a concrete pad. The AST supplied gasoline to a generator that powered the pump. Well HP-645 was permanently abandoned in 1995 and the well house was demolished and removed. The former AST is the suspected source of the petroleum impact.

A remediation system consisting of 14 vertical air sparge wells, four horizontal vapor extraction wells, and 21 soil vapor collection vent borings were installed in 1998 by J.A. Jones Environmental Services Company (J.A. Jones). Six of the 14 vertical sparge wells were installed to a depth of 80 feet BLS and eight of the 14 were installed to a depth of 50 feet BLS. The soil and groundwater treatment system was started on September 10, 1998. The system has reportedly operated continuously except during maintenance and sampling events.

The remedial goals for the site were based on the regulations current at the time and presented in the 1996 CAP. Current applicable remedial requirements for the contamination associated with the Building 645 AST is based on the corrective action requirements per 15A NCAC 2L .0106 which became effective on January 2, 1998 and the requirements in the NCDENR 2001 Guidelines. Based on these regulations, the contaminant cleanup levels established in the 1996 CAP are still relevant.

Review of the analytical data indicates that contaminant levels in the upper (less than 50 feet BLS) portions of the aquifer have been substantially reduced by the current remedial efforts. The shallow plume has been delineated but a refinement of the plume extent is necessary to address the current remediation extents. The vertical extent of the contaminant plume has not been delineated in all portions of the subject site. Additionally, petroleum contaminants identified in the deeper (80 feet BLS) portions of the aquifer do not appear to be benefiting from the remediation efforts and have not been horizontally defined.

Additional assessment is necessary to adequately define the vertical and horizontal extent of the contaminant plumes. Subsequent to the completion of the assessment activities, modification of the current remediation system will be necessary to address the deeper portions of the contaminant plume.

REMEDIAL ACTION OPTIMIZATION
&
REVISED CORRECTIVE ACTION PLAN
BUILDING 645

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CATLIN PROJECT NO. 203-063

AUGUST 26, 2004

1.0 BACKGROUND

1.1 PURPOSE OF REPORT

The purpose of this report is to provide information relevant to address and review the effectiveness of current remedial actions being conducted at the former Building 645 site located at the MCB, Camp Lejeune. Additionally, this report provides revisions to the CAP in order to achieve site closure. This report has been formatted in general accordance with the NAVFACENGCOM "Guidance for Optimizing Remedial Action Operation" document prepared by Radian International (Radian) and dated April 2001 with the ultimate purpose to "achieve environmentally protective site closeout at the least cost."

The work conducted herein was conducted in general accordance with the Workplan titled Remediation System Optimization Plans at the Various Sites, Marine Corps Base, Camp Lejeune, North Carolina dated July 16, 2003. CATLIN Engineers and Scientists (CATLIN) was authorized to perform this investigation by the LANTDIV NAVFACENGCOM in accordance with the Order of Supplies Contract Number N62470-01-D-3009, Delivery Order Number 0079.

1.2 SCOPE OF WORK

This Remedial Action Optimization & Revised Corrective Action Plan (RAO & RCAP) was developed in general accordance with the NAVFACENGCOM "Guidance for Optimizing Remedial Action Operation" document dated April 2001 and the 2001 Guidelines. Specific methods utilized to develop the RAO & RCAP included a thorough collection and review of available reports and field data. In addition, field reconnaissance was conducted to perform on-site inspections of existing site and remedial system conditions and conduct personal interviews with the system operators. Data was then reviewed and the RAO & RCAP was developed.

2.0 SITE HISTORY

The site is located approximately 0.5 miles south of the main gate at MCB, Camp Lejeune, North Carolina (see Figure 1). The former Building 645 was used as a well house for the former water supply well HP645 that was located approximately 20 feet north of Brewster Boulevard near the intersection of Brewster and Holcomb. The site is surrounded on the north, west, and south by wooded areas. Brewster Junior High School is located approximately 600 feet southwest of the site.

According to information presented in the CAP prepared by CATLIN for the site, dated September 25, 1996, the subject site formerly consisted of a pump and pump house (Building 645) utilized for water supply well HP645. The water supply well was part of the Holcomb Boulevard water collection system. Well HP645 was reportedly 245 feet deep and produced approximately 192 gpm (Geophex, 1991). The water supply well has been inactive since 1985, when water samples revealed the well to be impacted by petroleum constituents. A 110-gallon, steel AST was located adjacent to the structure on a concrete pad. The AST supplied gasoline to a generator that powered the pump. Well HP-645 was permanently abandoned in 1995 and the well house was demolished and removed. The former AST is the suspected source of the petroleum impact.

3.0 PREVIOUS INVESTIGATIONS

Studies conducted at the subject site have produced the following reports, from which the site-specific information was collected to be included in this RAO & RCAP:

- *Three Well Site Check, Building HP-645 (AST), dated March 1994,* prepared by R.E. Wright Associates, Inc.
- *Leaking Underground Storage Tank Comprehensive Site Assessment (CSA), 645, dated April 28, 1995,* prepared by Richard Catlin & Associates, Inc.
- *Leaking Underground Storage Tank Addendum Site Assessment (Addendum), 645, dated June 12, 1996,* prepared by Richard Catlin & Associates, Inc.
- *Leaking Underground Storage Tank Corrective Action Plan, 645, dated September 25, 1996,* prepared by Richard Catlin & Associates, Inc.
- *Annual Monitoring Report, Soil and Groundwater Building 645, dated July 2002,* prepared by J.A. Jones Environmental Services Company.
- *Final Annual Monitoring Report, Soil and Groundwater Building 645, dated January 2004,* prepared by Shaw Environmental, Inc.

According to previous documents, 23 monitoring wells have been identified at the subject site. The 23 monitoring wells include the following:

SHALLOW TYPE II	50 FEET DEEP TYPE III	80 FEET DEEP TYPE III	RECOVERY AND "DEEP TYPE II"
645-MW01	645-MW09	645-MW15	645-MW12
645-MW02	645-MW10	645-MW16	645-MW13*
645-MW03	645-MW11	645-MW17	645-MW14*
645-MW04	645-MW20**	645-MW18	
645-MW05		645-MW21	
645-MW06		645-MW22	
645-MW07			
645-MW08			
645-MW19**			
645-MW23			

* "Deep Type II" screened from approximately 25 to 35 feet BLS.

** Exact details of well not know

A detailed site plan, including monitoring well locations and temporary sampling locations, is presented on Figure 2.

Results of the investigative activities conducted prior to the completion of the CAP indicated that petroleum impact existed in the vadose soils. This was based on the analytical results of the soil sample collected from boring advance to install monitoring well 645-3 that revealed a concentration of 76.2 ppm of TPH 5030. However, during the preparation of the CAP, the sample depth (13 to 15 feet BLS) was compared to the groundwater levels and was deemed to have been collected from below the vadose zone. Therefore, no evidence of petroleum impacted vadose zone soils was identified during the assessment activities. Analytical soil summary tables are presented in Appendix A and the soil sample locations are presented in Appendix B.

Results from the groundwater sampling conducted during the assessment investigations indicated that hydrocarbons commonly associated with petroleum impact were present in both the shallow (less than 40 feet BLS) and the deeper portion (greater than 50 feet but less than 80 feet BLS) of the surficial aquifer. Analytical results conducted on the water supply well HP645 indicated that the upper portions of the Castle Hayne Aquifer were impacted by petroleum constituents.

No free product was identified in any of the monitoring wells or temporary sampling points installed at the subject site.

3.1 CONCEPTUAL SITE MODEL (BASED ON 1998 CAP)

3.1.1 Site Geology

The elevation of the site ranges from roughly 25 to 30 feet above MSL and the topography is relatively flat with relief near the drainage ditches. The majority of the land surface is covered with natural vegetation.

According to the 1996 CAP prepared by CATLIN, geology beneath the site appears to be continuously underlain by clay with interbedded sand lenses to approximately 20 feet BLS. This clay exhibited medium to low permeability and appeared to be an aquitard across the project site. Beneath the clay unit, a fine to medium grained sand was identified from 20 feet to greater than 50 feet BLS. Evidence of discontinuous limestone deposits was observed from approximately 25 to 30 feet BLS in wells 645-10, 645-14, and 645-16. Limestone was encountered during the installation of wells 645-15 through 645-17 from approximately 55 to 73 feet BLS. A fine-grained sand with limestone fragments was identified beneath the limestone to approximately 80 feet BLS.

The discontinuous material appears to be the upper limits of the Castle Hayne Formation and consisted of sandy limestone with interbedded, moderately well graded sands beginning at a depth of approximately 20 feet BLS.

3.1.2 Groundwater Elevation and Flow Direction

Depth to groundwater beneath the site at the time of the 1996 CAP ranged from 10 to 28 feet BLS. The underlying hydrogeology indicated that perched water conditions possibly existed beneath the site.

Local groundwater as determined in the 1996 CAP prepared by CATLIN from water level measurements collected on January 31, 1996 flowed generally towards the south and southwest within the shallow portion of the aquifer and towards the west-northwest within the deeper portion.

The aquifer's hydraulic conductivity was calculated during the site assessment activities (CATLIN, 1995) and was based on slug tests performed on three Type II wells (645-5, 645-6, and 645-9), on grain size analysis from 645-5, 645-7, and 645-12, and on an eight-hour pump test conducted on well 645-12. The average hydraulic conductivity of the surficial aquifer as determined from the pumping test at the site was 254.7 feet per day. The average hydraulic gradient along the project site utilizing wells 645-5 and 645-2 was determined to be 0.019 feet per foot or 1.8 percent. Using the above referenced values, an average linear groundwater flow velocity of 19.4 feet per day was estimated for the site.

3.1.3 Potential Receptors

At the time of the CAP (CATLIN, 1996) preparation, a potential receptor was defined by NCDEHNR (now referred to as NCDENR) in Section .0102 of 15A NCAC 2L, to include any human, plant, animal or structure with the potential to be adversely affected by the release or migration of contaminants. Guidance documents issued by the regulatory agency indicated that structures might include items such as utility lines, basements, and elevator shafts. Although not specifically included in the rule definition (.0102 15 NCAC 2L), regulatory officials also considered potential receptors to include environmental resources such as water supply wells, surface waters, drinking water supplies, and "regions of ground water that have been identified for planned resource development".

The potential receptor survey conducted by CATLIN (1996) resulted with the following conclusions:

- Three water supply wells (HP-644, HP-645, and HP-646) were located within 1,500 feet of the site. A MCB water treatment facility (Building 670) was located on the east side of Holcomb Boulevard, approximately 1,000 feet east of the site. The potential existed for exposure to petroleum contamination via ingestion and/or dermal contact should the water supply wells become contaminated. The locations of the water supply wells are presented on Figure 1.

- Underground utility services (water, electrical, and sanitary sewer) were located within the project area. Utility depths were unlikely to intersect the water table that is between 12 and 29 feet BLS. The utilities were not considered to be at risk for impact by the petroleum hydrocarbon contamination or act as preferential migration pathways.

- Northeast Creek was located approximately 4,500 feet northwest of the site and was the nearest mapped body of surface water. A drainage ditch was located to the north of the site. The ditch was used to contain and route surface water runoff and did not appear to be a discharge point for ground water. CATLIN concluded that it was unlikely that surface water would be impacted by the contaminant plume.

3.1.4 Contaminants of Concern

The list of contaminants identified by CATLIN above applicable action levels at the time of the CAP is included in Table 1. The maximum concentrations of these constituents identified in the CAP are included in Table 1. Summary tables of the analytical results for the 1996 CAP are included in Appendix A

and contaminant concentrations maps from the CAP are included in Appendix B.

4.0 REMEDIAL ACTION REVIEW

4.1 REMEDIAL SYSTEM OBJECTIVES

The objectives of the remedial actions as detailed in the CAP prepared by CATLIN (1996) were to:

4.1.1 Primary Source(s) Removal:

Well HP-645 was permanently abandoned in 1995 and the well house was demolished and removed. The AST was removed during the demolition activities.

4.1.2 Secondary Source Removal:

According to the CAP, unsaturated soils containing TPH concentration in excess of State action levels were not identified in the previous assessment.

4.1.3 Groundwater Remediation:

- Restore the affected section of the deeper portion of the surficial aquifer to North Carolina Groundwater Quality Standards (NCAC T15A:02L.0200) to protect its use as a possible drinking water resource.

- Restore the shallow portion of the aquifer to North Carolina 2L GWQS.

4.1.4 Target Cleanup Concentrations:

Target cleanup concentrations along with the maximum existing concentrations identified in the 1996 CAP are presented in Table 1 of this report. The cleanup targets for groundwater as presented in the CAP are based on the 2L GWQS relevant in 1996.

4.2 RECOMMENDED REMEDIAL STRATEGY

CATLIN evaluated numerous remedial options for the Building 645 site. Based on site specific conditions including contaminant plume size, contaminant migration pattern, and the estimated migration rate, the air sparge and soil vapor extraction (AS/SVE) system coupled with natural attenuation was recommended by CATLIN in the 1996 CAP.

As documented in the 1996 CATLIN CAP, the proposed locations and depths of the

ground water remediation system pipelines were based on:

- The horizontal and vertical geometry of the dissolved-phase petroleum hydrocarbon contaminant plume;
- The project site's stratigraphy;
- The results of the air sparging pilot tests that had been conducted at the site; and
- Design calculations.

A network of vertical air sparging wells was proposed to remediate the shallow (less than 50 feet deep) and deep (greater than 50 feet but less than 80 feet deep) portions of the surficial aquifer. For remediation of the shallow portion of the aquifer, the air sparging wells were proposed to be installed to a depth of 50 feet BLS. For remediation of the deeper portions of the aquifer, the air sparging wells were proposed to be installed to a depth of 80 feet BLS.

The focus of the deep air sparging was around the location of former Well HP-645 and along the down gradient edge of the deeper portion of the contaminant plume. The deeper wells were intended to address the remediation in the shallow section of the aquifer. The shallow wells were configured to prevent the migration of the contaminant plume across Brewster Boulevard and to address the groundwater contamination that existed north of the former Well HP-645.

Twenty-one gravel packed vent borings were proposed to be advanced through the clay layer to a depth of 17 feet BLS for collecting vapors from the air sparge wells. Nine of the vent borings were located along the northern edge of Brewster Boulevard in an effort to prevent hydrocarbon vapors from migrating southward. The soil vapor extraction/collection lines were proposed to be installed horizontally at a depth of four feet BLS.

Based on the CATLIN's 1996 CAP design calculations, the deeper air sparging wells were estimated to require a total aeration flow rate of approximately 130 cfm (approximately 22 cfm per well), while the shallow air sparging wells were estimated to require a total flow rate of approximately 110 cfm (approximately 14 cfm per well). The soil vapor extraction lines were estimated to require a total vacuum airflow rate of 413 cfm.

4.3 IMPLEMENTED REMEDIAL SYSTEM

Subsequent to the CAP approval, a remediation system, consisting of an air sparge and soil vapor extraction (AS/SVE) was installed in 1998 by J.A. Jones.

The installed treatment system consisted of fourteen vertical air-sparge wells (AS-1 through AS-14) and four horizontal vapor extraction wells (SVE-1 through SVE-4). Air-sparge wells AS-1 through AS-6 were installed to a depth of 80 feet BLS and air-

sparge wells AS-7 through AS-14 were constructed to a depth of 50 feet BLS. Twenty-one soil vapor collection vent borings were installed below the horizontal soil vapor extraction line from 4.5 to 20 feet BLS. The vent borings were intended to allow vertical migration of soil vapor through the zone of lower permeability to the soil vapor extraction lines.

The soil and groundwater treatment system was started on September 10, 1998. According to the Annual Monitoring Report (Shaw, 2004). An additional 19 soil vapor collection vent borings were installed at the site in 2000. The current remedial system layout is presented in Figure 3.

4.4 REMEDIAL SYSTEM STATUS

Details pertaining to actual system operation time are documented in the 2004 Final Annual Monitoring Report prepared by Shaw. As detailed in the Annual Monitoring Report, during the reporting period from July 31, 1999 to July 31, 2002, the air sparge system operated 23 of 36 months. The air sparge portion of the remedial system was inoperable for several weeks seven times during the reporting period.

Shaw reports in the Annual Monitoring Report (2004) that the airflow injection rates have been routinely adjusted by J.A. Jones during site inspections to optimize the system's performance and prevent excessive groundwater mounding. During the reporting period of July 1999 to July 2002 for the Annual Monitoring Report (Shaw, 2004), the system was operated at a reported average total system flow rate of 790 cfm. This discharge rate was calculated from measurements collected by J.A. Jones on a monthly basis from Capsuhelic differential pressure indicators located on each extraction well and summing the flow rates. Due to the method of adding dilution air during collection of air quality samples, the actual amount of VOCs recovered could not be calculated.

The remedial system is reportedly physically inspected a minimum of once per week.

4.5 MONITORING STATUS

According to the 2004 Annual Monitoring Report completed by Shaw, depth to groundwater measurements have been collected monthly from each of the 23 groundwater monitoring wells at the Building 645 site from June 10, 1999 to June 11, 2002. The depth to water measurements have been collected both under static conditions and during system operation.

In late 1999 to mid to late 2000, a substantial increase in the concentrations of dissolved petroleum constituents was noted in the groundwater samples collected from the Type III monitoring well 645-MW18. The trend is evident in the graphical representation of contaminant concentrations over timetables included in Appendix H of this report. Due to these increases in contaminant concentrations, the following

four activities were completed to attempt to identify a potential cause of the contaminant increase and to evaluate contaminant plume migration:

- A fingerprint analysis of groundwater samples collected from 645-MW18 and the source monitoring wells was completed;
- Geoprobe groundwater sampling near monitoring well 645-MW18 and the source monitoring wells;
- Subsurface and seismic profiling conducted by Geophex Services, Ltd. (Geophex); and
- Installation of three permanent monitoring wells placed to delineate the groundwater contaminant plume and for use in monitoring plume migration near monitoring well 645-MW18.

According to the 2002 Annual Monitoring Report (J.A. Jones, 2002), groundwater samples were collected from monitoring well 645-MW18 and the selected monitoring wells 645-MW2, 645-MW12, and 645-MW15. Results of the analysis indicated the potential that the contaminants identified in the groundwater sample collected from the Type III monitoring well 645-MW18 closely matched the contaminant's fingerprint from the sample collected from the Type II monitoring well 645-MW2. Laboratory results of the groundwater samples additionally indicated that the contaminants identified in the sample collected from 645-MW18 might be a "fresher" version of the contaminants detected in the sample collected from 645-MW2. Details of the fingerprint analysis are presented in the 2002 Annual Monitoring Report prepared by J.A. Jones.

In November 2000, J.A. Jones supervised the collection of six groundwater samples from five Geoprobe borings advanced at locations in the areas up gradient and down gradient of 645-MW18 and analyzed by EPA Methods 602 and 625. The groundwater samples were collected at depths of 30 feet and 80 feet BLS. Analytical results indicated that benzene was present in two of the three groundwater samples collected at 80 feet BLS at concentrations of 1.7 µg/L and 1.5 µg/L. Analytical summaries of the Geoprobe sampling are graphically presented in Appendix E.

Subsequent to the completion of the Geoprobe investigation, J.A. Jones supervised the installation of two Type III monitoring wells (645-MW21 and 645-MW22) and one Type II (645-MW23) monitoring well in July 2001. Monitoring well 645-MW21 was installed to a depth of 80 feet BLS and was advanced adjacent to monitoring well 645-MW4. Monitoring wells 645-MW22 and 645-MW23 were installed as a nested pair to depth of 80 feet BLS and 30 feet BLS, respectively. These additional wells were installed to attempt to further delineate the contaminant plume.

According to the 2004 Annual Monitoring Report presented by Shaw, groundwater samples were collected from the subject site prior to system start-up on July 29,1998 from monitoring wells 645-1 through 645-20. Groundwater samples were collected quarterly from the same monitoring wells with the exception of 645-7 and 645-14

from June 1999 through June 2000. For the period of June 2001 to June 2002, groundwater samples were collected according to the following:

- Quarterly from monitoring wells 645-1 through 645-3, 645-9, 645-12, 645-15, and 645-18;
- Semi-annually from monitoring wells 645-6, 645-11, 645-13, 645-16, and 645-17;
- Annually from 645-4, 645-8, 645-10, 645-19, and 645-20.
- Groundwater samples were additionally collected from monitoring wells 645-21 and 645-22 quarterly after September 2001.

All collected groundwater samples were reportedly analyzed by Paradigm Laboratories for volatile aromatic hydrocarbons using EPA Method 602 and EPA Method 610 (samples collected until September 2003) or EPA Method 625 (samples collected after September 2003). During the summer of 2002, groundwater monitoring and remedial system operation and maintenance responsibility was transferred from J.A. Jones to Shaw.

4.6 CURRENT CONTAMINANT CONCENTRATIONS

4.6.1 Free Product

No measurable thickness of free product has been identified at the site.

4.6.2 Soil

No detectable concentrations of TPH-gasoline or TPH-diesel have been identified in any of the vadose zone soil samples taken during any of the site assessment investigations conducted at the subject site. Analytical results from the assessment activities are summarized in Appendix A and graphically illustrated in Appendix B. The soil sample analysis result shown for well 645-3 is for a sample collected at a depth of 13 to 15 feet below grade during the three well site check investigation. Contamination detected in this soil sample and in soil sample "SS-1A" appears to be the result of migration of contaminants within the capillary fringe and, therefore, do not constitute vadose zone soil contamination. Depth to water in well 645-3 was measured at 15.0 feet below top of casing (12.7 feet below grade) on August 13, 1996. No evidence suggests that site conditions pertaining to vadose soil impact have changed.

4.6.3 Groundwater

The maximum groundwater contaminations at the time of 1996 CAP are

presented on Table 1. The most recent groundwater-sampling event completed at the site was conducted in December 2003 by Shaw. Groundwater samples were collected from monitoring wells 645-MW1 through 645-MW3, 645-MW5, 645-MW6, 645-MW9, 645-MW11, 645-MW12, 645-MW13, 645-MW15 through 645-MW18, and 645-MW21 through 645-MW23 and analyzed per EPA Methods 602 and 625.

Review of the December 8, 2003 sampling results revealed that concentrations of BTEX constituents were identified above current 2L GWQS in groundwater samples collected from the following monitoring wells:

- 645-MW1 (ethylbenzene – 94.3 µg/L)
- 645-MW2 (benzene – 2.4 µg/L, ethylbenzene – 110 µg/L, and total xylenes - 716 µg/L)
- 645-MW18 (benzene – 788 µg/L, ethylbenzene – 838 µg/L, toluene – 3,570 µg/L, and total xylenes – 2,260 µg/L)
- 645-MW22 (benzene – 6.9 µg/L)

Polynuclear aromatic hydrocarbons identified in the groundwater samples collected during the December 8, 2003 sampling event above current 2L GWQS included the following:

- 645-MW1 (1-methylnaphthalene – 23.4 µg/L, 2-methylnaphthalene - 34.3 µg/L, naphthalene – 32.2 µg/L)
- 645-MW2 (1-methylnaphthalene – 30.0 µg/L, 2-methylnaphthalene - 42.9 µg/L, naphthalene – 45.1 µg/L)
- 645-MW3 (1-methylnaphthalene – 7.4 µg/L)
- 645-MW12 (1-methylnaphthalene – 2.0 µg/L)

Historical analytical results summary tables are included in Appendix D. An analytical data summary of the most recent groundwater sampling events (December 2002 through December 2003) is presented in Appendix G. The analytical results from the December 2003 sampling event along with the interpreted areal extents are presented for benzene, toluene, ethylbenzene, total xylenes, and naphthalene on Figures 4/4A through 8/8A, respectively.

5.0 REMEDIATION EFFECTIVENESS EVALUATION

A review of the 2003 sampling data revealed the following contaminant percentage decreases as compared to the concentrations presented in the CAP:

COMPOUND	MAXIMUM CONCENTRATION DETECTED FROM CAP	MAXIMUM CONCENTRATION DETECTED IN 2003	PERCENT DECREASE
Benzene	3,650 µg/L	788 µg/L	78%
Toluene	19,100 µg/L	838 µg/L	96%
Ethylbenzene	3,090 µg/L	3,570 µg/L	[16%]
Total Xylenes	35,100 µg/L	2,490 µg/L	93%
Naphthalene	1,370 µg/L	113 µg/L	92%
2,4 Dimethylphenol	645 µg/L	NA	--

NA = Not Analyzed [ ] = Net Increase

The current areal extent of shallow groundwater contamination identified above 2L GWQS in the shallow surficial aquifer appears to be significantly reduced from the estimated areal extent at the time of the 1996 CAP preparation. However, a large portion of the areal extent of the plume as established in 1996 CAP was determined with temporary sampling points. The elimination of the temporary sampling points, specifically HP-1, HP-7, and HP-10, from the CAP data would result with estimated plume extents similar to those as interpreted from the December 2003 data. Therefore, with the current data set, the horizontal extent of dissolved petroleum impact at the project site may not be established.

As presented in the previous table, the magnitude of the contaminant concentrations, especially in the source area, has decreased significantly since the 1996 CAP. Since the source area is located within the limits of the sparged area, it is safe to assume that the reduction in contaminant concentrations may be a result of the remedial efforts. Therefore, the remedial efforts appear to be effective for the shallow portions of the contaminant plume. The estimated areal extents of the shallow plumes from the December 2003 sampling event are included in Figures 4 through 8. Analytical summary data tables from the CAP are included in Appendix A and graphically represented in Appendix B.

The contaminant contaminations in the 45 to 55 feet deep zone of the aquifer have demonstrated substantial decreases based on those identified in CATLIN's 1996 CAP. No groundwater samples from the Type III monitoring wells screened within this interval (645-9, 645-10, and 645-11) have contained concentrations of target compounds above 2L GWQS since the remedial system began operation.

The concentrations of petroleum constituents identified in groundwater samples collected from 45-50 feet BLS in monitoring wells 645-MW18 and 645-MW22 during the periodic sampling events have been highly variable and do not appear to be influenced by any of the remedial activities being conducted on site. The contaminant levels identified in groundwater samples collected from these wells overall have increased substantially with the highest levels of contaminant concentrations identified during the 2000 to 2001 sampling events. Dissolved petroleum contaminant levels have decreased since the peak in the 2000 to 2001 sampling events, yet still remain substantially higher than the shallow contaminant levels and above current 2L GWQS. The highest contaminant levels have consistently been

identified in groundwater samples collected from 645-MW18.

Monitoring well 645-MW18 is located on the extreme eastern portion of the project site, approximately 250 feet from the source area. No contamination in excess of 2L GWQS has been identified in the shallow Type II monitoring well 645-MW6 that is paired with 645-MW18. Based on these observations, the remedial efforts currently in effect at the Building 645 site do not appear to be effective in addressing the contamination identified in the deeper portions of the aquifer. Additionally, based on the physical location of 645-MW18 in relation to the source area along with the elevated contaminant levels as compared to the groundwater samples collected from the Type IIs, the exact source of the petroleum impact to the deeper (greater than 45 feet deep) portions of the site is uncertain. Similar conditions have been identified in the Hadnot Point Industrial Area where the pumping of numerous water production wells is suspected to have caused the downward and subsequent horizontal migration of petroleum constituents. The estimated areal extents of the shallow plumes from the December 2003 sampling event are included in Figures 4A through 8A. Analytical summary data tables and graphs from the 1996 CAP are included in Appendices A and B.

Graphical representations of the historical contaminant levels identified in groundwater samples collected from the selected monitoring wells are included in Appendix H.

5.1 SYSTEM SUITABILITY

Based on the reduced levels of groundwater contamination in the shallow subsurface, beneficial remedial actions are occurring at the subject site that appear to be a result of the active remedial system; therefore, the system as designed appears to be suitable to the shallow portion of the contaminant plume. The air sparging technology appears to be suitable to address the contaminant levels identified at the subject site; however, a modification of the remedial system is necessary to adequately address the petroleum impact identified in the deeper portions of the subject site.

6.0 REMEDIATION MODIFICATIONS AND ALTERNATIVES

6.1 REGULATORY FRAMEWORK EVALUATION

The remedial goals for the site were based on the regulations current at the time and presented in the 1996 CAP. Current applicable remedial requirements for the contamination associated with the Building 645 AST is based on the corrective action requirements per 15A NCAC 2L .0106 which became effective on January 2, 1998 and the requirements in the NCDENR 2000 Guidelines. Based on these regulations, the contaminant cleanup levels established in the 1996 CAP are still relevant.

If an additional source is identified that is not from the former AST that indicates a mixed plume, the regulatory mechanism may be altered. Per the General Assembly of the North Carolina Session Law 2003-352, House Bill 897 (House Bill 897), "...a mixed plume of contamination that results from releases of petroleum form both an

underground storage tank and an aboveground storage tank or other source may be cleaned up under the risk-based cleanup rules applicable to releases from petroleum underground storage tanks...". As such, reclassification of the site based on current risk factors would be necessary.

6.2 REVISED CONCEPTUAL SITE MODEL

6.2.1 Groundwater Depth and Flow Direction

Groundwater gauging data and groundwater elevation contour maps as interpreted by J.A. Jones in the Annual Monitoring Report (Shaw, 2004) are included in Appendix C. Review of the data generated from these gauging events as presented in the 2004 Shaw Annual Monitoring Report indicates that overall flow direction trend of the shallow aquifer has been west to southwest. This data, as compared to the historical data presented in the previous reports, indicates that the groundwater flow trends at the site have generally remained consistent. Depth to groundwater has additionally remained relatively consistent in the shallow zone. Therefore, no change to the groundwater flow characteristics is necessary in the revised conceptual model.

6.2.2 Potential Receptors

The potential receptors have been re-evaluated during the preparation of this RAO & RCAP using the Risk Classification and Land Use Form included in Appendix F. Due to the release, originating from an AST, the Risk Classification and Land Use Form was only used as a template to address and document any changes to the receptors and land use.

The receptor survey that was completed as part of this plan did not identify any additional potential receptors within the area of investigation. Water supply well HP-645, previously identified within 1,500 feet of the subject site, was permanently abandoned and the associated well house and piping were demolished in 1995. Water supply wells HP-644 (located 1,480 feet west of the release) and HP-646 (located 1,400 feet north northeast of the release) are still active.

Six additional active water supply wells were identified within 3,000 feet of the subject site. The total depth of these water supply wells ranges from 134 to 270 feet BLS with screened intervals beginning at 85 to 265 feet BLS. Although these wells are outside of the 1,500 feet zone, the hydrogeologic makeup of the area suggests that the potential exists for these wells to impact the vertical gradient of the site. Similar conditions identified in the Hadnot Point Industrial Area of Camp Lejeune resulted in the downward migration of petroleum constituents.

The potential receptors are presented on the Site Location Map on Figure 1.

6.2.3 Contaminants of Concern

The contaminants of concern as established in the 1996 CAP are still relevant. However, current analysis has detected 1-methylnaphthalene and 2-methlynaphthalene. The analysis utilized in the assessments conducted prior to the CAP was not applicable to the detection of these constituents. Additionally, detectable levels of 2,4 dimethylphenol were identified in the 1996 CAP. The current analytical suite does not include an analysis that includes 2,4 dimethylphenol as a reportable compound.

6.3 ALTERNATIVE REGULATORY MECHANISMS

6.3.1 Revised Target Cleanup Goals

No changes in the contaminant clean up levels were identified during preparations of this document. Therefore, no revised cleanup goals are necessary.

6.3.2 Land Use Restrictions

This notice would be utilized as part of a remedial action for sites if approved by the NCDENR – UST Section for low risk UST sites that do not require further remedial actions per the RBCA rules that have petroleum constituents in excess of the 2L GWQS. This notice is not applicable for the site at this time.

6.4 ALTERNATIVE REMEDIAL TECHNOLOGIES

No alternative remedial technologies appear to be necessary to accomplish the ultimate goal of site closure. However, modification of the current sparge system will be necessary to address the petroleum contamination identified in the deeper portions of the aquifer.

6.5 COST EFFICIENCY EVALUATION

No alternative remedial recommendations have been made for the project site. Therefore, no comparative cost evaluations have been completed.

7.0 OPTIMIZATION RECOMMENDATIONS

7.1 SOIL

Based on review of historical data, no petroleum related vadose zone soil impact associated with the Building 645 release appears to be present at the subject site. Therefore, no additional soil assessment or remediation appears to be necessary.

7.2 GROUNDWATER

The current remedial system appears to be sufficient in reducing the contaminant levels within the upper (less than and equal to 50 feet) portions of the contaminant plume. Therefore, CATLIN recommends the continued operation of the AS/SVE system. Specific details to complete this recommendation are as follows:

1. The horizontal extent of petroleum impact to the shallow (less than 40 feet) aquifer needs to be refined to the west and south of the source area. Two shallow (approximately 25 feet deep BLS) Type II monitoring wells are proposed to establish a refined plume boundary. The locations of the proposed wells are presented Figure 9.

2. The horizontal extent of petroleum impact to the groundwater in the 50 feet BLS strata has been adequately defined and delineated. No additional assessment of the 50 feet zone is recommended.

3. The horizontal extent of petroleum impact to the 80 feet portion of the aquifer needs to be refined to the north, south, and east of the source area. Five 80 feet deep Type III monitoring wells are proposed across the subject site. The locations of the proposed wells are presented on Figure 9.

4. The vertical extent of petroleum impact has not been delineated at the subject site. The extent of contamination has been confirmed at a depth of 80 feet BLS; therefore, a 100 feet deep Type III monitoring well is proposed near the location of 645-18. This location has historically demonstrated the highest concentrations of dissolved petroleum constituents at depth. The location of the proposed monitoring well is presented on Figure 9.

5. Subsequent to the installation of the proposed monitoring wells, a comprehensive groundwater sampling event is recommended. Groundwater samples should be collected from all monitoring wells located at the subject site and analyzed per EPA Method 602 plus xylenes and EPA Method 625 plus TICs.

6. If delineation and refinement of the contaminant plume is not achieved horizontally and vertically in the shallow and 80 feet deep zone, additional

assessment will be necessary.

7. Assuming delineation and refinement of the contaminant plumes is achieved with the current proposed monitoring well scheme; CATLIN recommends to shut down the western "leg" of the sparge system extending from, but not including, the southern most 80 feet deep sparge point westward. This would include shutting down sparge points AS01 through AS04 as presented on Figure 3. It should be noted that the remediation points were labled by CATLIN for reference only and may not accurately portray the actual names of the points assigned at the time of installation. Additionally, the soil vent borings along the portion of the system should remain active.

8. Based on the result of the comprehensive sampling event conducted after the installation of the proposed monitoring wells, adjustment of sampling criteria will be necessary.

9. Prepare a CAP Addendum to address the installation of additional AS/SVE points extending eastward from the existing system to a depth sufficient to penetrate below the contaminant plume. The vertical extent of the contaminant plume is assumed to be delineated with the 100 feet deep proposed monitoring well.

10. Based on the locations of the potable water supply wells HP-644 and HP-646 identified during the receptor survey, CATLIN recommends that MCB, Camp Lejeune shut down and abandons these potable water supply wells as soon as possible. It is possible that wells HP-644 and HP-646 are contributing to the spread of contaminants at the 80 feet depth. Therefore, the shut down of the potable water supply wells should assist in limiting additional vertical migration of contamination and minimizing additional horizontal migration within the 80-feet deep groundwater zone.

Groundwater sampling is recommended to continue on a quarterly basis subsequent to system modification. The first quarterly sampling event conducted after remedial system modification should include all existing monitoring wells. Groundwater samples collected from the monitoring wells should be analyzed per EPA Method 602 plus xylenes and EPA Method 625 plus TICs. The results of this sampling should be presented within a Groundwater Monitoring Report following the sampling event. Based on the results of the groundwater sampling event, future sampling criteria should be presented in the Groundwater Monitoring Report.

8.0 IMPLEMENTATION

8.1 IMPLEMENTATION PLAN

The following is a suggested implementation plan:

- Submittal of RAO & RCAP to NCDENR for approval of recommendations.
- Install proposed monitoring wells.
- Conduct comprehensive groundwater sampling event.
- Shutdown and abandonment of water supply wells HP-644 and HP-646.
- Revise quarterly sampling scheme based on findings of comprehensive groundwater sampling.
- Prepare CAP Addendum to address modification of existing AS/SVE system and re-assess Potential Receptor.
- Modify AS/SVE system as recommended in CAP Addendum.
- Continue the suggested quarterly groundwater sampling until remedial goals are achieved.
- Once remedial goals are achieved, shutdown the active remedial system.
- Continue groundwater monitoring for one year to verify that no contamination rebound occurs.
- Prepare a Groundwater Monitoring Report with Site Closure Request (if no rebound contamination is present above applicable standards).
- Site Restoration:
    - Disassemble and remove the AS/SVE system. Components of the system may be utilized at other sites or stored for future use.
    - AS/SVE wells and non-relevant monitoring wells should be abandoned in place in accordance to 15A NCAC 2C.0113.

8.2 SCHEDULE FOR IMPLEMENTATION

Installation of the additional groundwater monitoring wells may be completed immediately. Due to the logistics of the monitoring well installation, the upcoming September 2004 sampling event will be an appropriate milestone to conduct the comprehensive sampling event.

9.0 LIMITATIONS

The field and groundwater data evaluated as part of this report provide isolated data points and may not represent conditions at every location in the project area. Analyses and conclusions of this report, being based on interpolation between data points at the project area, may not be completely representative of all site conditions. Conclusions and recommendations from this report are based on the best available data in an effort to comply with current regulatory requirements.

10.0 REFERENCES

J.A. Jones Environmental Services Company, 2002, *Annual Monitoring Report, Soil and Groundwater Building 645.* July 2002.

North Carolina Department of Environment and Natural Resources, Groundwater Section, 1998, *Groundwater Section Guidelines for the Investigation and Remediation of Soils and Groundwater, Volume II: Petroleum Underground Storage Tanks,* Raleigh, North Carolina, January 2, 1998.

North Carolina Department of Environment and Natural Resources, Division of Waste Management, UST Section, 2001, *Guidelines for Assessment and Corrective Action.* Effective July 1, 2001.

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Radian International, 2001, *Guidance for Optimizing Remedial Action Operation.* Prepared for Naval Facilities Engineering Service Center, Port Hueneme, California. April 2001.

Richard Catlin and Associates (CATLIN), 1996, *Leaking Underground Storage Tank Comprehensive Site Assessment, 645.* April 28, 1995

Richard Catlin and Associates (CATLIN), 1996, *Leaking Underground Storage Tank Comprehensive Site Assessment (Addendum), 645.* June 12, 1996.

Richard Catlin and Associates, 1996, *Leaking Underground Storage Tank Corrective Action Plan, 645.* September 25, 1996.

Shaw Environmental, 2004, *Final Annual Monitoring Report, Soil and Groundwater Building 645.* January 2004.

TABLES

TABLE 1

MAXIMUM CONTAMINANT CONCENTRATIONS AND TARGET CLEANUP LEVELS

REMEDIAL ACTION OPTIMIZATION
&
REVISED CORRECTIVE ACTION PLAN
BUILDING 645

MARINE CORPS BASE, CAMP LEJEUNE

MEDIUM		COMPONENT	1996 MAXIMUM CONCENTRATIONS FROM CAP	1996 TARGET CLEANUP*	2003 MAXIMUM CONCENTRATIONS (THROUGH DECEMBER)	REVISED TARGET CLEANUP
FREE PRODUCT	FEET	NONE IDENTIFIED				
VADOSE ZONE SOIL	mg/Kg	NONE IDENTIFIED				
GROUNDWATER	µg/L	Benzene	3,650	1.0	788	1
		Toluene	19,100	1,000	3,570	1,000
		Ethylbenzene	3,090	29	838	29
		Total Xylenes	35,100	530	2,490	530
		Naphthalene	1,370	21	113	21
		1-Methylnaphthalene	NA	n/a	30.0	NE
		2-Methylnaphthalene	NA	n/a	49.9	14
		2,4 Dimethylphenol	17.5	NE	NA	NE

NE = None Established
NA = Not Analyzed
n/a = Not Applicable
* = As Presented in 1996 CATLIN CAP

TABLE 2

WATER SUPPLY WELL INFORMATION

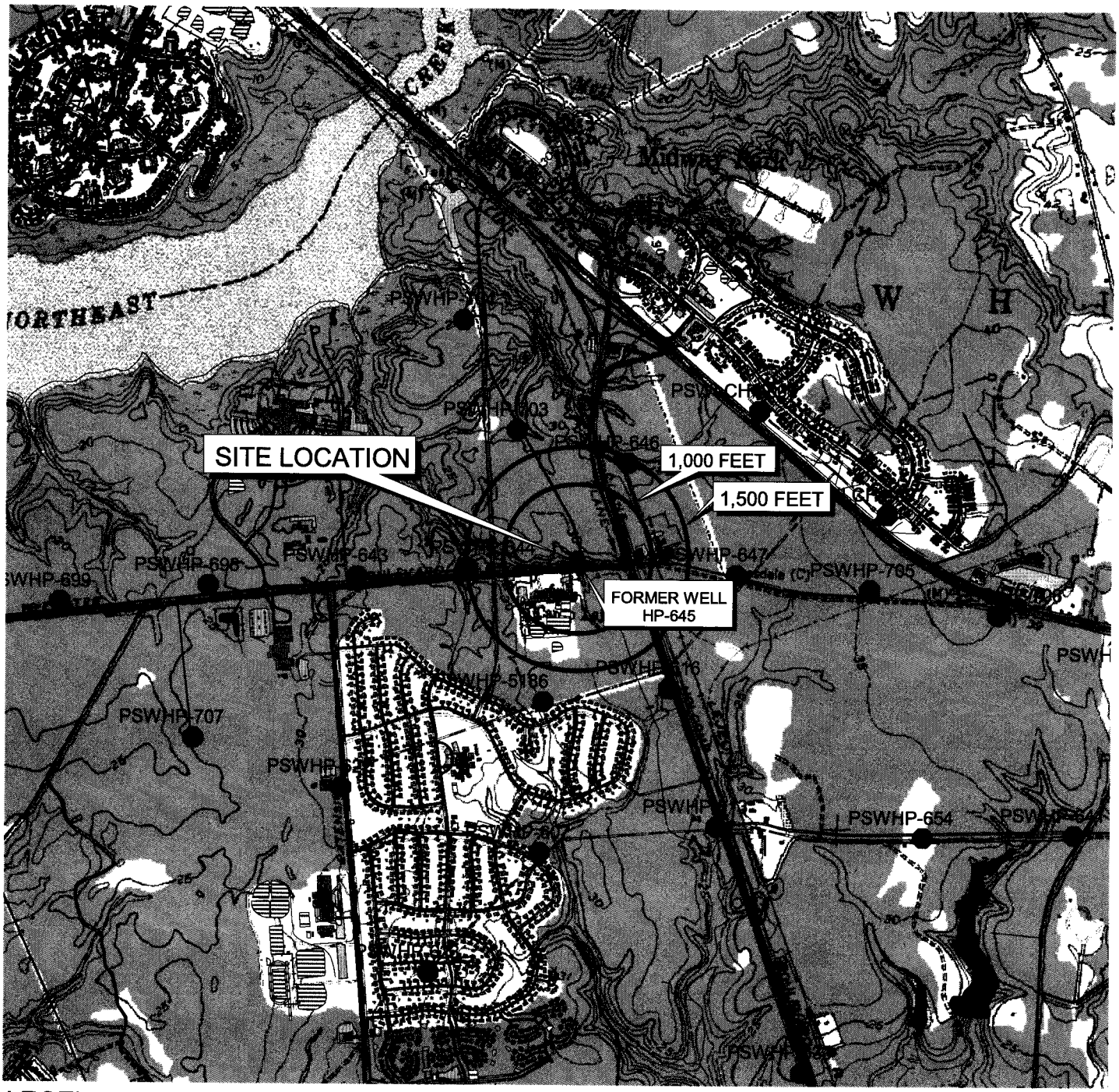
REMEDIAL ACTION OPTIMIZATION
&
REVISED CORRECTIVE ACTION PLAN
BUILDING 645

MARINE CORPS BASE, CAMP LEJEUNE

Well ID#	Location	Year Drilled	Well Depth (ft. BLS)	Well Diameter (inches)	Well Screen Intervals (x to y ft. BLS)	Distance from Release (ft.)	Direction from Release
HP-616	Holcomb Boulevard	1942	170	8	95 -115	2,100	East
					130 -140		
					160 -170		
HP-643	Brewster Boulevard	1971	250	10	90 -100	3,000	West
					138 -148		
					230 -240		
HP-644	Brewster Boulevard	1971	255	10	85 -100	1,480	West
					235 -250		
HP-646	Holcomb Boulevard	1971	270	10	90 -100	1,400	North Northeast
					240 -250		
					255 -265		
HP-647	Rock Road	1970	200	10	105 -115	2,000	East
					138 -143		
					175 -190		
HP-703	Old Heavy Equipment Access Road	1985	145	NO DATA AVAILABLE		1,900	North Northwest
HP-5186	Alabama Avenue	Unknown	160	NO DATA AVAILABLE		1,975	South Southwest
LCH-4009	Highway 24 North	1942	134	NO DATA AVAILABLE		3,100	Northeast

BLS = Below Land Surface

FIGURES



LEGEND

- WATER SUPPLY WELL
- FENCE
- PLAYGROUND
- ATHLETIC FIELD
- ATHLETIC COURT
- WATER PIPE
- PAVEMENT
- PARKING LOT
- SURFACE WATER BODY
- CREEK/STREAM
- DITCH
- SLABS
- EXISTING BUILDINGS

CAMP LEJEUNE, N.C.
N 2437.5 - W 7715.0 / 7.5
1952
PHOTOREVISED 1971

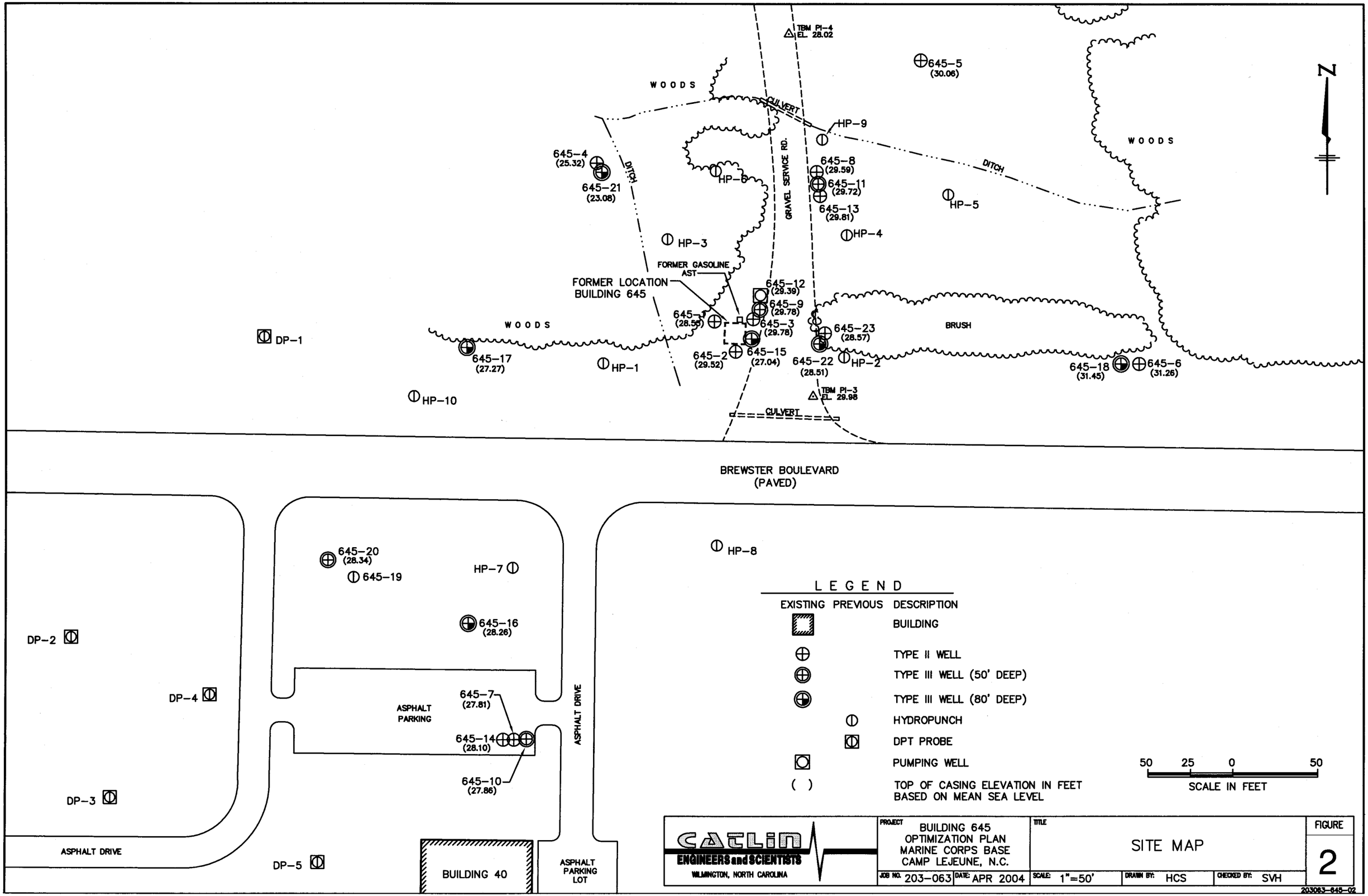
0.5 0 0.5 1 Kilometers

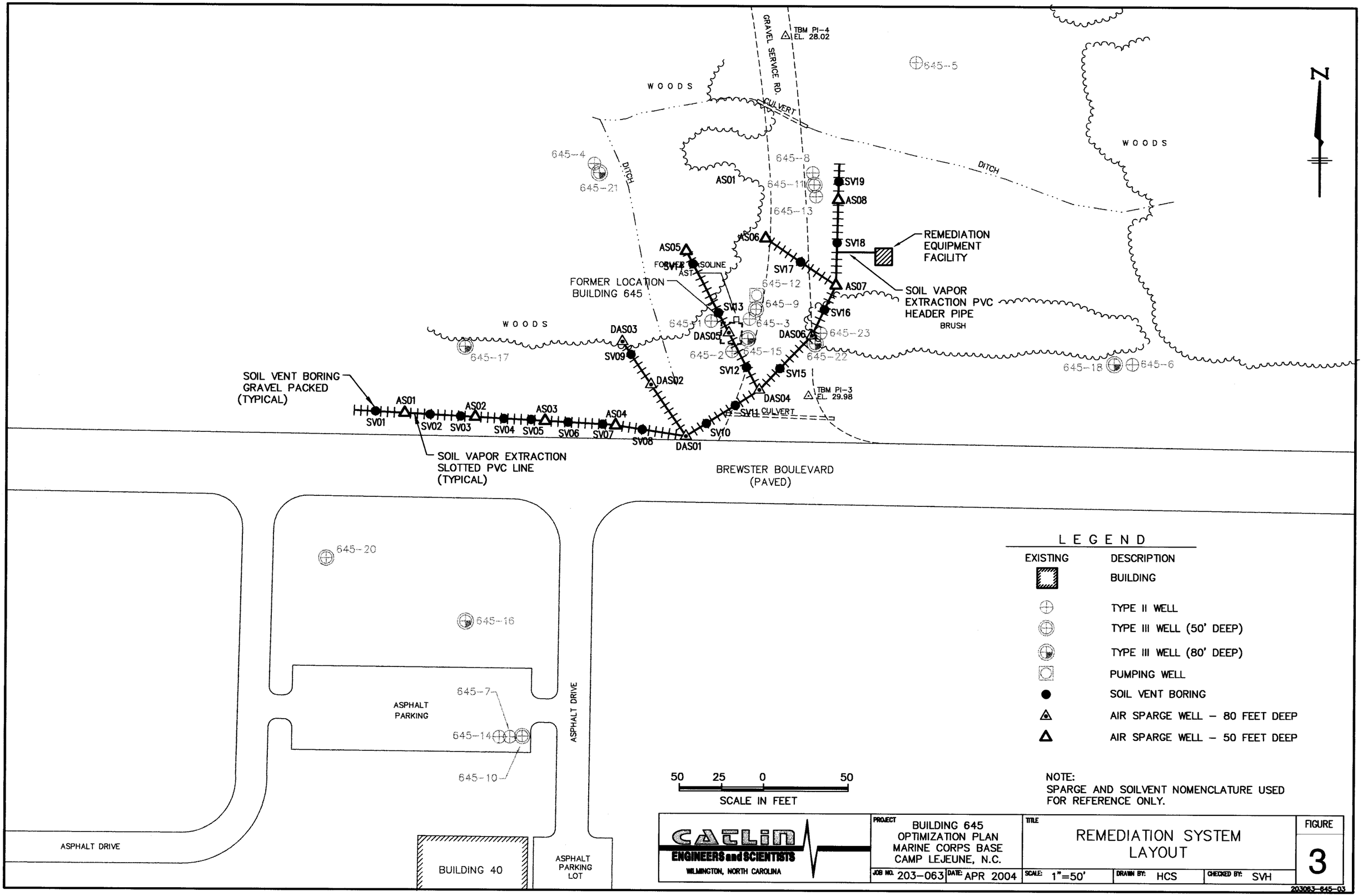
1000 0 1000 2000 3000 4000 5000 Feet

0.6 0 0.6 1.2 Miles

N

CATLIN ENGINEERS and SCIENTISTS	PROJECT: BUILDING 645 OPTIMIZATION PLAN MARINE CORPS BASE CAMP LEJEUNE, N.C.	TITLE: SITE LOCATION MAP			FIGURE 1
	JOB NO.: 203-063	DATE: MAY 2004	SCALE: 1 : 24,000	DRAWN BY: SVH	CHECKED BY: MEM


TBM PI-4
EL. 28.02
645-5
(30.06)
WOODS
CULVERT
HP-9
645-4
(25.32)
645-21
(23.08)
DITCH
GRAVEL SERVICE RD.
HP-6
645-8
(29.59)
645-11
(29.72)
645-13
(29.81)
HP-5
WOODS
DITCH
HP-3
HP-4
FORMER GASOLINE AST
FORMER LOCATION BUILDING 645
645-12
(29.39)
645-9
(29.78)
645-1
(28.56)
645-3
(29.78)
WOODS
BRUSH
DP-1
645-17
(27.27)
HP-1
645-2
(29.52)
645-15
(27.04)
645-22
(28.51)
645-23
(28.57)
HP-2
645-18
(31.45)
645-6
(31.26)
HP-10
TBM PI-3
EL. 29.98
CULVERT
BREWSTER BOULEVARD
(PAVED)
HP-8
645-20
(28.34)
645-19
HP-7
645-16
(28.26)
DP-2
DP-4
645-7
(27.81)
ASPHALT PARKING
ASPHALT DRIVE
645-14
(28.10)
645-10
(27.86)
DP-3
ASPHALT DRIVE
DP-5
BUILDING 40
ASPHALT PARKING LOT
N
LEGEND
EXISTING
PREVIOUS
DESCRIPTION
BUILDING
TYPE II WELL
TYPE III WELL (50' DEEP)
TYPE III WELL (80' DEEP)
HYDROPUNCH
DPT PROBE
PUMPING WELL
( ) TOP OF CASING ELEVATION IN FEET BASED ON MEAN SEA LEVEL
50 25 0 50
SCALE IN FEET
CATLIN
ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA
PROJECT
BUILDING 645
OPTIMIZATION PLAN
MARINE CORPS BASE
CAMP LEJEUNE, N.C.
TITLE
SITE MAP
FIGURE
2
JOB NO. 203-063
DATE: APR 2004
SCALE: 1"=50'
DRAWN BY: HCS
CHECKED BY: SVH
203083-645-02



LEGEND

EXISTING	DESCRIPTION
	BUILDING
	TYPE II WELL
	TYPE III WELL (50' DEEP)
	TYPE III WELL (80' DEEP)
	PUMPING WELL
	SOIL VENT BORING
	AIR SPARGE WELL – 80 FEET DEEP
	AIR SPARGE WELL – 50 FEET DEEP

50 25 0 50

SCALE IN FEET

NOTE:
SPARGE AND SOILVENT NOMENCLATURE USED FOR REFERENCE ONLY.

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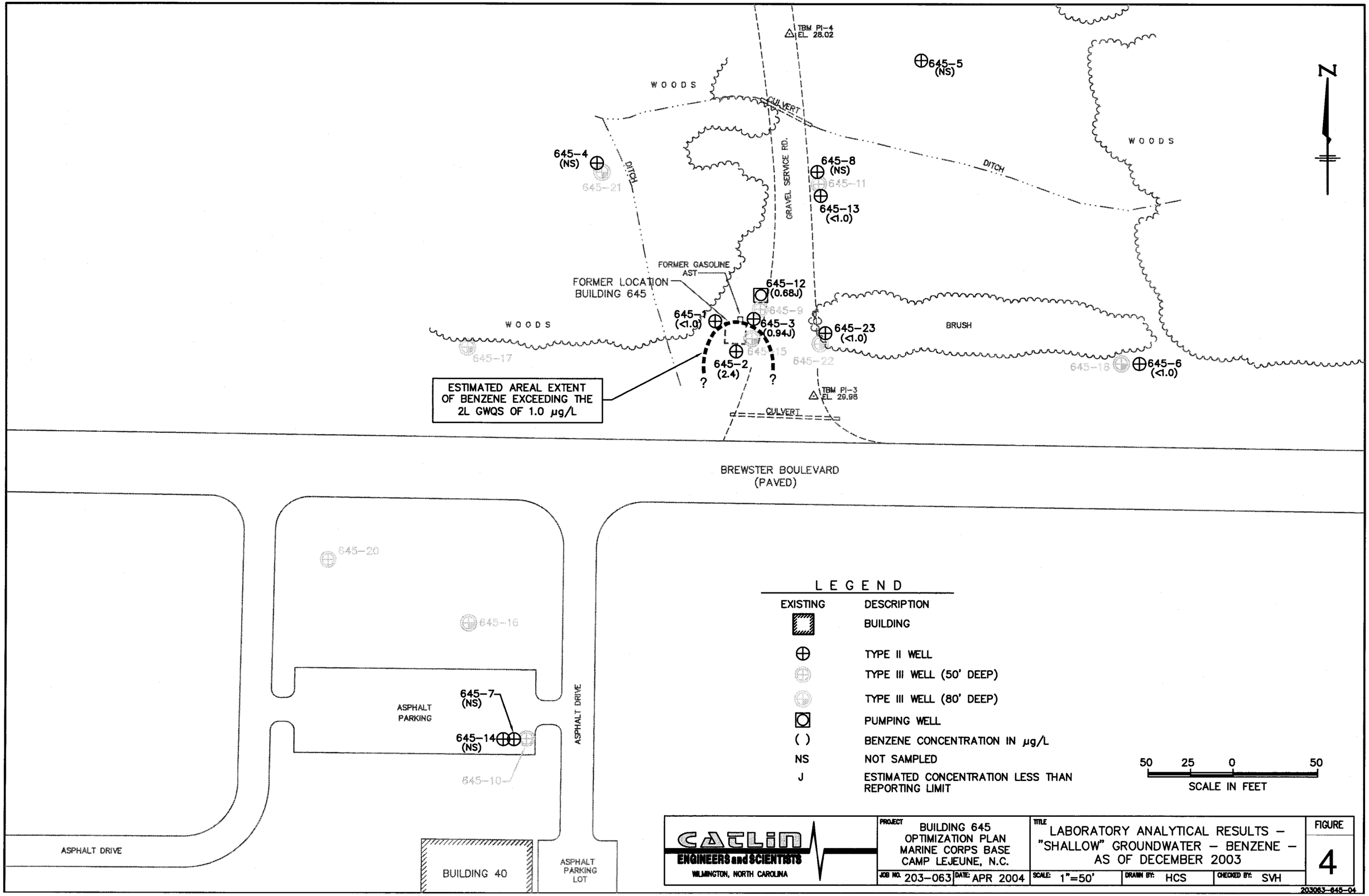
PROJECT: BUILDING 645 OPTIMIZATION PLAN MARINE CORPS BASE CAMP LEJEUNE, N.C.

TITLE: REMEDIATION SYSTEM LAYOUT

FIGURE 3

JOB NO. 203-063 | DATE: APR 2004 | SCALE: 1"=50' | DRAWN BY: HCS | CHECKED BY: SVH

203063-645-03



CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT	TITLE	FIGURE
BUILDING 645 OPTIMIZATION PLAN MARINE CORPS BASE CAMP LEJEUNE, N.C.	LABORATORY ANALYTICAL RESULTS – "SHALLOW" GROUNDWATER – BENZENE – AS OF DECEMBER 2003	4

JOB NO.	DATE	SCALE	DRAWN BY	CHECKED BY
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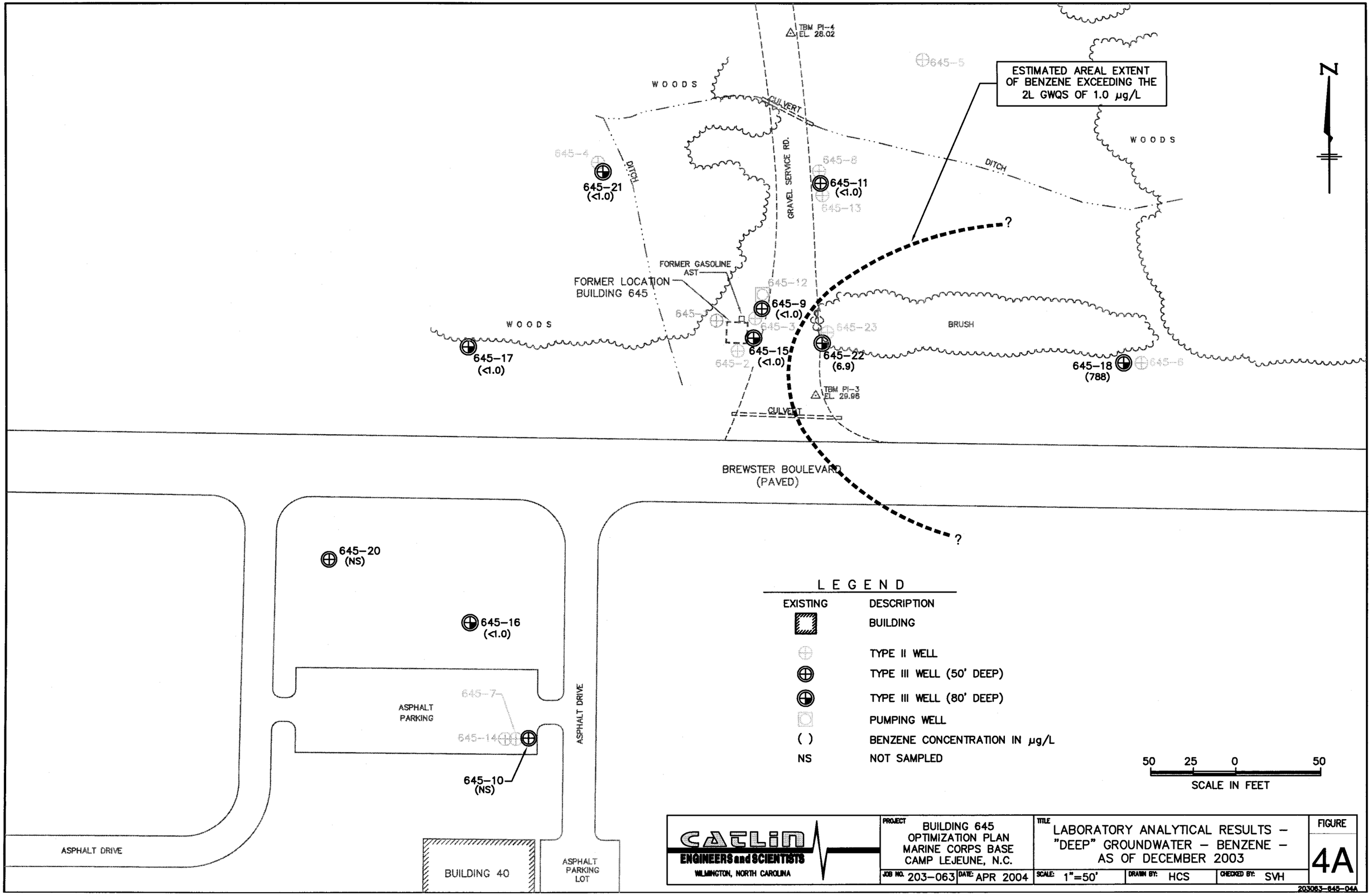
203063-645-04



CATLIN ENGINEERS and SCIENTISTS
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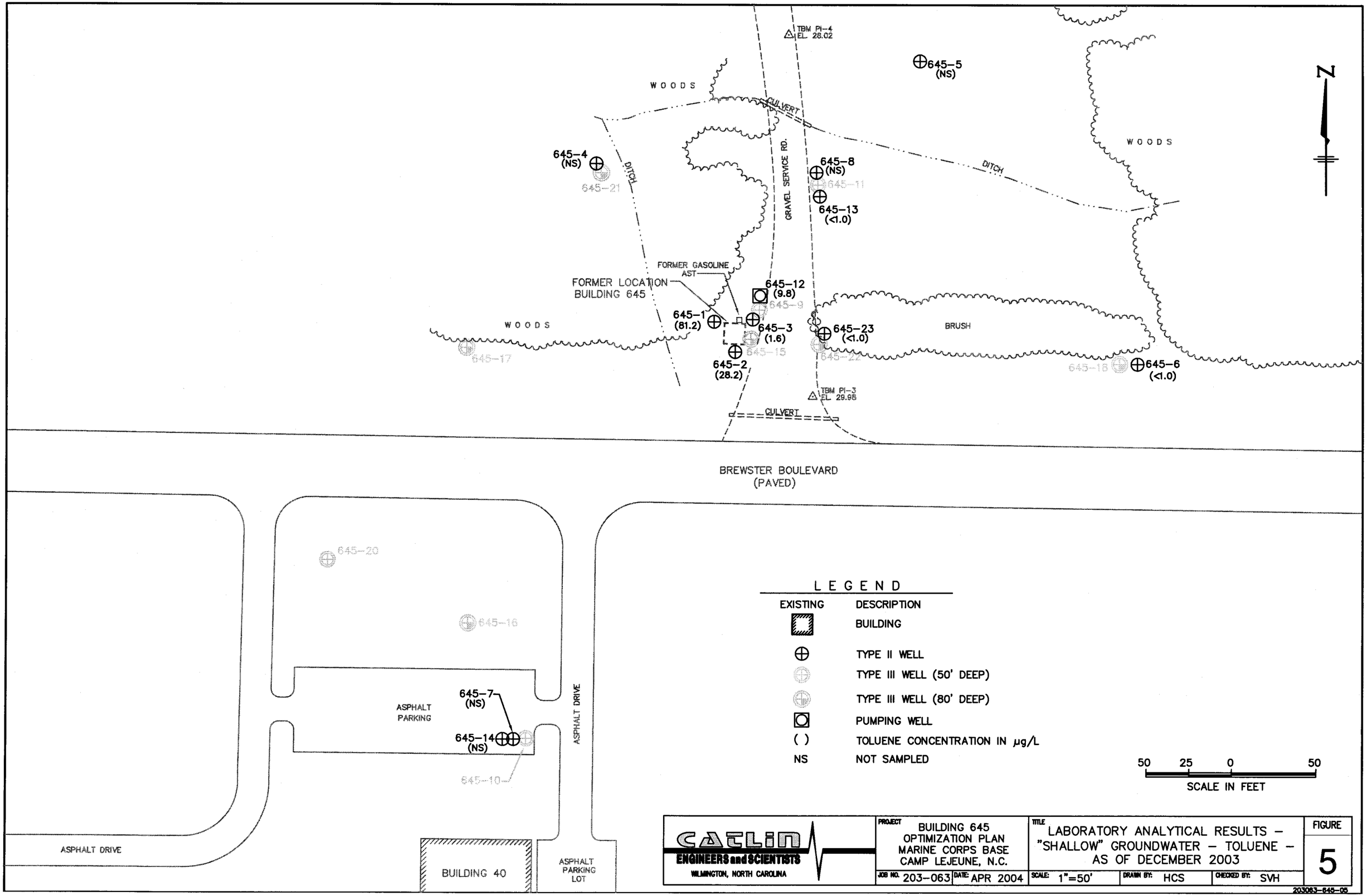
PROJECT: BUILDING 645 OPTIMIZATION PLAN MARINE CORPS BASE CAMP LEJEUNE, N.C.		TITLE: LABORATORY ANALYTICAL RESULTS – "DEEP" GROUNDWATER – BENZENE – AS OF DECEMBER 2003			FIGURE 4A
JOB NO. 203-063	DATE: APR 2004	SCALE: 1"=50'	DRAWN BY: HCS	CHECKED BY: SVH	

203063-645-04A



LEGEND

EXISTING	DESCRIPTION
	BUILDING
⊕	TYPE II WELL
	TYPE III WELL (50' DEEP)
	TYPE III WELL (80' DEEP)
	PUMPING WELL
( )	TOLUENE CONCENTRATION IN µg/L
NS	NOT SAMPLED

50 25 0 50

SCALE IN FEET

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT: BUILDING 645 OPTIMIZATION PLAN MARINE CORPS BASE CAMP LEJEUNE, N.C.

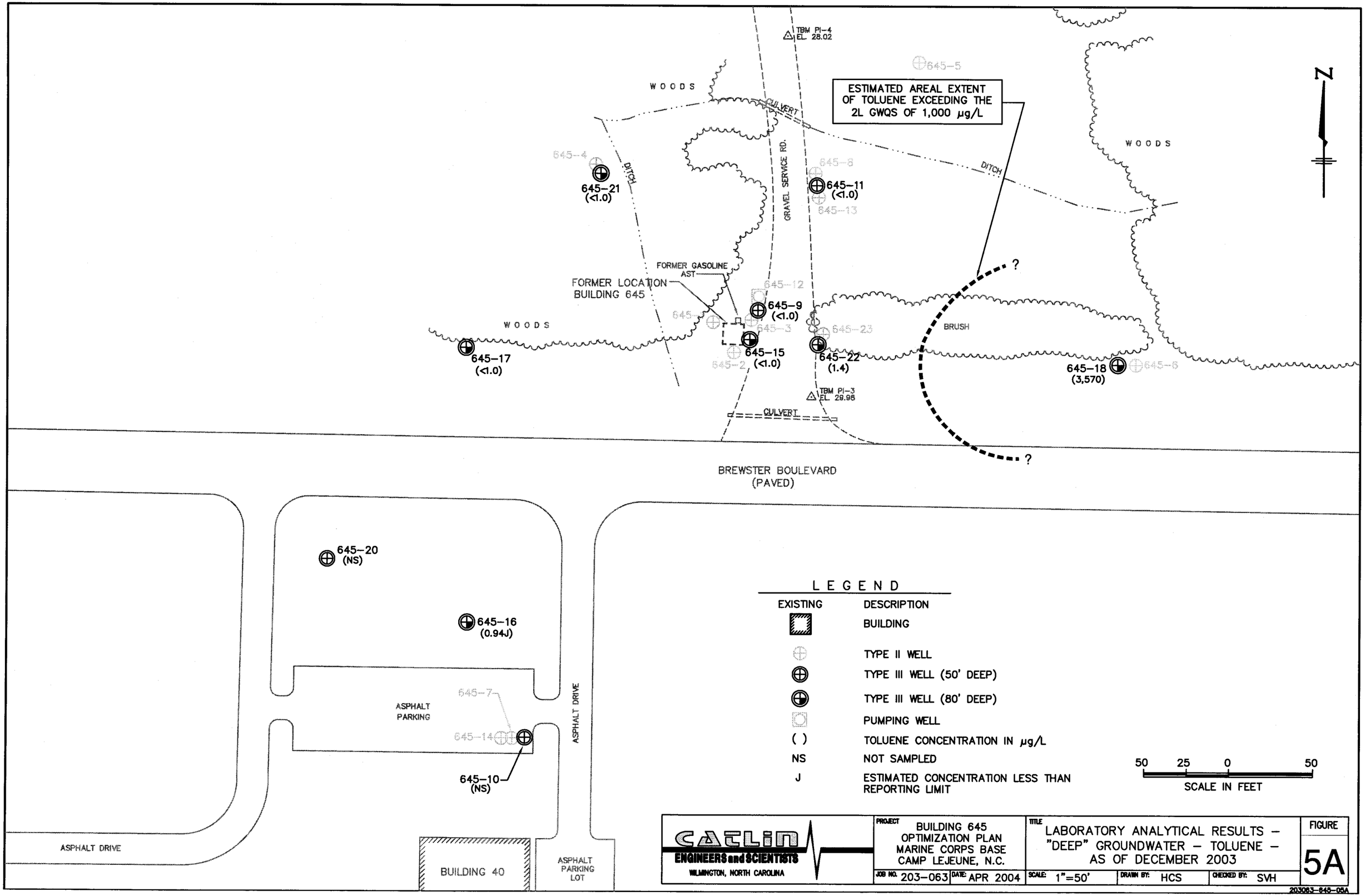
JOB NO. 203-063 | DATE: APR 2004

TITLE: LABORATORY ANALYTICAL RESULTS – "SHALLOW" GROUNDWATER – TOLUENE – AS OF DECEMBER 2003

SCALE: 1"=50' | DRAWN BY: HCS | CHECKED BY: SVH

FIGURE 5

203063-645-05



LEGEND

EXISTING	DESCRIPTION
	BUILDING
	TYPE II WELL
	TYPE III WELL (50' DEEP)
	TYPE III WELL (80' DEEP)
	PUMPING WELL
( )	TOLUENE CONCENTRATION IN µg/L
NS	NOT SAMPLED
J	ESTIMATED CONCENTRATION LESS THAN REPORTING LIMIT

50 25 0 50
SCALE IN FEET

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

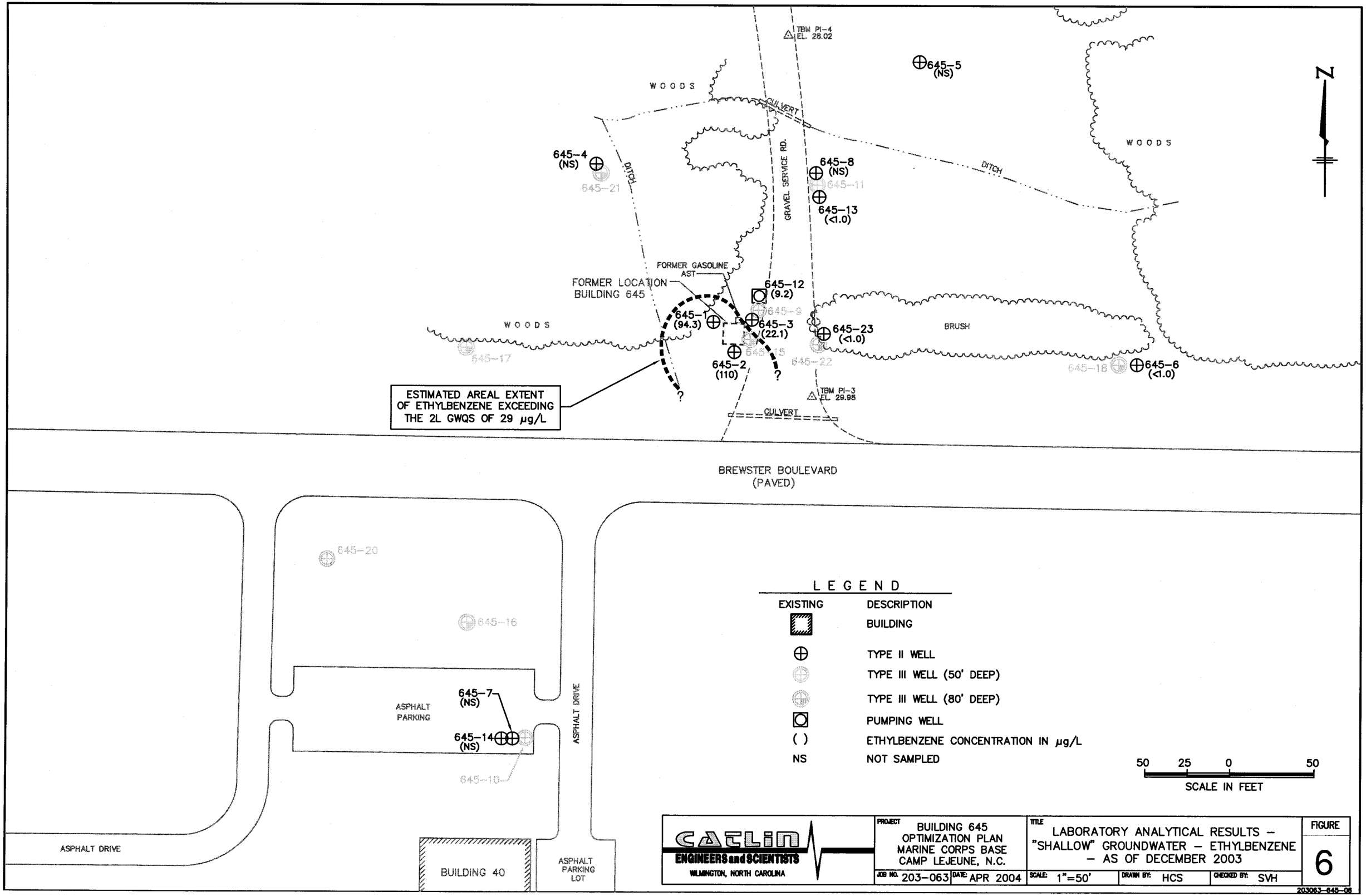
PROJECT: BUILDING 645 OPTIMIZATION PLAN MARINE CORPS BASE CAMP LEJEUNE, N.C.

TITLE: LABORATORY ANALYTICAL RESULTS – "DEEP" GROUNDWATER – TOLUENE – AS OF DECEMBER 2003

FIGURE 5A

JOB NO. 203-063 | DATE: APR 2004 | SCALE: 1"=50' | DRAWN BY: HCS | CHECKED BY: SVH

203063-645-05A

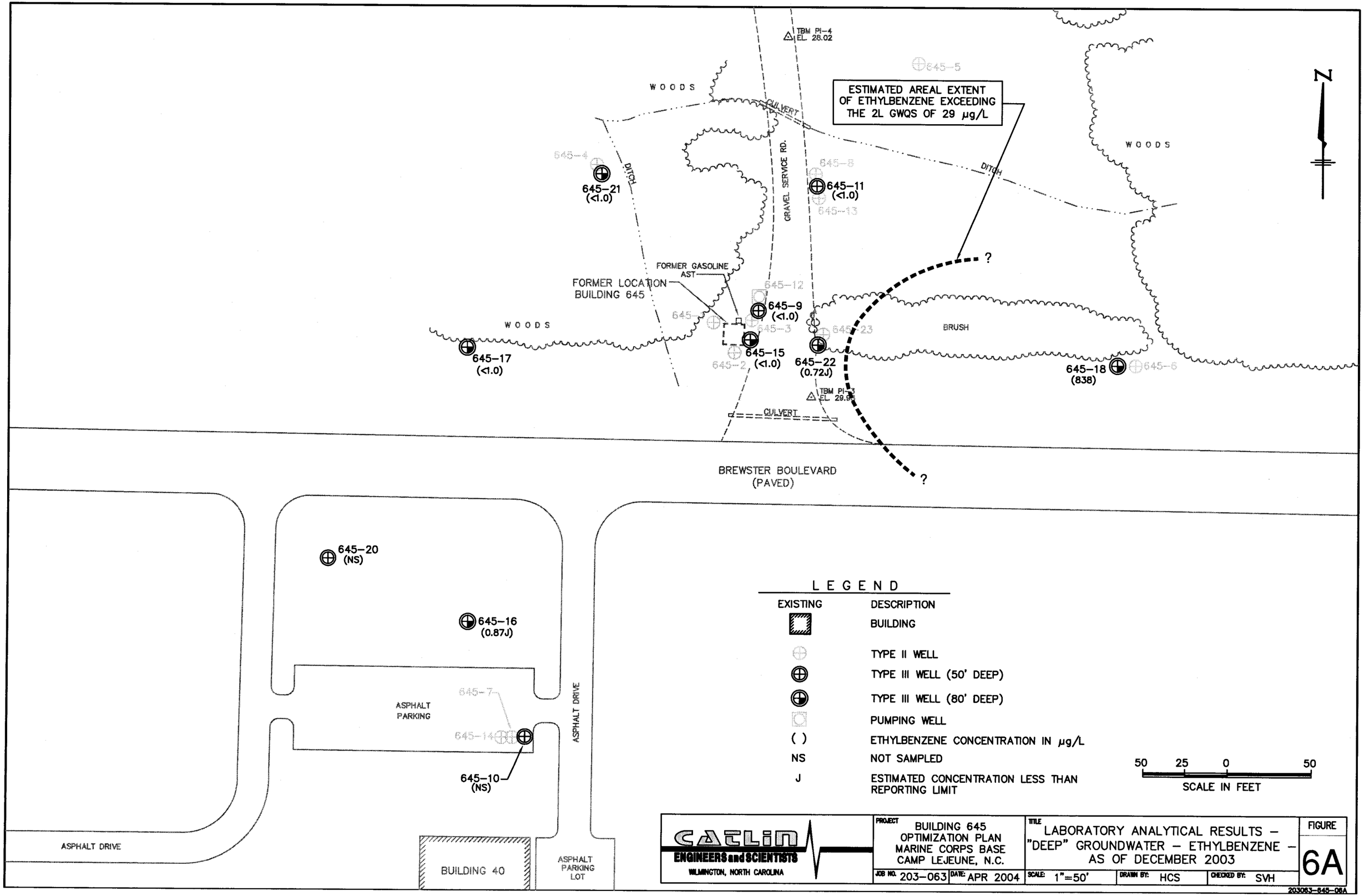


CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT	TITLE	FIGURE
BUILDING 645 OPTIMIZATION PLAN MARINE CORPS BASE CAMP LEJEUNE, N.C.	LABORATORY ANALYTICAL RESULTS – "SHALLOW" GROUNDWATER – ETHYLBENZENE – AS OF DECEMBER 2003	6

JOB NO.	DATE	SCALE	DRAWN BY	CHECKED BY
203-063	APR 2004	1"=50'	HCS	SVH

203063-645-06



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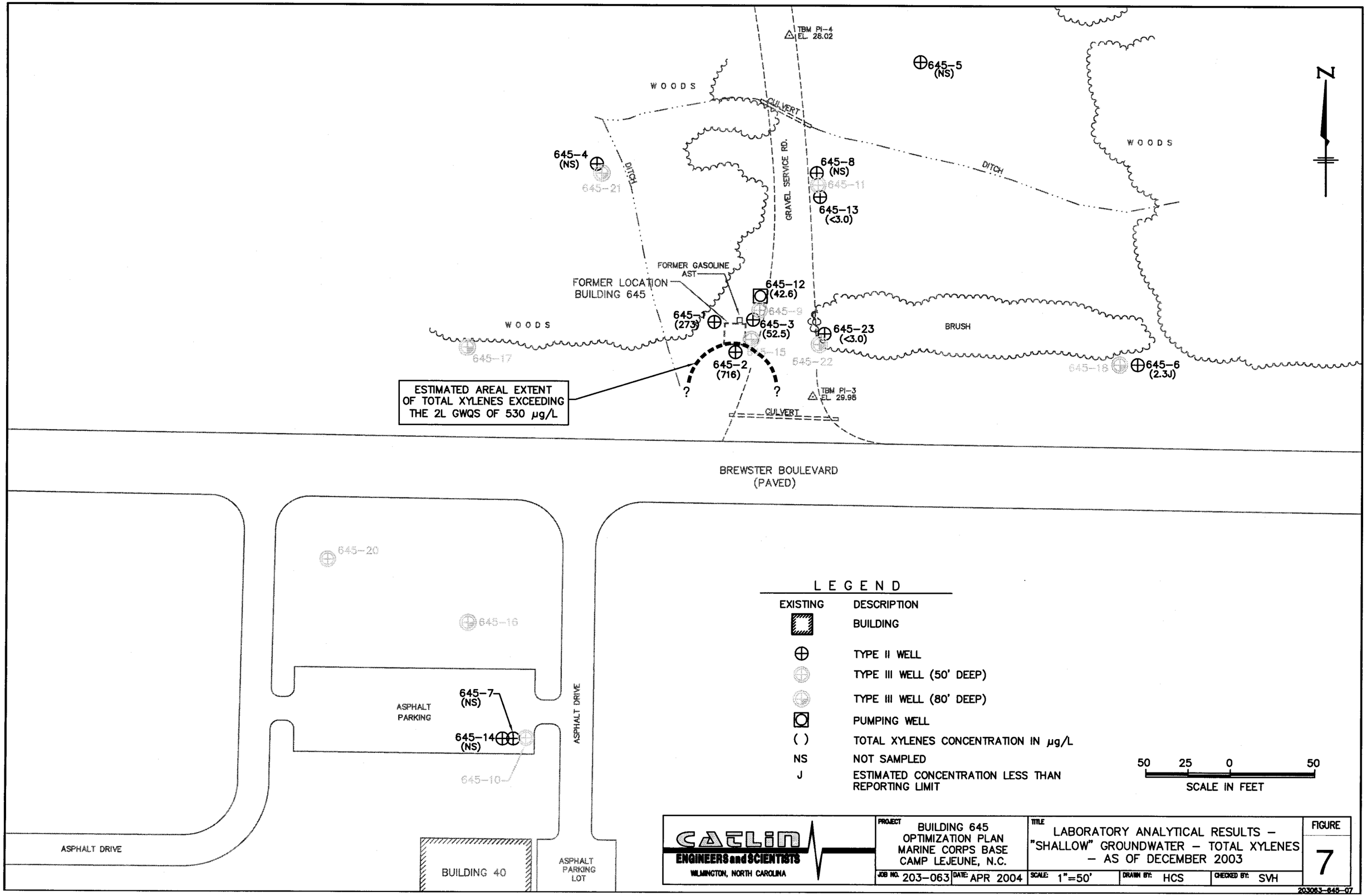
PROJECT: BUILDING 645 OPTIMIZATION PLAN MARINE CORPS BASE CAMP LEJEUNE, N.C.	TITLE: LABORATORY ANALYTICAL RESULTS – "DEEP" GROUNDWATER – ETHYLBENZENE – AS OF DECEMBER 2003			FIGURE 6A
JOB NO. 203-063	DATE: APR 2004	SCALE: 1"=50'	DRAWN BY: HCS	CHECKED BY: SVH

203063-645-06A



LEGEND

EXISTING	DESCRIPTION
	BUILDING
⊕	TYPE II WELL
	TYPE III WELL (50' DEEP)
	TYPE III WELL (80' DEEP)
	PUMPING WELL
( )	TOTAL XYLENES CONCENTRATION IN µg/L
NS	NOT SAMPLED
J	ESTIMATED CONCENTRATION LESS THAN REPORTING LIMIT

50 25 0 50
SCALE IN FEET

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

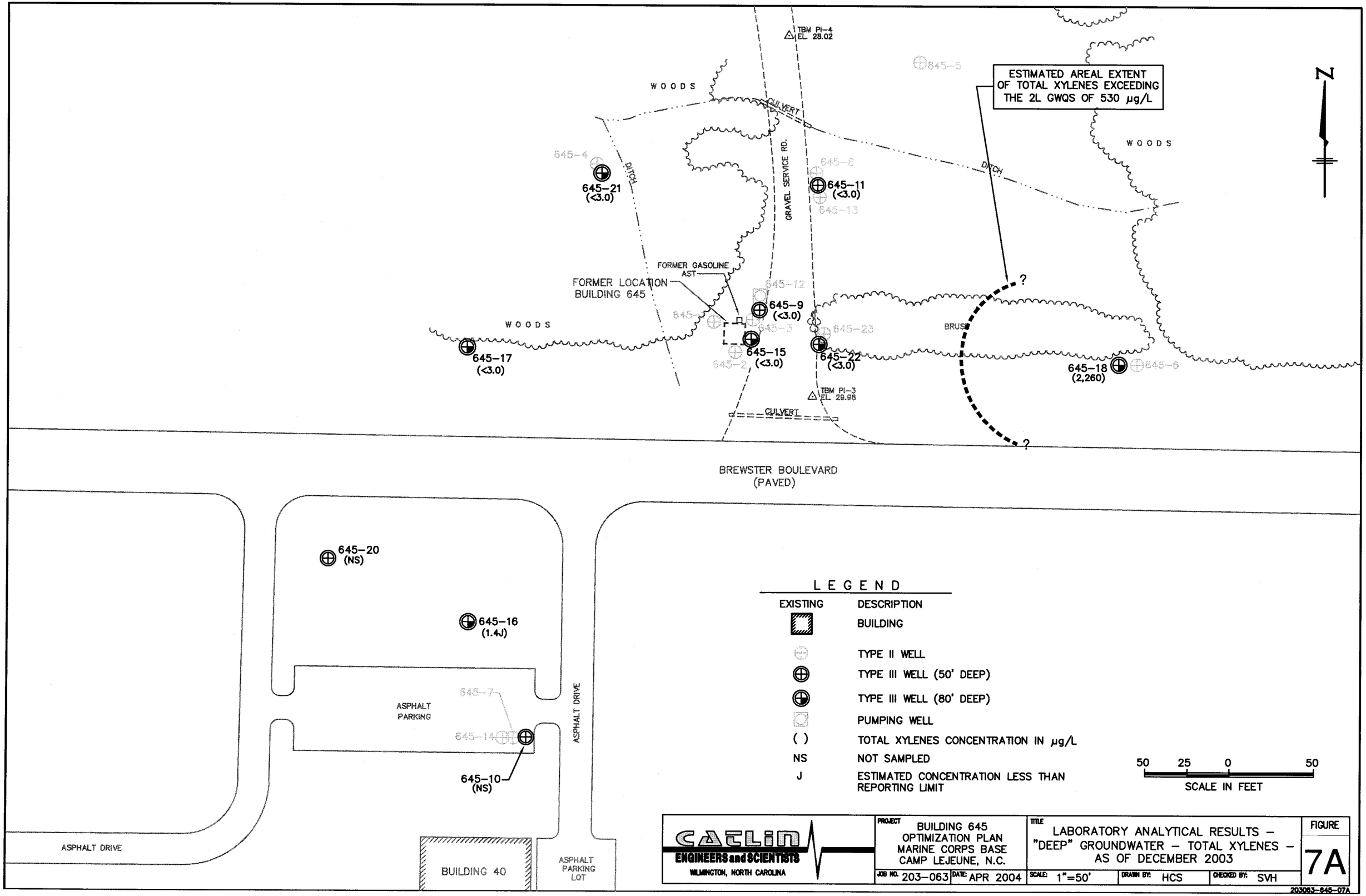
PROJECT: BUILDING 645 OPTIMIZATION PLAN MARINE CORPS BASE CAMP LEJEUNE, N.C.

TITLE: LABORATORY ANALYTICAL RESULTS – "SHALLOW" GROUNDWATER – TOTAL XYLENES – AS OF DECEMBER 2003

FIGURE 7

JOB NO. 203-063 | DATE: APR 2004 | SCALE: 1"=50' | DRAWN BY: HCS | CHECKED BY: SVH

203063-645-07



LEGEND

EXISTING	DESCRIPTION
	BUILDING
	TYPE II WELL
	TYPE III WELL (50' DEEP)
	TYPE III WELL (80' DEEP)
	PUMPING WELL
( )	TOTAL XYLENES CONCENTRATION IN µg/L
NS	NOT SAMPLED
J	ESTIMATED CONCENTRATION LESS THAN REPORTING LIMIT

50 25 0 50
SCALE IN FEET

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

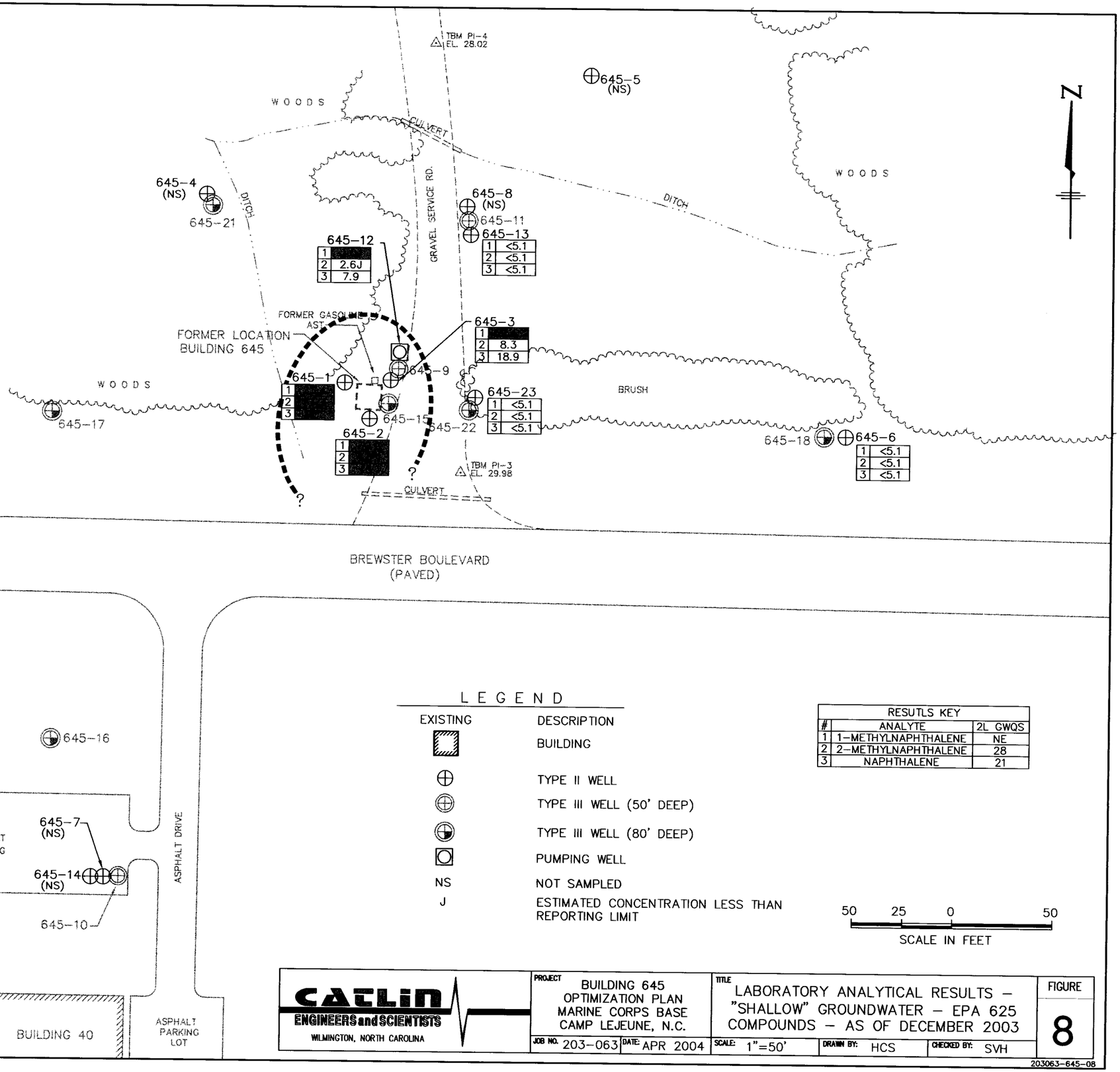
PROJECT: BUILDING 645 OPTIMIZATION PLAN MARINE CORPS BASE CAMP LEJEUNE, N.C.

JOB NO. 203-063 | DATE: APR 2004 | SCALE: 1"=50' | DRAWN BY: HCS | CHECKED BY: SVH

TITLE: LABORATORY ANALYTICAL RESULTS – "DEEP" GROUNDWATER – TOTAL XYLENES – AS OF DECEMBER 2003

FIGURE 7A

203063-645-07A



L E G E N D

EXISTING	DESCRIPTION
	BUILDING
⊕	TYPE II WELL
⊕	TYPE III WELL (50' DEEP)
⊕	TYPE III WELL (80' DEEP)
◯	PUMPING WELL
NS	NOT SAMPLED
J	ESTIMATED CONCENTRATION LESS THAN REPORTING LIMIT

RESUTLS KEY		
#	ANALYTE	2L GWQS
1	1-METHYLNAPHTHALENE	NE
2	2-METHYLNAPHTHALENE	28
3	NAPHTHALENE	21

50 25 0 50
SCALE IN FEET

NOTE:
1. ALL RESULTS IN µg/L
2. SHADED CONCENTRATIONS EXCEED CORRESPONDING 2L GWQS
3. ALL OTHER 625 COMPOUNDS BELOW QUANTITATION LIMITS

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

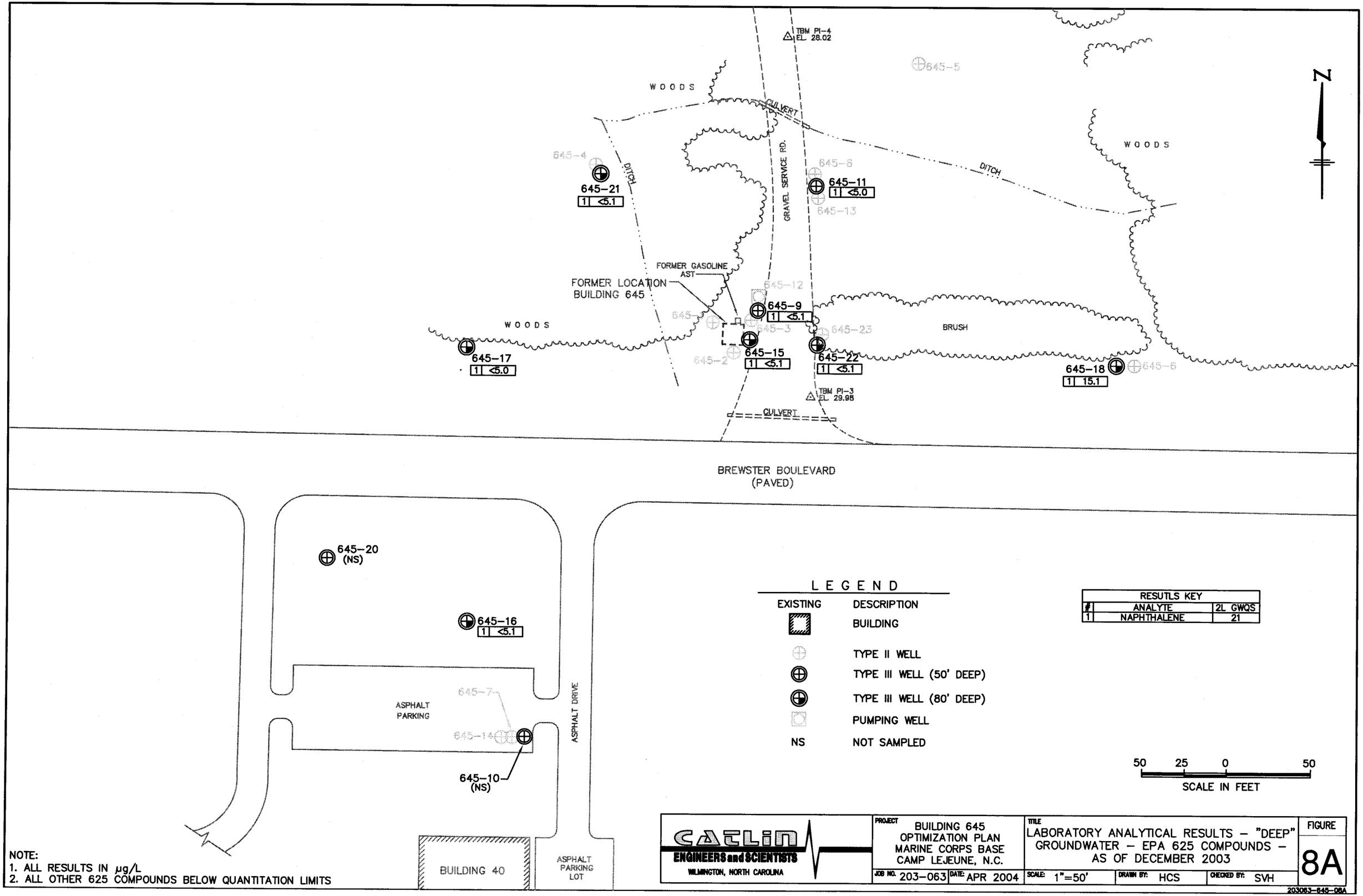
PROJECT: BUILDING 645 OPTIMIZATION PLAN MARINE CORPS BASE CAMP LEJEUNE, N.C.

TITLE: LABORATORY ANALYTICAL RESULTS – "SHALLOW" GROUNDWATER – EPA 625 COMPOUNDS – AS OF DECEMBER 2003

FIGURE 8

JOB NO. 203-063 | DATE: APR 2004 | SCALE: 1"=50' | DRAWN BY: HCS | CHECKED BY: SVH

203063-645-08



LEGEND

EXISTING	DESCRIPTION
	BUILDING
	TYPE II WELL
	TYPE III WELL (50' DEEP)
	TYPE III WELL (80' DEEP)
	PUMPING WELL
NS	NOT SAMPLED

RESUTLS KEY		
#	ANALYTE	2L GWQS
1	NAPHTHALENE	21

50 25 0 50

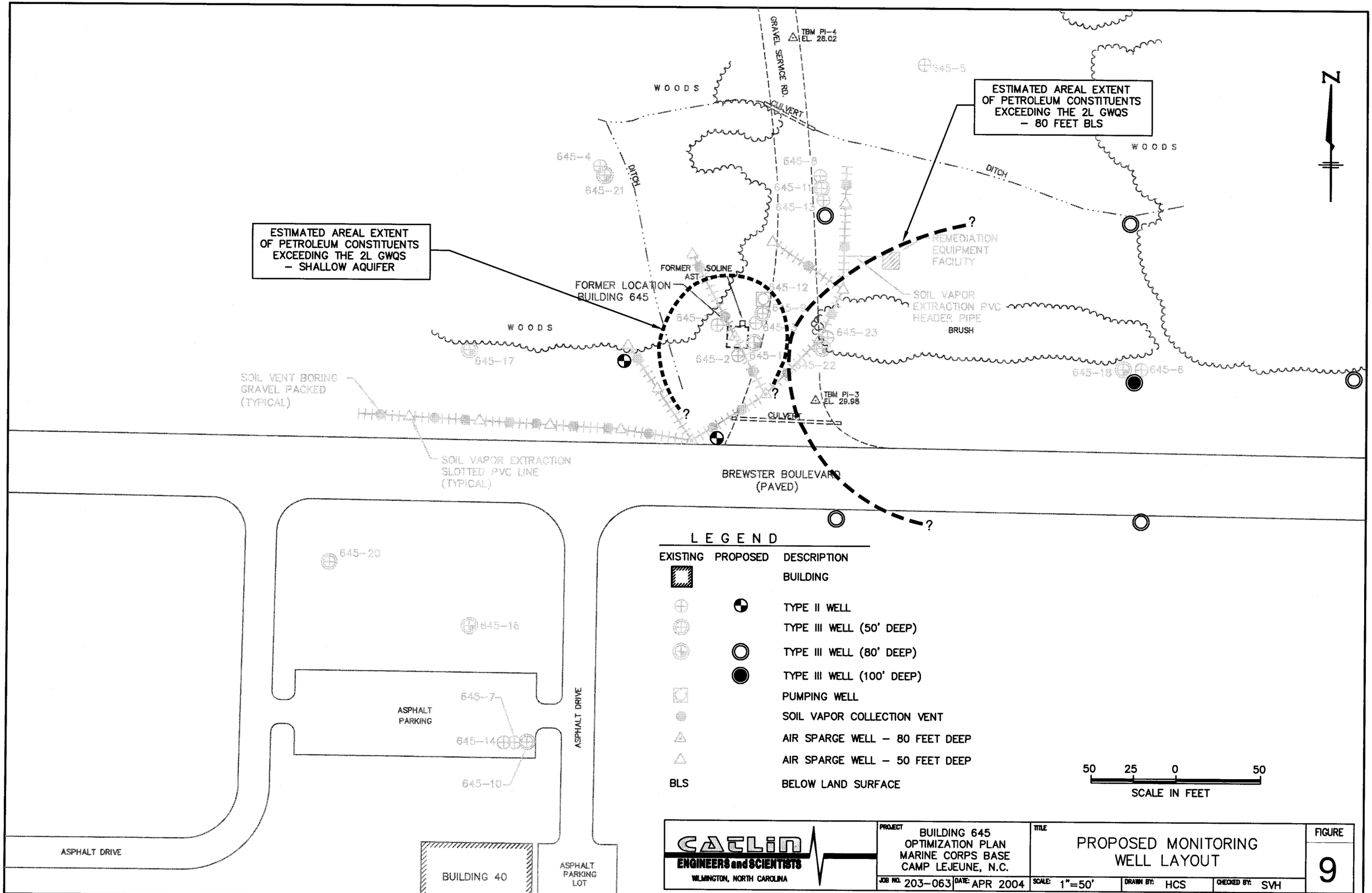
SCALE IN FEET

NOTE:
1. ALL RESULTS IN µg/L
2. ALL OTHER 625 COMPOUNDS BELOW QUANTITATION LIMITS

CATLIN ENGINEERS and SCIENTISTS
WILMINGTON, NORTH CAROLINA

PROJECT: BUILDING 645 OPTIMIZATION PLAN MARINE CORPS BASE CAMP LEJEUNE, N.C.	TITLE: LABORATORY ANALYTICAL RESULTS – "DEEP" GROUNDWATER – EPA 625 COMPOUNDS – AS OF DECEMBER 2003			FIGURE 8A
JOB NO. 203-063	DATE: APR 2004	SCALE: 1"=50'	DRAWN BY: HCS	CHECKED BY: SVH

203063-645-08A



CATLIN ENGINEERS and SCIENTISTS
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PROJECT	TITLE	FIGURE
BUILDING 645 OPTIMIZATION PLAN MARINE CORPS BASE CAMP LEJEUNE, N.C.	PROPOSED MONITORING WELL LAYOUT	9

JOB NO. 203-063 | DATE: APR 2004 | SCALE: 1"=50' | DRAWN BY: HCS | CHECKED BY: SVH

203063-645-09

APPENDIX A

ANALYTICAL DATA SUMMARY TABLES
PRE-CAP

TABLE 1.2 (Page 1 of 2)

SUMMARY OF LABORATORY ANALYTICAL RESULTS*
HYDROPUNCH GROUND WATER SAMPLES

PURGEABLE AROMATICS-EPA METHOD 602

645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

	N.C. GROUND WATER STANDARD*	HP-1	HP-2	HP-3	HP-4	HP-5
DATE SAMPLED		10/20/94	10/20/94	10/20/94	10/21/94	10/24/94
ANALYTE						
Benzene	1	4.1	BDL	BQL	8.6	BDL
Toluene	1000	4.8	BDL	57	BDL	BDL
Chlorobenzene	50	BDL	BDL	BQL	BDL	BDL
Ethylbenzene	29	0.7	BDL	222	10.2	BDL
Xylenes	530	2.3	BDL	544	5.6	BDL
1,3 Dichlorobenzene	620	BDL	BDL	BQL	BDL	BDL
1,4 Dichlorobenzene	75	BDL	BDL	BQL	BDL	BDL
1,2 Dichlorobenzene	620	BDL	BDL	BQL	BDL	BDL
TOTALS		11.9	BDL	823	24.4	BDL

* = All results in ug/L (ppb)
BDL = Below Detection Limits
BQL = Below Quantitation Limits
Shaded areas indicate noncompliant concentrations.

TABLE 1.2 (Page 2 of 2)

SUMMARY OF LABORATORY ANALYTICAL RESULTS*
HYDROPUNCH GROUND WATER SAMPLES

PURGEABLE AROMATICS-EPA METHOD 602

645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

	N.C. GROUND WATER STANDARD*	HP-6	HP-7	HP-8	HP-9	HP-10
DATE SAMPLED		10/24/94	10/25/94	10/25/94	10/25/94	11/17/94
ANALYTE						
Benzene	1	BDL	14.3	BDL	3.7	1.3
Toluene	1000	BDL	0.7	0.7	12.6	0.8
Chlorobenzene	50	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	29	1.9	BDL	BDL	10.2	BDL
Xylenes	530	BDL	BDL	BDL	34.5	BDL
1,3 Dichlorobenzene	620	BDL	BDL	BDL	BDL	BDL
1,4 Dichlorobenzene	75	BDL	BDL	BDL	BDL	BDL
1,2 Dichlorobenzene	620	BDL	BDL	BDL	BDL	BDL
TOTALS		1.9	15.0	0.7	61.0	2.1

* = All results in ug/L (ppb)
BDL = Below Detection Limits
BQL = Below Quantitation Limits
Shaded areas indicate noncompliant concentrations.

TABLE 1.3A

SUMMARY OF LABORATORY ANALYTICAL RESULTS - DPT GROUND WATER SAMPLES

PURGEABLE AROMATICS-EPA METHOD 602

645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

	N.C. GROUND WATER STANDARD*	DP-1	DP-2	DP-3	DP-4	DP-5
DATE SAMPLED		2/12/96	2/12/96	2/12/96	2/12/96	2/12/96
ANALYTE						
Benzene	1	BDL	BDL	BDL	BDL	BDL
Toluene	1000	0.5	BDL	BDL	BDL	1.7
Chlorobenzene	50	BDL	BDL	BDL	BDL	BDL
Ethylbenzene	29	BDL	BDL	BDL	BDL	BDL
Xylenes	530	BDL	BDL	BDL	BDL	BDL
1,3 Dichlorobenzene	620	BDL	BDL	BDL	BDL	BDL
1,4 Dichlorobenzene	75	BDL	BDL	BDL	BDL	BDL
1,2 Dichlorobenzene	620	BDL	BDL	BDL	BDL	BDL
TOTALS		0.5	BDL	BDL	BDL	1.7

* = All results in ug/L (ppb)
BDL = Below Detection Limits

TABLE 1.3B

SUMMARY OF LABORATORY ANALYTICAL RESULTS - DPT GROUND WATER SAMPLES

POLYNUCLEAR AROMATIC HYDROCARBONS-EPA METHOD 610

645 MARINE CORPS BASE CAMP LEJEUNE, NORTH CAROLINA

	N.C. GROUND WATER STANDARD*	DP-1	DP-2	DP-3	DP-4	DP-5
DATE SAMPLED		2/12/96	2/12/96	2/12/96	2/12/96	2/12/96
ANALYTE						
All compounds**	varies	BDL	BQL	BQL	BDL	BQL

* = All results in ug/L (ppb)
** = All compounds listed in Laboratory Analytical Reports in Appendix G.
BDL = Below Detection Limits
BQL = Below Quantitation Limits

TABLE 1.4A (Page 1 of 3)

SUMMARY OF LABORATORY ANALYTICAL RESULTS*
MONITORING WELL GROUND WATER SAMPLES

PURGEABLE AROMATICS - EPA METHOD 602

645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

	NC GROUND WATER STANDARD*	645-1	645-2	645-3	645-4	645-5	645-6
DATE SAMPLED		10/21/91	10/21/94	10/21/94	10/25/94	11/02/94	11/09/94
ANALYTE							
Benzene	1	948	112	1,330	BDL	BDL	BDL
Toluene	1000	17,700	1,290	15,600	1.2	BDL	BDL
Chlorobenzene	50	BQL	BQL	BQL	BDL	BDL	BDL
Ethylbenzene	29	6,930	481	3,090	BDL	BDL	BDL
Xylenes	530	35,100	2,190	15,200	BDL	BDL	BDL
1,3 Dichlorobenzene	620	BQL	BQL	BQL	BDL	BDL	BDL
1,4 Dichlorobenzene	75	BQL	BQL	BQL	BDL	BDL	BDL
1,2 Dichlorobenzene	620	BQL	BQL	BQL	BDL	1.4	BDL
TOTALS		60,678	4,073	35,220	1.2	1.4	BDL

* = All results in ug/L (ppb)
BDL = Below Detection Limits
BQL = Below Quantitation Limits
Shaded areas indicate noncompliant concentrations.

TABLE 1.4A (Page 2 of 3)

SUMMARY OF LABORATORY ANALYTICAL RESULTS*
MONITORING WELL GROUND WATER SAMPLES

PURGEABLE AROMATICS - EPA METHOD 602

645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

	NC GROUND WATER STANDARD*	645-9	645-10	645-11	645-12	645-13	645-14	645-WWC
DATE SAMPLED		11/09/94	11/09/94	11/09/94	11/09/94	11/22/94	11/22/94	11/09/94
ANALYTE								
Benzene	1	149	BDL	3.0	3,650	7.0	BDL	21.9
Toluene	1000	0.9	2.2	7.2	19,100	77.5	0.6	90.5
Chlorobenzene	50	BDL	BDL	BDL	BQL	BDL	BDL	BDL
Ethylbenzene	29	83.4	0.9	2.2	2,280	113	0.6	10.9
Xylenes	530	45.2	1.8	5.0	10,300	270	BDL	47.9
1,3 Dichlorobenzene	620	BDL	BDL	BDL	BQL	BDL	BDL	BDL
1,4 Dichlorobenzene	75	BDL	BDL	BDL	BQL	BDL	BDL	BDL
1,2 Dichlorobenzene	620	BDL	BDL	BDL	BQL	BDL	BDL	BDL
TOTALS		278.5	4.9	17.4	35,330	467.5	1.2	171.2

* = All results in ug/L (ppb)
BDL = Below Detection Limits
BQL = Below Quantitation Limits
Shaded areas indicate noncompliant concentrations.

TABLE 1.4A (Page 3 of 3)

SUMMARY OF LABORATORY ANALYTICAL RESULTS -
MONITORING WELL GROUND WATER SAMPLES

PURGEABLE AROMATICS - EPA METHOD 602

645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

	N.C. GROUND WATER STANDARD*	645-15	645-16	645-17	645-18	WWC
DATE SAMPLED		3/15/96	3/13/96	3/15/96	8/16/96	3/28/96
ANALYTE						
Benzene	1	23.4	BDL	0.6	1.2	0.2
Toluene	1000	5.9	1.0	BDL	4.8	0.13
Chlorobenzene	50	BDL	BDL	BDL	BDL	0.16
Ethylbenzene	29	BDL	0.9	BDL	1.1	0.2
Xylenes	530	3.6	BDL	BDL	5.8	0.6
1,3 Dichlorobenzene	620	BDL	BDL	BDL	BDL	0.34
1,4 Dichlorobenzene	75	BDL	BDL	BDL		0.14
1,2 Dichlorobenzene	620	BDL	0.6	BDL		0.06
TOTALS		32.9	1.9	0.6		0.93

* = All results in ug/L (ppb)
BDL = Below Detection Limits
Shaded areas indicate concentrations in excess of NCAC T15A:02L standards.

TABLE 1.4B (Page 1 of 3)

SUMMARY OF LABORATORY ANALYTICAL RESULTS - MONITORING WELL GROUND WATER SAMPLES

POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) - EPA METHOD 610

645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

	N.C. GROUND WATER STANDARD*	645-1	645-2	645-3	645-4	645-5	645-6
DATE SAMPLED		1/31/96	1/31/96	1/31/96	1/31/96	1/31/96	1/31/96
ANALYTE							
Naphthalene	21	720	2.6	210	BDL	BDL	BDL
Acenaphthylene	210	9.7	1.6	42.8	BDL	BDL	BDL
Acenaphthene	80	5.3	BDL	6.1	BDL	BDL	BDL
Fluorene	280	1.7	BDL	BDL	BDL	BDL	BDL
All other compounds**	varies	BDL	BDL	BDL	BDL	BDL	BDL
TOTALS		736.7	4.2	258.9	BDL	BDL	BDL

* = All results in ug/L (ppb)
** = All other compounds listed in Laboratory analytical results in Appendix I.
BDL = Below Detection Limits
Shaded areas indicate concentrations in excess of NCAC T15A:02L standards.
Interim maximum allowable concentrations for naphthalene, acenaphthylene, acenaphthene, and fluorene have been proposed by the NCDEHNR and have been applied to this investigation.
Well 645-7 could not be sampled because no water was present.

TABLE 1.4B (Page 2 of 3)

SUMMARY OF LABORATORY ANALYTICAL RESULTS -
MONITORING WELL GROUND WATER SAMPLES

POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) - EPA METHOD 610

645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

	N.C. GROUND WATER STANDARD*	645-8	645-9	645-10	645-11	645-12	645-13
DATE SAMPLED		1/31/96	1/31/96	1/31/96	1/31/96	1/31/96	1/31/96
ANALYTE							
Naphthalene	21	BDL	51.7	2.8	BDL	106	BDL
Acenaphthylene	210	BDL	BDL	BDL	BDL	29.6	BDL
Acenaphthene	80	BDL	BDL	BDL	BDL	4.6	BDL
Fluorene	280	BDL	BDL	BDL	BDL	1.4	BDL
All other compounds**	varies	BDL	BDL	BDL	BDL	BDL	BDL
TOTALS		BDL	51.7	2.8	BDL	141.6	BDL

* = All results in ug/L (ppb)
** = All other compounds listed in Laboratory analytical results in Appendix I.
BDL = Below Detection Limits
Shaded areas indicate concentrations in excess of NCAC T15A:02L standards.
Interim maximum allowable concentrations for naphthalene, acenaphthylene, acenaphthene, and fluorene have been proposed by the NCDEHNR and have been applied to this investigation.

TABLE 1.4B (Page 3 of 3)

SUMMARY OF LABORATORY ANALYTICAL RESULTS -
MONITORING WELL GROUND WATER SAMPLES

POLYNUCLEAR AROMATIC HYDROCARBONS (PAH) - EPA METHOD 610

645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

	N.C. GROUND WATER STANDARD*	645-14	645-15	645-16	645-17	WASTE WATER
DATE SAMPLED		1/31/96	3/15/96	3/13/96	3/15/96	1/31/96
ANALYTE						
Naphthalene	21	BDL	1.9	BQL	1.9	82.2
Acenaphthylene	210	BDL	BDL	BQL	2.9	BDL
Acenaphthene	80	BDL	BDL	BQL	BDL	BDL
Fluorene	280	BDL	BDL	BQL	BDL	BDL
All other compounds**	varies	BDL	BDL	BQL	BDL	BDL
TOTALS		BDL	1.9	BQL	4.8	82.8

* = All results in ug/L (ppb)
** = All other compounds listed in Laboratory analytical results in Appendix I.
BDL = Below Detection Limits
Shaded areas indicate concentrations in excess of NCAC T15A:02L standards.
Interim maximum allowable concentrations for naphthalene, acenaphthylene, acenaphthene, and fluorene have been proposed by the NCDEHNR and have been applied to this investigation.
Well 645-7 could not be sampled because no water was present.

TABLE 1.4C

SUMMARY OF LABORATORY ANALYTICAL RESULTS*
MONITORING WELL GROUND WATER SAMPLES

BASE NEUTRALS/ACID EXTRACTABLES - EPA METHOD 625

645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

	N.C. GROUND WATER STANDARD*	645-1	645-2	645-3	645-4	645-WWC	LAB BLANK
DATE SAMPLED		10/21/94	10/21/94	10/21/94	10/21/94	11/14/94	
ANALYTE							
BASE NEUTRALS							
Naphthalene	21	1,370	49.5	514	641	BDL	BDL
All other compounds**		BQL	BDL	BDL	BDL	BDL	BDL
ACID EXTRACTABLES							
2,4 - Dimethylphenol	NE	BQL	BDL	16.7	17.5	BDL	BDL
All other compounds**		BQL	BDL	BDL	BDL	BDL	BDL

* = All results in ug/L (ppb)
** = All other compounds listed in laboratory analytical results in Appendix I.
BDL = Below Detection Limits
BQL = Below Quantitation Limits
NE = None Established. According to NCAC T15A:02L standards, any compounds found above laboratory detection limits are considered noncompliant unless otherwise specified by the NCDEHNR.
Shaded areas indicate noncompliant concentrations.
Interim maximum allowable concentrations have been established for Naphthalene by the NCDEHNR and have been applied to this investigation.

TABLE 5.5A (Page 1 of 2)

SUMMARY OF LABORATORY ANALYTICAL RESULTS*
MONITORING WELL GROUND WATER SAMPLES

PURGEABLE AROMATICS - EPA METHOD 602

645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

	NC GROUND WATER STANDARD*	645-1	645-2	645-3	645-4	645-5	645-6
DATE SAMPLED		10/21/91	10/21/94	10/21/94	10/25/94	11/02/94	11/09/94
ANALYTE							
Benzene	1	948	112	1,330	BDL	BDL	BDL
Toluene	1000	17,700	1,290	15,600	1.2	BDL	BDL
Chlorobenzene	50	BQL	BQL	BQL	BDL	BDL	BDL
Ethylbenzene	29	6,930	481	3,090	BDL	BDL	BDL
Xylenes	530	35,100	2,190	15,200	BDL	BDL	BDL
1,3 Dichlorobenzene	620	BQL	BQL	BQL	BDL	BDL	BDL
1,4 Dichlorobenzene	75	BQL	BQL	BQL	BDL	BDL	BDL
1,2 Dichlorobenzene	620	BQL	BQL	BQL	BDL	1.4	BDL
TOTALS		60,678	4,073	35,220	1.2	1.4	BDL

* = All results in ug/L (ppb)
BDL = Below Detection Limits
BQL = Below Quantitation Limits
Shaded areas indicate noncompliant concentrations.

TABLE 5.5A (Page 2 of 2)

SUMMARY OF LABORATORY ANALYTICAL RESULTS*
MONITORING WELL GROUND WATER SAMPLES

PURGEABLE AROMATICS - EPA METHOD 602

645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

	NC GROUND WATER STANDARD*	645-9	645-10	645-11	645-12	645-13	645-14	645-WWC
DATE SAMPLED		11/09/94	11/09/94	11/09/94	11/09/94	11/22/94	11/22/94	11/09/94
ANALYTE								
Benzene	1	149	BDL	3.0	3,650	7.0	BDL	21.9
Toluene	1000	0.9	2.2	7.2	19,100	77.5	0.6	90.5
Chlorobenzene	50	BDL	BDL	BDL	BQL	BDL	BDL	BDL
Ethylbenzene	29	83.4	0.9	2.2	2,280	113	0.6	10.9
Xylenes	530	45.2	1.8	5.0	10,300	270	BDL	47.9
1,3 Dichlorobenzene	620	BDL	BDL	BDL	BQL	BDL	BDL	BDL
1,4 Dichlorobenzene	75	BDL	BDL	BDL	BQL	BDL	BDL	BDL
1,2 Dichlorobenzene	620	BDL	BDL	BDL	BQL	BDL	BDL	BDL
TOTALS		278.5	4.9	17.4	35,330	467.5	1.2	171.2

* = All results in ug/L (ppb)
BDL = Below Detection Limits
BQL = Below Quantitation Limits
Shaded areas indicate noncompliant concentrations.

TABLE 5.5B

SUMMARY OF LABORATORY ANALYTICAL RESULTS*
MONITORING WELL GROUND WATER SAMPLES

BASE NEUTRALS/ACID EXTRACTABLES - EPA METHOD 625

645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

	N.C. GROUND WATER STANDARD*	645-1	645-2	645-3	645-4	645-WWC	LAB BLANK
DATE SAMPLED		10/21/94	10/21/94	10/21/94	10/21/94	11/14/94	
ANALYTE							
BASE NEUTRALS							
Naphthalene	21	1,370	49.5	514	641	BDL	BDL
All other compounds**		BQL	BDL	BDL	BDL	BDL	BDL
ACID EXTRACTABLES							
2,4 - Dimethylphenol	NE	BQL	BDL	16.7	17.5	BDL	BDL
All other compounds**		BQL	BDL	BDL	BDL	BDL	BDL

* = All results in ug/L (ppb)

** = All other compounds listed in laboratory analytical results in Appendix I.

BDL = Below Detection Limits

BQL = Below Quantitation Limits

NE = None Established. According to NCAC T15A:02L standards, any compounds found above laboratory detection limits are considered noncompliant unless otherwise specified by the NCDEHNR.

Shaded areas indicate noncompliant concentrations.

Interim maximum allowable concentrations have been established for Naphthalene by the NCDEHNR and have been applied to this investigation.

TABLE 5.5C

**SUMMARY OF LABORATORY ANALYTICAL RESULTS*
MONITORING WELL GROUND WATER SAMPLES**

TOTAL LEAD - EPA METHOD 3030

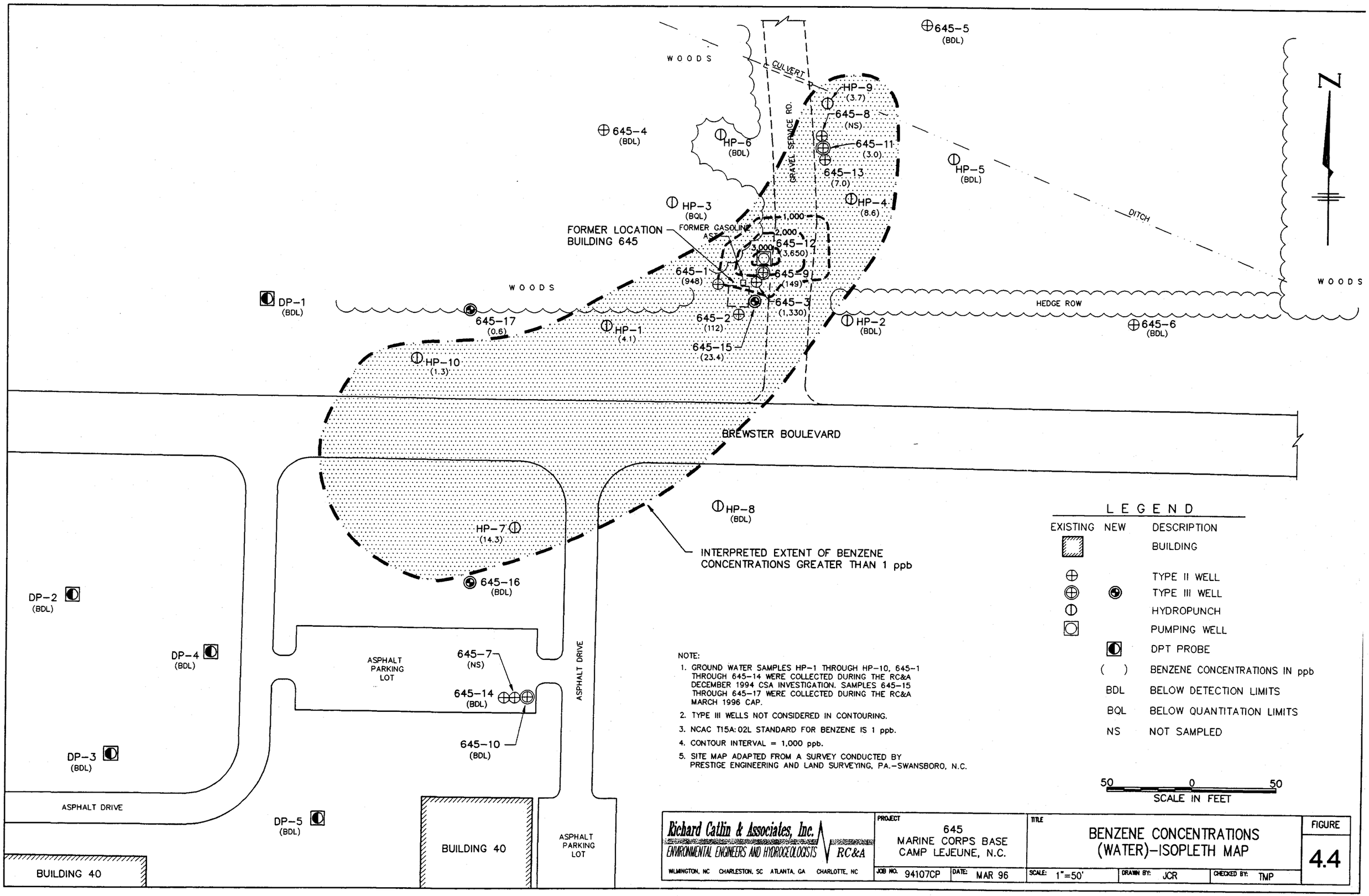
**645
MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA**

	REGULATORY LEVEL (mg/L)	645-2	645-12
DATE SAMPLED		11/14/94	11/14/94
ANALYTE			
Lead	.015	0.136	BDL

*All results in mg/L (ppm)
BDL = Below Detection Limits
Shaded areas indicate noncompliant concentrations.

APPENDIX B

ANALYTICAL DATA SUMMARY FIGURES
PRE-CAP



LEGEND

EXISTING	NEW	DESCRIPTION
▨		BUILDING
⊕		TYPE II WELL
⊕	◉	TYPE III WELL
⌀		HYDROPUNCH
◯		PUMPING WELL
◐		DPT PROBE
( )		BENZENE CONCENTRATIONS IN ppb
BDL		BELOW DETECTION LIMITS
BQL		BELOW QUANTITATION LIMITS
NS		NOT SAMPLED

NOTE:

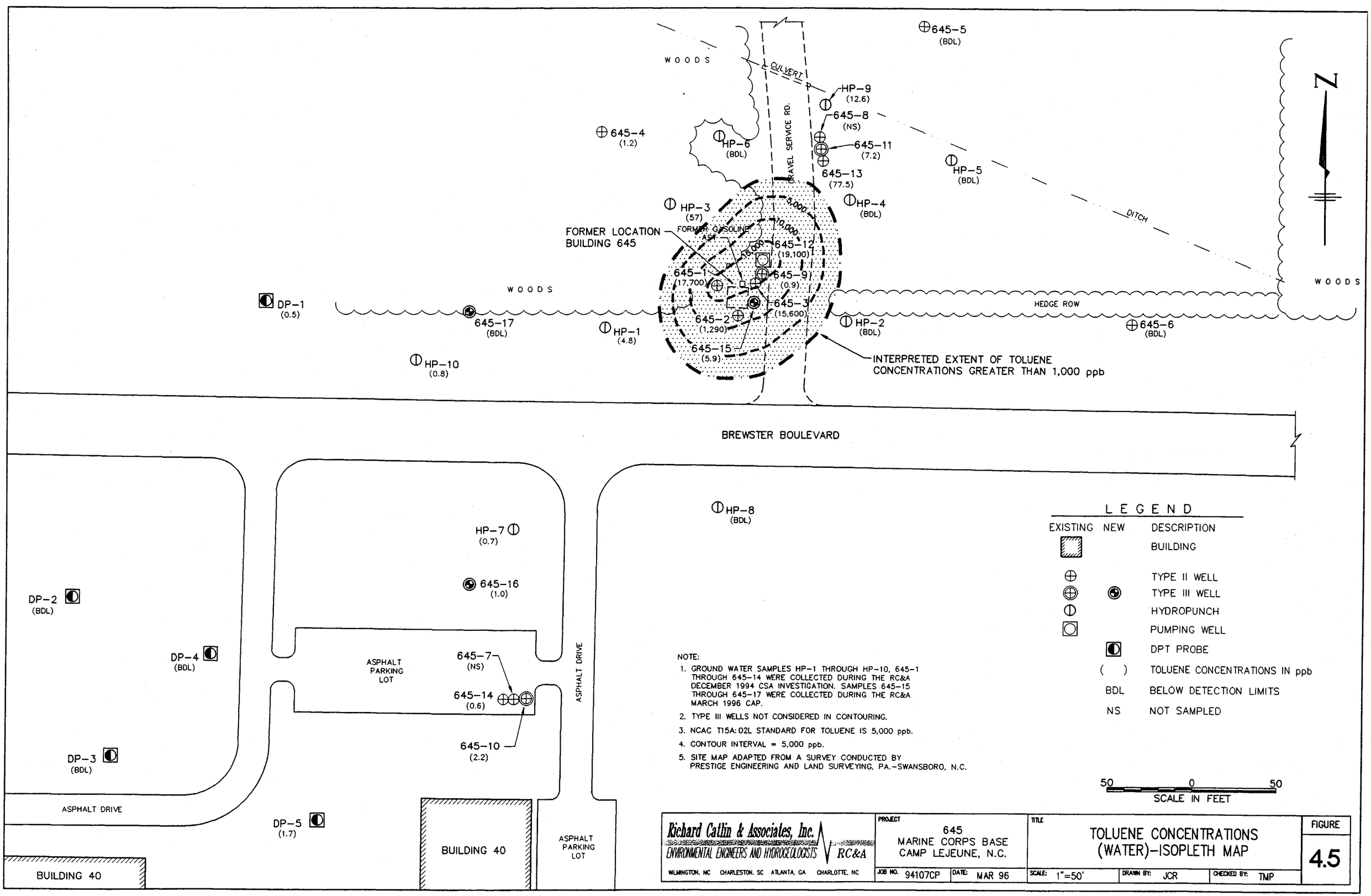
1. GROUND WATER SAMPLES HP-1 THROUGH HP-10, 645-1 THROUGH 645-14 WERE COLLECTED DURING THE RC&A DECEMBER 1994 CSA INVESTIGATION. SAMPLES 645-15 THROUGH 645-17 WERE COLLECTED DURING THE RC&A MARCH 1996 CAP.
2. TYPE III WELLS NOT CONSIDERED IN CONTOURING.
3. NCAC T15A:02L STANDARD FOR BENZENE IS 1 ppb.
4. CONTOUR INTERVAL = 1,000 ppb.
5. SITE MAP ADAPTED FROM A SURVEY CONDUCTED BY PRESTIGE ENGINEERING AND LAND SURVEYING, P.A.-SWANSBORO, N.C.

50 0 50
SCALE IN FEET

Richard Catlin & Associates, Inc.
ENVIRONMENTAL ENGINEERS AND HYDROGEOLOGISTS RC&A
WILMINGTON, NC CHARLESTON, SC ATLANTA, GA CHARLOTTE, NC

PROJECT	TITLE	FIGURE
645 MARINE CORPS BASE CAMP LEJEUNE, N.C.	BENZENE CONCENTRATIONS (WATER)-ISOPLETH MAP	4.4

JOB NO.	DATE	SCALE	DRAWN BY	CHECKED BY
94107CP	MAR 96	1"=50'	JCR	TMP



LEGEND

EXISTING	NEW	DESCRIPTION
▨		BUILDING
⊕		TYPE II WELL
⊕	⊛	TYPE III WELL
⌀		HYDROPUNCH
◯		PUMPING WELL
◐		DPT PROBE
( )		TOLUENE CONCENTRATIONS IN ppb
BDL		BELOW DETECTION LIMITS
NS		NOT SAMPLED

NOTE:

1. GROUND WATER SAMPLES HP-1 THROUGH HP-10, 645-1 THROUGH 645-14 WERE COLLECTED DURING THE RC&A DECEMBER 1994 CSA INVESTIGATION. SAMPLES 645-15 THROUGH 645-17 WERE COLLECTED DURING THE RC&A MARCH 1996 CAP.
2. TYPE III WELLS NOT CONSIDERED IN CONTOURING.
3. NCAC T15A:02L STANDARD FOR TOLUENE IS 5,000 ppb.
4. CONTOUR INTERVAL = 5,000 ppb.
5. SITE MAP ADAPTED FROM A SURVEY CONDUCTED BY PRESTIGE ENGINEERING AND LAND SURVEYING, P.A.-SWANSBORO, N.C.

50 0 50
SCALE IN FEET

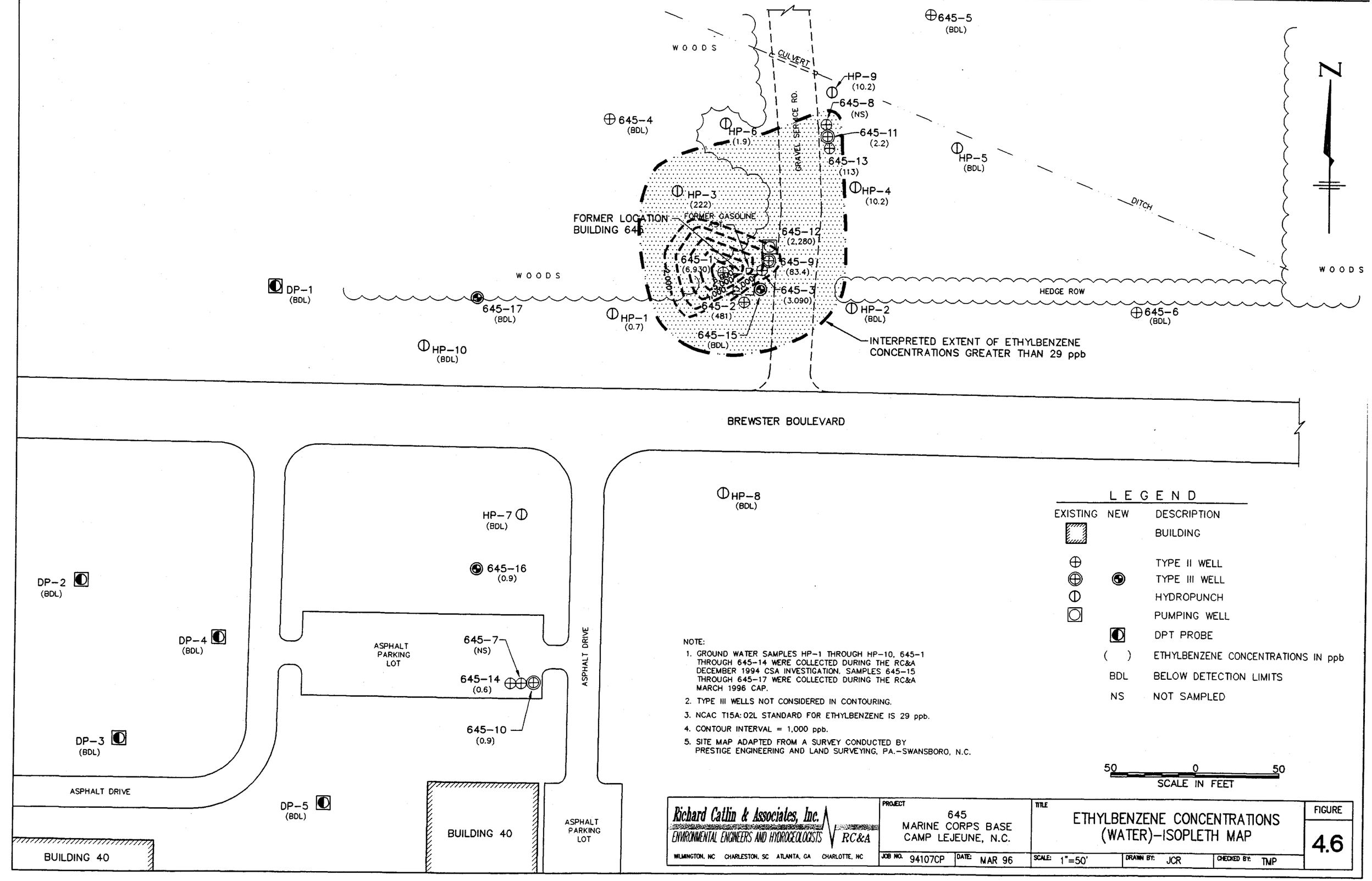
Richard Catlin & Associates, Inc.
ENVIRONMENTAL ENGINEERS AND HYDROGEOLOGISTS RC&A
WILMINGTON, NC CHARLESTON, SC ATLANTA, GA CHARLOTTE, NC

PROJECT: 645 MARINE CORPS BASE CAMP LEJEUNE, N.C.

TITLE: TOLUENE CONCENTRATIONS (WATER)-ISOPLETH MAP

FIGURE: 4.5

JOB NO. 94107CP | DATE: MAR 96 | SCALE: 1"=50' | DRAWN BY: JCR | CHECKED BY: TMP



LEGEND

EXISTING	NEW	DESCRIPTION
▨		BUILDING
⊕		TYPE II WELL
⊕	◉	TYPE III WELL
⦶		HYDROPUNCH
◯		PUMPING WELL
	◐	DPT PROBE
	( )	ETHYLBENZENE CONCENTRATIONS IN ppb
	BDL	BELOW DETECTION LIMITS
	NS	NOT SAMPLED

NOTE:

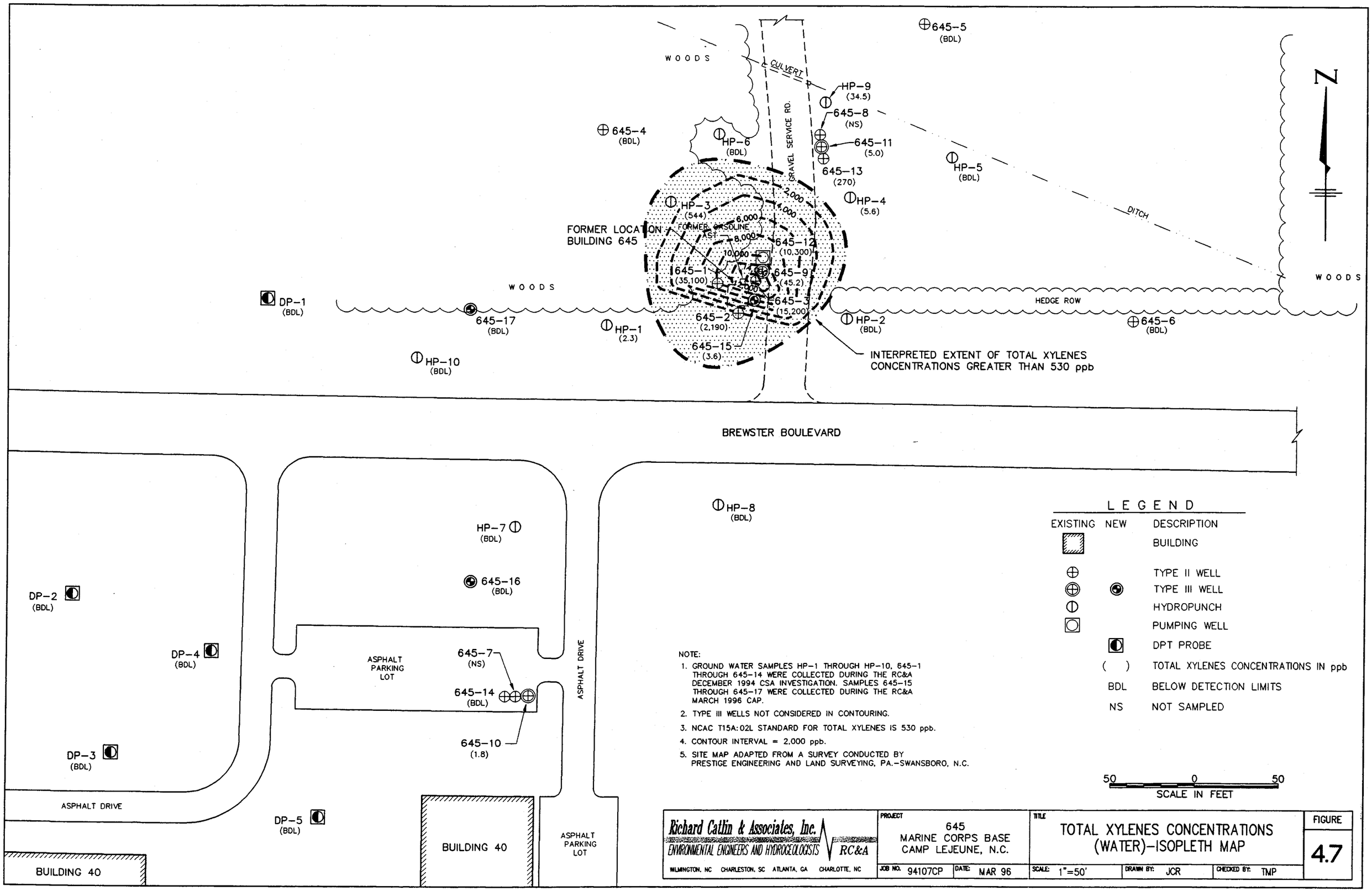
1. GROUND WATER SAMPLES HP-1 THROUGH HP-10, 645-1 THROUGH 645-14 WERE COLLECTED DURING THE RC&A DECEMBER 1994 CSA INVESTIGATION. SAMPLES 645-15 THROUGH 645-17 WERE COLLECTED DURING THE RC&A MARCH 1996 CAP.
2. TYPE III WELLS NOT CONSIDERED IN CONTOURING.
3. NCAC T15A:02L STANDARD FOR ETHYLBENZENE IS 29 ppb.
4. CONTOUR INTERVAL = 1,000 ppb.
5. SITE MAP ADAPTED FROM A SURVEY CONDUCTED BY PRESTIGE ENGINEERING AND LAND SURVEYING, P.A.-SWANSBORO, N.C.

50 0 50
SCALE IN FEET

Richard Catlin & Associates, Inc. / RC&A
ENVIRONMENTAL ENGINEERS AND HYDROGEOLOGISTS
WILMINGTON, NC CHARLESTON, SC ATLANTA, GA CHARLOTTE, NC

PROJECT	TITLE	FIGURE
645 MARINE CORPS BASE CAMP LEJEUNE, N.C.	ETHYLBENZENE CONCENTRATIONS (WATER)-ISOPLETH MAP	4.6

JOB NO.	DATE	SCALE	DRAWN BY	CHECKED BY
94107CP	MAR 96	1"=50'	JCR	TMP



LEGEND

EXISTING	NEW	DESCRIPTION
▨		BUILDING
⊕		TYPE II WELL
⊕	◉	TYPE III WELL
⦶		HYDROPUNCH
◯		PUMPING WELL
◐		DPT PROBE
( )		TOTAL XYLENES CONCENTRATIONS IN ppb
BDL		BELOW DETECTION LIMITS
NS		NOT SAMPLED

NOTE:

1. GROUND WATER SAMPLES HP-1 THROUGH HP-10, 645-1 THROUGH 645-14 WERE COLLECTED DURING THE RC&A DECEMBER 1994 CSA INVESTIGATION. SAMPLES 645-15 THROUGH 645-17 WERE COLLECTED DURING THE RC&A MARCH 1996 CAP.
2. TYPE III WELLS NOT CONSIDERED IN CONTOURING.
3. NCAC T15A:02L STANDARD FOR TOTAL XYLENES IS 530 ppb.
4. CONTOUR INTERVAL = 2,000 ppb.
5. SITE MAP ADAPTED FROM A SURVEY CONDUCTED BY PRESTIGE ENGINEERING AND LAND SURVEYING, PA.-SWANSBORO, N.C.

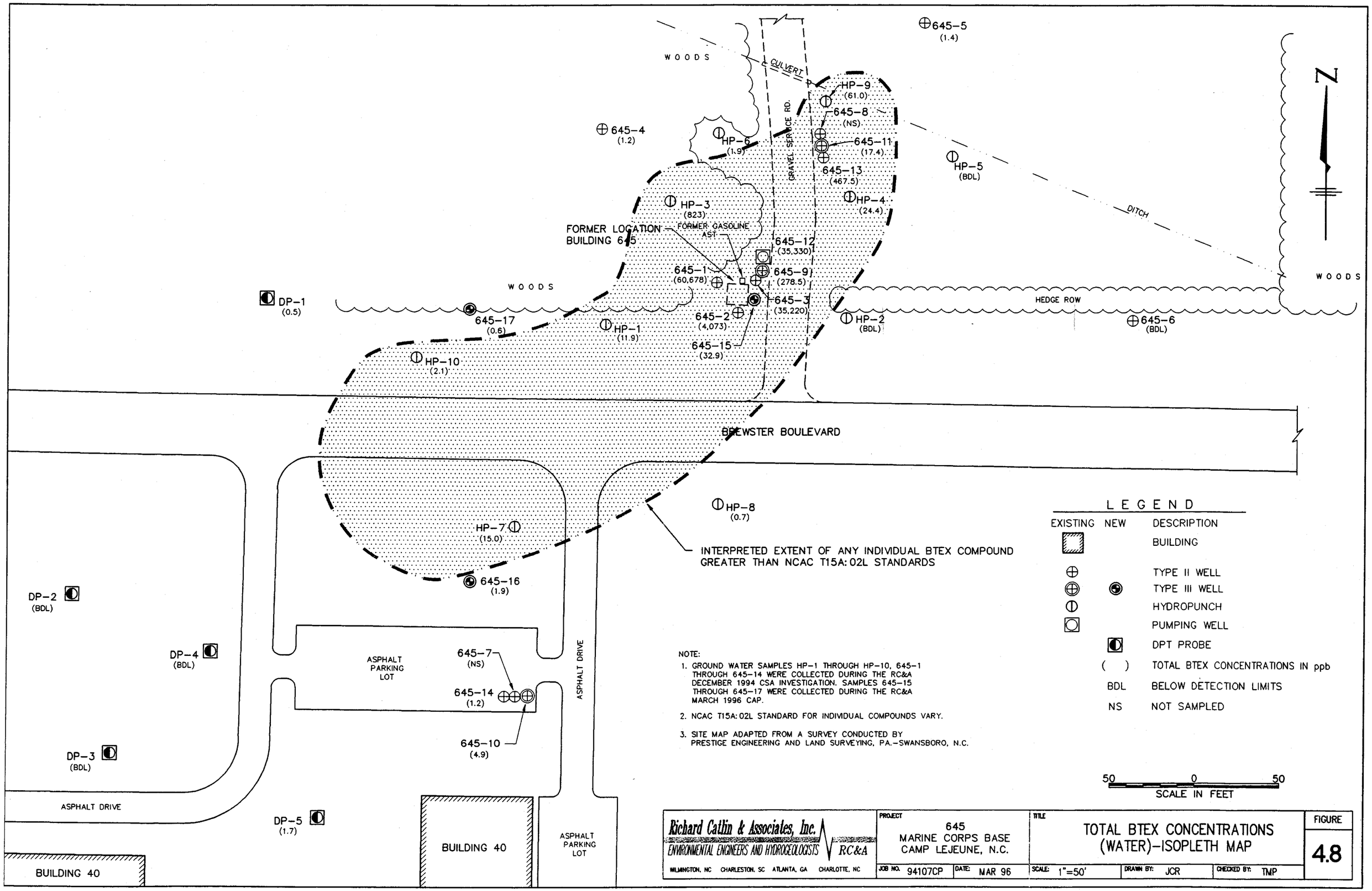
50 0 50
SCALE IN FEET

Richard Catlin & Associates, Inc.
ENVIRONMENTAL ENGINEERS AND HYDROGEOLOGISTS
RC&A
WILMINGTON, NC CHARLESTON, SC ATLANTA, GA CHARLOTTE, NC

PROJECT: 645 MARINE CORPS BASE CAMP LEJEUNE, N.C.
JOB NO. 94107CP | DATE: MAR 96

TITLE: TOTAL XYLENES CONCENTRATIONS (WATER)-ISOPLETH MAP
SCALE: 1"=50' | DRAWN BY: JCR | CHECKED BY: TMP

FIGURE 4.7



INTERPRETED EXTENT OF ANY INDIVIDUAL BTEX COMPOUND GREATER THAN NCAC T15A:02L STANDARDS

LEGEND

EXISTING	NEW	DESCRIPTION
▨		BUILDING
⊕		TYPE II WELL
⊕	◉	TYPE III WELL
⌀		HYDROPUNCH
◯		PUMPING WELL
◐		DPT PROBE
( )		TOTAL BTEX CONCENTRATIONS IN ppb
BDL		BELOW DETECTION LIMITS
NS		NOT SAMPLED

NOTE:

1. GROUND WATER SAMPLES HP-1 THROUGH HP-10, 645-1 THROUGH 645-14 WERE COLLECTED DURING THE RC&A DECEMBER 1994 CSA INVESTIGATION. SAMPLES 645-15 THROUGH 645-17 WERE COLLECTED DURING THE RC&A MARCH 1996 CAP.
2. NCAC T15A:02L STANDARD FOR INDIVIDUAL COMPOUNDS VARY.
3. SITE MAP ADAPTED FROM A SURVEY CONDUCTED BY PRESTIGE ENGINEERING AND LAND SURVEYING, P.A.-SWANSBORO, N.C.

50 0 50
SCALE IN FEET

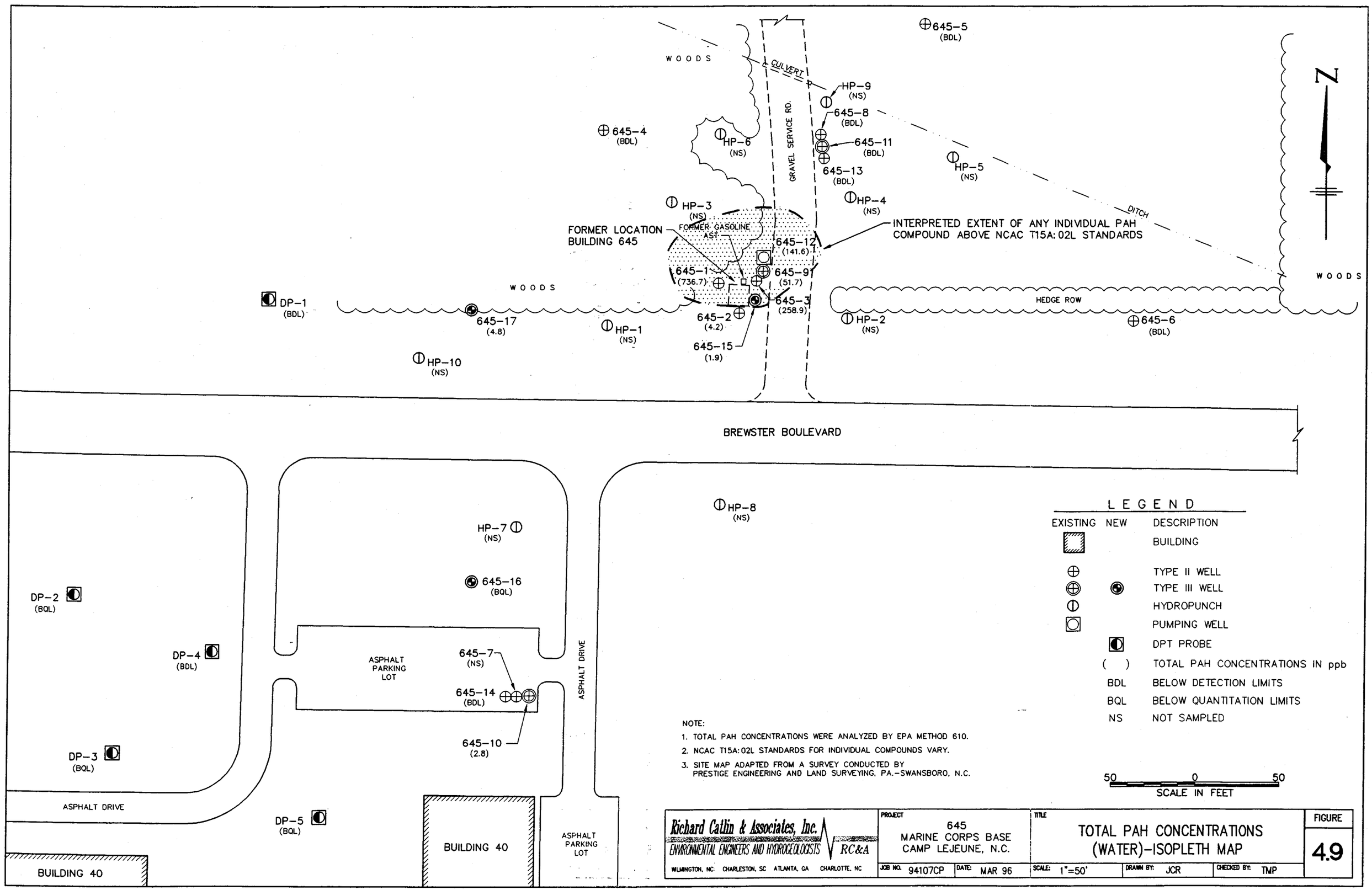
Richard Catlin & Associates, Inc.
ENVIRONMENTAL ENGINEERS AND HYDROGEOLOGISTS RC&A
WILMINGTON, NC CHARLESTON, SC ATLANTA, GA CHARLOTTE, NC

PROJECT: 645 MARINE CORPS BASE CAMP LEJEUNE, N.C.

TITLE: TOTAL BTEX CONCENTRATIONS (WATER)-ISOPLETH MAP

FIGURE: 4.8

JOB NO. 94107CP | DATE: MAR 96 | SCALE: 1"=50' | DRAWN BY: JCR | CHECKED BY: TMP



LEGEND

EXISTING	NEW	DESCRIPTION
▨		BUILDING
⊕		TYPE II WELL
⊕	◉	TYPE III WELL
◐		HYDROPUNCH
◯		PUMPING WELL
	◐	DPT PROBE
	( )	TOTAL PAH CONCENTRATIONS IN ppb
	BDL	BELOW DETECTION LIMITS
	BQL	BELOW QUANTITATION LIMITS
	NS	NOT SAMPLED

NOTE:

1. TOTAL PAH CONCENTRATIONS WERE ANALYZED BY EPA METHOD 610.
2. NCAC T15A:02L STANDARDS FOR INDIVIDUAL COMPOUNDS VARY.
3. SITE MAP ADAPTED FROM A SURVEY CONDUCTED BY PRESTIGE ENGINEERING AND LAND SURVEYING, PA.-SWANSBORO, N.C.

50 0 50
SCALE IN FEET

Richard Catlin & Associates, Inc.
ENVIRONMENTAL ENGINEERS AND HYDROGEOLOGISTS RC&A
WILMINGTON, NC CHARLESTON, SC ATLANTA, GA CHARLOTTE, NC

PROJECT: 645 MARINE CORPS BASE CAMP LEJEUNE, N.C.

TITLE: TOTAL PAH CONCENTRATIONS (WATER)-ISOPLETH MAP

FIGURE: 4.9

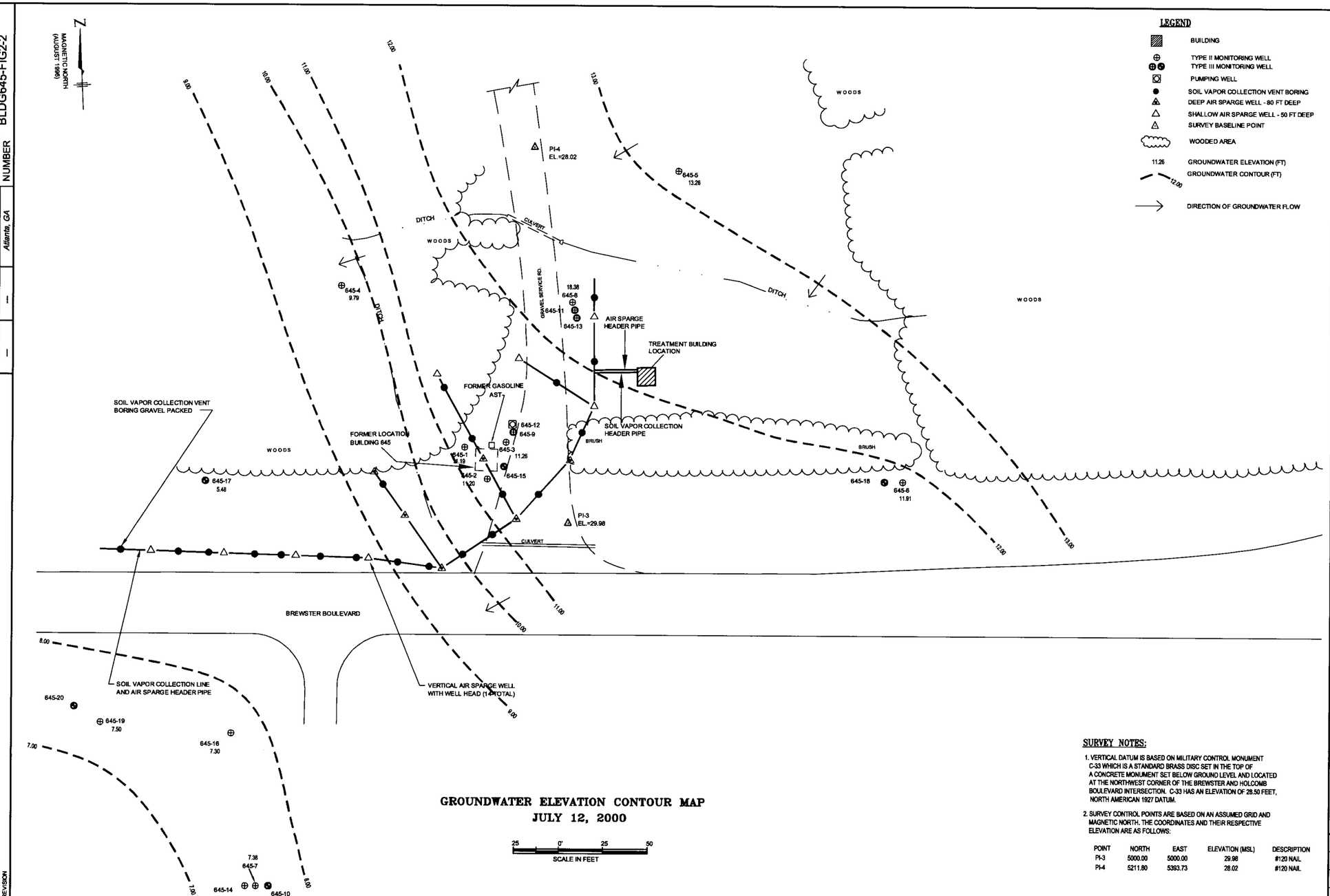
JOB NO. 94107CP | DATE: MAR 96 | SCALE: 1"=50' | DRAWN BY: JCR | CHECKED BY: TMP

APPENDIX C

GROUNDWATER GAUGING DATA AND CONTOUR MAPS POST-CAP THROUGH JUNE 2002

IMAGE	X-REF	OFFICE	DRAWING NUMBER
—	—	*Atlanta, GA*	BLDG645-FIG2-2

MAGNETIC NORTH (AUGUST 1999)



GROUNDWATER ELEVATION CONTOUR MAP
JULY 12, 2000

25 0' 25 50
SCALE IN FEET

SURVEY NOTES:

1. VERTICAL DATUM IS BASED ON MILITARY CONTROL MONUMENT C-33 WHICH IS A STANDARD BRASS DISC SET IN THE TOP OF A CONCRETE MONUMENT SET BELOW GROUND LEVEL AND LOCATED AT THE NORTHWEST CORNER OF THE BREWSTER AND HOLCOMB BOULEVARD INTERSECTION. C-33 HAS AN ELEVATION OF 28.50 FEET, NORTH AMERICAN 1927 DATUM.
2. SURVEY CONTROL POINTS ARE BASED ON AN ASSUMED GRID AND MAGNETIC NORTH. THE COORDINATES AND THEIR RESPECTIVE ELEVATION ARE AS FOLLOWS:

POINT	NORTH	EAST	ELEVATION (MSL)	DESCRIPTION
PI-3	5000.00	5000.00	29.98	#120 NAIL
PI-4	5211.80	5393.73	28.02	#120 NAIL

REFERENCE: J. A. JONES MONITORING REPORT.

PLOT DATE: 10/06/03
FORMAT REVISION

REVISIONS					
REV	DATE	BY	CHK'D	APPR'D	DESCRIPTION/ISSUE

PROJECT NO. 645623

CHECKED BY	RBK	
APPROVED BY		

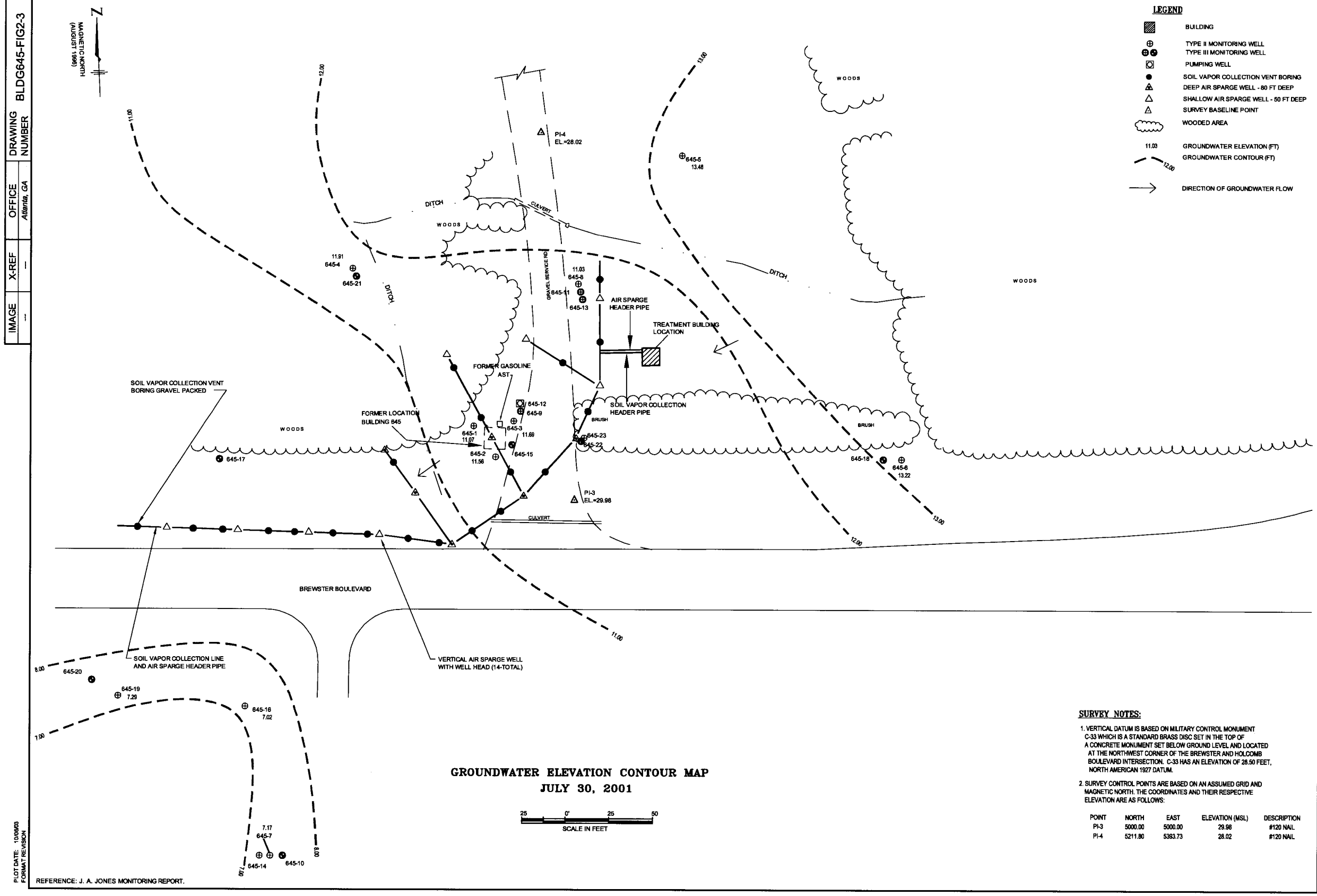
Shaw Shaw Environmental, Inc.

DESIGNED BY	RBK
DRAWN BY	JEL

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA
NAVAL STATION
ATLANTIC DIVISION
ANNUAL MONITORING REPORT
BUILDING 645
CAMP GEIGER, NORTH CAROLINA
GROUNDWATER ELEVATION CONTOUR MAP-JULY 12, 2000

SCALE: AS SHOWN	SIZE: D
DELIVERY ORDER NO. 0011	
CONSTR. CONTRACT NO. N62470-02-D-3260	
NAVFAC DRAWING NO. ?	
SHEET I.D. 2-2	

IMAGE	X-REF	OFFICE	DRAWING NUMBER
--	--	Atlanta, GA	BLDG645-FIG2-3



GROUNDWATER ELEVATION CONTOUR MAP
JULY 30, 2001

REFERENCE: J. A. JONES MONITORING REPORT.

PLOT DATE: 10/08/03
FORMAT REVISION

SURVEY NOTES:

1. VERTICAL DATUM IS BASED ON MILITARY CONTROL MONUMENT C-33 WHICH IS A STANDARD BRASS DISC SET IN THE TOP OF A CONCRETE MONUMENT SET BELOW GROUND LEVEL AND LOCATED AT THE NORTHWEST CORNER OF THE BREWSTER AND HOLCOMB BOULEVARD INTERSECTION. C-33 HAS AN ELEVATION OF 28.50 FEET, NORTH AMERICAN 1927 DATUM.
2. SURVEY CONTROL POINTS ARE BASED ON AN ASSUMED GRID AND MAGNETIC NORTH. THE COORDINATES AND THEIR RESPECTIVE ELEVATION ARE AS FOLLOWS:

POINT	NORTH	EAST	ELEVATION (MSL)	DESCRIPTION
PI-3	5000.00	5000.00	29.98	#120 NAIL
PI-4	5211.80	5383.73	28.02	#120 NAIL

REVISIONS

REV	DATE	BY	CHKD	APRVD	DESCRIPTION/ISSUE

PROJECT NO. 845823

DESIGNED BY	RBK
DRAWN BY	JEL
CHECKED BY	
APPROVED BY	

Shaw Environmental, Inc.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION ATLANTIC DIVISION NORFOLK, VIRGINIA

ANNUAL MONITORING REPORT
BUILDING 645
CAMP GEIGER, NORTH CAROLINA

GROUNDWATER ELEVATION CONTOUR MAP-JULY 30, 2001

SCALE:	SIZE:
AS SHOWN	D

DELIVERY ORDER NO.
0011

CONSTR. CONTRACT NO.
N62470-02-D-3260

NAVFAC DRAWING NO.
?

SHEET I.D.
2-3

IMAGE	X-REF	OFFICE	DRAWING NUMBER
--	--	*Atlanta, GA*	BLDG645-FIG2-4

N
MAGNETIC NORTH (AUGUST 1998)

LEGEND
- BUILDING
- TYPE II MONITORING WELL
- TYPE III MONITORING WELL
- PUMPING WELL
- SOIL VAPOR COLLECTION VENT BORING
- DEEP AIR SPARGE WELL - 80 FT DEEP
- SHALLOW AIR SPARGE WELL - 50 FT DEEP
- SURVEY BASELINE POINT
- WOODED AREA
- 11.72 GROUNDWATER ELEVATION (FT)
- 12.00 GROUNDWATER CONTOUR (FT)
- DIRECTION OF GROUNDWATER FLOW

WOODS
DITCH
CULVERT
GRAVEL SERVICE RD.
DRY
645-4
645-21
645-5
12.24
PI-4
EL.=28.02
9.86
645-8
645-11
645-13
AIR SPARGE HEADER PIPE
TREATMENT BUILDING LOCATION
FORMER GASOLINE AST
645-12
645-9
SOIL VAPOR COLLECTION VENT BORING GRAVEL PACKED
FORMER LOCATION BUILDING 645
645-1
6.75
645-3
5.02
645-2
7.59
645-15
645-17
SOIL VAPOR COLLECTION HEADER PIPE
BRUSH
645-23
645-22
645-18
645-6
11.72
PI-3
EL. =29.98
CULVERT
10.00
11.00
12.00
7.00
BREWSTER BOULEVARD
SOIL VAPOR COLLECTION LINE AND AIR SPARGE HEADER PIPE
VERTICAL AIR SPARGE WELL WITH WELL HEAD (14-TOTAL)
5.00
645-20
645-19
4.73
645-16
4.38
4.00
4.77
645-7
645-14
645-10
4.50
5.00

REFERENCE: J. A. JONES MONITORING REPORT.

GROUNDWATER ELEVATION CONTOUR MAP
JUNE 10, 2002

25 0' 25 50
SCALE IN FEET

SURVEY NOTES:

1. VERTICAL DATUM IS BASED ON MILITARY CONTROL MONUMENT C-33 WHICH IS A STANDARD BRASS DISC SET IN THE TOP OF A CONCRETE MONUMENT SET BELOW GROUND LEVEL AND LOCATED AT THE NORTHWEST CORNER OF THE BREWSTER AND HOLCOMB BOULEVARD INTERSECTION. C-33 HAS AN ELEVATION OF 28.50 FEET, NORTH AMERICAN 1927 DATUM.
2. SURVEY CONTROL POINTS ARE BASED ON AN ASSUMED GRID AND MAGNETIC NORTH. THE COORDINATES AND THEIR RESPECTIVE ELEVATION ARE AS FOLLOWS:

POINT	NORTH	EAST	ELEVATION (MSL)	DESCRIPTION
PI-3	5000.00	5000.00	29.98	#120 NAIL
PI-4	5211.80	5393.73	28.02	#120 NAIL

PLOT DATE: 10/08/03
FORMAT REVISION

REVISIONS					
REV	DATE	BY	CHK'D	APPV'D	DESCRIPTION/ISSUE

PROJECT NO. 645623

CHECKED BY	RBK
APPROVED BY	

Shaw Shaw Environmental, Inc.

DESIGNED BY	RBK
DRAWN BY	JEL

DEPARTMENT OF THE NAVY
NAVAL STATION
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA
ANNUAL MONITORING REPORT
BUILDING 645
CAMP GEIGER, NORTH CAROLINA
GROUNDWATER ELEVATION CONTOUR MAP–JUNE 10, 2002

SCALE: AS SHOWN	SIZE: D
DELIVERY ORDER NO. 0011	
CONSTR. CONTRACT NO. N62470-02-D-3260	
NAVFAC DRAWING NO. 7	
SHEET I.D. 2-4	

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

		7/2/2002[2]			6/10/2002[1]			5/8/2002[2]		
Sample Point	Top of Casing Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
645-1	28.55		21.20	7.35		21.80	6.75		17.61	10.94
645-2	29.52		20.58	8.94		22.02	7.50		18.44	11.08
645-3	29.78		23.69	6.09		24.76	5.02		18.78	11.00
645-4	25.32		Dry			Dry			15.01	10.31
645-5	30.06		18.35	11.71		17.82	12.24		17.54	12.52
645-6	31.26		19.75	11.51		19.54	11.72		19.06	12.20
645-7	27.81		22.65	5.16		23.04	4.77		22.62	5.19
645-8	29.59		22.11	7.48		19.71	9.88		19.34	10.25
645-9	29.78		24.46	5.32		25.06	4.72		24.43	5.35
645-10	27.86		22.65	5.21		23.20	4.66		22.69	5.17
645-11	29.72		24.44	5.28		24.84	4.88		24.39	5.33
645-12	29.39		23.85	5.54		24.41	4.98		23.51	5.88
645-13	29.81		24.73	5.08		24.78	5.03		22.28	7.53
645-14	28.10		22.89	5.21		23.44	4.66		23.04	5.06
645-15	27.04		22.05	4.99		22.87	4.17		19.73	7.31
645-16	28.26		23.09	5.17		23.90	4.36		23.58	4.68
645-17	27.27		22.10	5.17		22.88	4.39		18.18	9.09
645-18	31.45		23.38	8.07		23.92	7.53		23.55	7.90
645-19	28.34		23.20	5.14		23.61	4.73		23.04	5.30
645-20	28.34		23.10	5.24		23.57	4.77		23.03	5.31
645-21[3]	23.08		17.62	5.46		18.30	4.78		18.15	4.93
645-22[3]	28.51		23.13	5.38		23.92	4.59		22.99	5.52
645-23[3]	28.57		22.40	6.17		23.37	5.20		19.41	9.16

Notes:

[1] System not operational during water level survey.

[2] System operational during water level survey.

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7/30/01

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

		4/10/2002[2]			3/11/2002[1]			2/5/2002[1]			
Sample Point	Top of Casing Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)
645-1	28.55		17.52	11.03		18.41	10.14		20.68	7.87	
645-2	29.52		18.39	11.13		18.96	10.56		22.28	7.24	
645-3	29.78		18.67	11.11		22.43	7.35		24.16	5.62	
645-4	25.32		15.31			Dry			Dry		
645-5	30.06		17.24	12.82		18.72	11.34		18.59	11.47	
645-6	31.26		18.67	12.59		20.85	10.41		19.79	11.47	
645-7	27.81		22.71	5.10		22.94	4.87		22.90	4.91	
645-8	29.59		18.25	11.34		22.30	7.29		23.92	5.67	
645-9	29.78		25.23	4.55		24.44	5.34		25.04	4.74	
645-10	27.86		22.73	5.13		22.53	5.33		23.03	4.83	
645-11	29.72		24.59	5.13		24.21	5.51		24.84	4.88	
645-12	29.39		23.18	6.21		23.75	5.64		24.38	5.01	
645-13	29.81		19.28	10.53		24.07	5.74		24.74	5.07	
645-14	28.10		22.98	5.12		22.53			Not Measured		
645-15	27.04		Not Measured			22.28	4.76		22.83	4.21	
645-16	28.26		24.30	3.96		23.53	4.73		23.73	4.53	
645-17	27.27		11.68	15.59		22.38	4.89		22.75	4.52	
645-18	31.45		23.24	8.21		23.30	8.15		23.98	7.47	
645-19	28.34		23.13	5.21		23.16	5.18		23.38	4.96	
645-20	28.34		23.10	5.24		23.05	5.29		23.40	4.94	
645-21[3]	23.08		17.70	5.38		17.74	5.34		18.19	4.89	
645-22[3]	28.51		22.10	6.41		23.30	5.21		23.58	4.93	
645-23[3]	28.57		18.35	10.22		22.10	6.47		23.32	5.25	

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

		1/15/2002[1]		12/12/2001[1]			11/5/2001[1]			10/11/2001[1]	
Sample Point	Top of Casing Elevation (ft., msl)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)
645-1	28.55	21.09	7.46		21.24	7.31		19.91	8.64		19.57
645-2	29.52	22.35	7.17		22.26	7.26		20.33	9.19		19.89
645-3	29.78	23.73	6.05		24.00	5.78		21.34	8.44		21.35
645-4	25.32	15.72	9.60		15.70	9.62		15.72	9.60		15.70
645-5	30.06	18.59	11.47		18.28	11.78		17.81	12.25		17.50
645-6	31.26	20.03	11.23		19.65	11.61		19.13	12.13		17.25
645-7	27.81	22.13	5.68		21.99	5.82		21.12	6.69		21.45
645-8	29.59	23.27	6.32		23.11	6.48		20.52	9.07		20.26
645-9	29.78	24.17	5.61		23.87	5.91		22.71	7.07		23.00
645-10	27.86	22.19	5.67		22.03	5.83		21.10	6.76		21.46
645-11	29.72	24.04	5.68		23.75	5.97		22.53	7.19		22.75
645-12	29.39	23.58	5.81		23.36	6.03		22.03	7.36		22.30
645-13	29.81	23.96	5.85		23.81	6.00		22.40	7.41		22.66
645-14	28.10	22.44	5.66		22.49	5.61		21.35	6.75		Not Measured
645-15	27.04	22.33	4.71		21.80	5.24		20.34	6.70		20.73
645-16	28.26	23.06	5.20		22.62	5.64		21.81	6.45		20.01
645-17	27.27	22.21	5.06		21.90	5.37		20.47	6.80		20.87
645-18	31.45	23.18	8.27		22.88	8.57		21.86	9.59		21.87
645-19	28.34	22.63	5.71		22.45	5.89		21.60	6.74		21.87
645-20	28.34	22.50	5.84		22.31	6.03		21.64	6.70		21.86
645-21[3]	23.08	17.72	5.36		17.25	5.83		15.86	7.22		16.17
645-22[3]	28.51	23.33	5.18		23.01	5.50		21.50	7.01		21.83
645-23[3]	28.57	22.55	6.02		22.56	6.01		20.06	8.51		20.73

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

			10/4/2001[1]			9/10/2001[1]			9/4/2001[1]		
Sample Point	Top of Casing Elevation (ft., msl)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
645-1	28.55	8.98		18.54	10.01		18.14	10.41		18.55	10.00
645-2	29.52	9.63		19.52	10.00		18.73	10.79		19.14	10.38
645-3	29.78	8.43		20.40	9.38		19.37	10.41		20.75	9.03
645-4	25.32	9.62		Not Measured			14.21	11.11		14.86	10.46
645-5	30.06	12.56		Not Measured			17.10	12.96		17.05	13.01
645-6	31.26	14.01		Not Measured			18.42	12.84		18.39	12.87
645-7	27.81	6.36		Not Measured			21.38	6.43		21.46	6.35
645-8	29.59	9.33		19.48	10.11		17.58	12.01		18.76	10.83
645-9	29.78	6.78		23.10	6.68		22.97	6.81		23.20	6.58
645-10	27.86	6.40		Not Measured			21.36	6.50		21.52	6.34
645-11	29.72	6.97		22.69	7.03		22.75	6.97		23.05	6.67
645-12	29.39	7.09		22.15	7.24		22.23	7.16		22.45	6.94
645-13	29.81	7.15		22.39	7.42		22.74	7.07		22.90	6.91
645-14	28.10			Not Measured			21.66	6.44		21.76	7.39
645-15	27.04	6.31		20.43	6.61		20.64	6.40		21.08	6.59
645-16	28.26	8.25		Not Measured			21.92	6.34		22.15	7.23
645-17	27.27	6.40		Not Measured			20.62	6.65		21.09	8.15
645-18	31.45	9.58		Not Measured			21.89	9.56		22.17	10.75
645-19	28.34	6.47		Not Measured			21.75	6.59		21.88	7.59
645-20	28.34	6.48		Not Measured			21.74	6.60		21.85	7.68
645-21[3]	23.08	6.91		15.95	7.13		*			*	
645-22[3]	28.51	6.68		21.51	7.00		*			*	
645-23[3]	28.57	7.84		20.58	7.99		*			*	

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

		7/30/2001[2]			6/12/2001[1]			5/15/01[1]			
Sample Point	Top of Casing Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)
645-1	28.55		16.88	11.67		17.06	11.49		16.05	12.50	
645-2	29.52		17.96	11.56		17.95	11.57		17.02	12.50	
645-3	29.78		18.09	11.69		18.06	11.72		17.95	11.83	
645-4	25.32		13.41	11.91		14.76	10.56		15.68	9.64	
645-5	30.06		16.58	13.48		15.23	14.83		15.90	14.16	
645-6	31.26		18.04	13.22		17.61	13.65		17.32	13.94	
645-7	27.81		20.64	7.17		23.70	4.11		19.52	8.29	
645-8	29.59		18.56	11.03		17.55	12.04		Not Measured		
645-9	29.78		22.20	7.58		22.40	7.38		19.65	10.13	
645-10	27.86		20.60	7.26		24.00	3.86		18.22	9.64	
645-11	29.72		22.00	7.72		22.20	7.52		Not Measured		
645-12	29.39		21.95	7.44		21.50	7.89		Not Measured		
645-13	29.81		16.20	13.61		23.20	6.61		Not Measured		
645-14	28.10		Not Measured			20.71	7.39		Not Measured		
645-15	27.04		20.31	6.73		20.45	6.59		Not Measured		
645-16	28.26		21.24	7.02		21.03	7.23		18.98	9.28	
645-17	27.27		20.13	7.14		19.12	8.15		17.92	9.35	
645-18	31.45		21.22	10.23		20.70	10.75		18.13	13.32	
645-19	28.34		21.05	7.29		20.75	7.59		18.32	10.02	
645-20	28.34		21.01	7.33		20.66	7.68		18.42	9.92	
645-21[3]	23.08		*			*			*		
645-22[3]	28.51		*			*			*		
645-23[3]	28.57		*			*			*		

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

		4/20/01[1]		3/20/01[1]			2/8/01[2]			2/2/01[1]	
Sample Point	Top of Casing Elevation (ft., msl)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)
645-1	28.55	15.90	12.65		13.91	14.64		14.41	14.14		15.88
645-2	29.52	16.66	12.86		14.75	14.77		15.72	13.80		16.78
645-3	29.78	16.73	13.05		14.76	15.02		15.86	13.92		16.92
645-4	25.32	13.12	12.20		11.87	13.45		14.22	11.10		13.90
645-5	30.06	15.05	15.01		13.78	16.28		15.59	14.47		15.64
645-6	31.26	16.22	15.04		14.62	16.64		16.77	14.49		16.73
645-7	27.81	18.61	9.20		19.28	8.53		19.57	8.24		19.20
645-8	29.59	Not Measured			14.18	15.41		Not Measured			16.37
645-9	29.78	21.16	8.62		21.16	8.62		20.72	9.06		21.05
645-10	27.86	18.52	9.34		19.01	8.85		19.53	8.33		19.22
645-11	29.72	Not Measured			20.51	9.21		Not Measured			20.93
645-12	29.39	Not Measured			20.04	9.35		Not Measured			19.71
645-13	29.81	Not Measured			20.43	9.38		Not Measured			20.63
645-14	28.10	18.92	9.18		19.31	8.79		19.77	8.33		19.45
645-15	27.04	Not Measured			19.26	7.78		Not Measured			19.28
645-16	28.26	18.80	9.46		19.62	8.64		20.43	7.83		20.05
645-17	27.27	17.93	9.34		18.62	8.65		19.31	7.96		19.05
645-18	31.45	20.07	11.38		20.45	11.00		20.45	11.00		20.31
645-19	28.34	19.05	9.29		19.59	8.75		19.76	8.58		19.52
645-20	28.34	18.85	9.49		19.42	8.92		20.70	7.64		19.46
645-21[3]	23.08	*			*			*			*
645-22[3]	28.51	*			*			*			*
645-23[3]	28.57	*			*			*			*

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

			1/31/01[1]			12/12/00[1]			11/9/00[2]		
Sample Point	Top of Casing Elevation (ft., msl)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
645-1	28.55	12.67		15.31	13.24		14.26	14.29		15.60	12.95
645-2	29.52	12.74		16.24	13.28		14.95	14.57		16.60	12.92
645-3	29.78	12.86		16.36	13.42		15.16	14.62		16.85	12.93
645-4	25.32	11.42		13.42	11.90		Not Measured			13.92	11.40
645-5	30.06	14.42		15.12	14.94		15.22	14.84		16.01	14.05
645-6	31.26	14.53		16.14	15.12		16.31	14.95		17.33	13.93
645-7	27.81	8.61		18.63	9.18		19.20	8.61		19.68	8.13
645-8	29.59	13.22		15.87	13.72		17.12	12.47		Not Measured	
645-9	29.78	8.73		20.31	9.47		20.19	9.59		20.43	9.35
645-10	27.86	8.64		18.51	9.35		18.93	8.93		18.78	9.08
645-11	29.72	8.79		20.17	9.55		20.60	9.12		Not Measured	
645-12	29.39	9.68		19.12	10.27		19.50	9.89		18.46	10.93
645-13	29.81	9.18		20.02	9.79		20.53	9.28		Not Measured	
645-14	28.10	8.65		18.85	9.25		18.27	9.83		19.02	9.08
645-15	27.04	7.76		17.91	9.13		18.70	8.34		17.85	9.19
645-16	28.26	8.21		18.99	9.27		19.35	8.91		19.58	8.68
645-17	27.27	8.22		17.85	9.42		18.16	9.11		18.30	8.97
645-18	31.45	11.14		19.42	12.03		19.93	11.52		19.37	12.08
645-19	28.34	8.82		18.94	9.40		19.30	9.04		19.28	9.06
645-20	28.34	8.88		18.86	9.48		19.18	9.16		19.38	8.96
645-21[3]	23.08			*			*			*	
645-22[3]	28.51			*			*			*	
645-23[3]	28.57			*			*			*	

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

		9/30/00[1]			8/17/00[1]			7/12/00[2]			
Sample Point	Top of Casing Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)
645-1	28.55		13.90	14.65		15.97	12.58		17.36	11.19	
645-2	29.52		14.29	15.23		16.71	12.81		18.32	11.20	
645-3	29.78		14.63	15.15		16.83	12.95		18.52	11.26	
645-4	25.32		13.36	11.96		Not Measured			15.53	9.79	
645-5	30.06		15.09	14.97		15.90	14.16		16.80	13.26	
645-6	31.26		16.27	14.99		17.15	14.11		19.35	11.91	
645-7	27.81		21.05	6.76		20.03	7.78		20.43	7.38	
645-8	29.59		14.80	14.79		16.75	12.84		11.21	18.38	
645-9	29.78		22.87	6.91		23.09	6.69		22.90	6.88	
645-10	27.86		21.10	6.76		21.13	6.73		20.41	7.45	
645-11	29.72		22.81	6.91		22.93	6.79		21.00	8.72	
645-12	29.39		21.03	8.36		21.66	7.73		28.00	1.39	
645-13	29.81		22.44	7.37		22.78	7.03		17.00	12.81	
645-14	28.10		Not Measured			21.34	6.76		Not Measured		
645-15	27.04		21.40	5.64		21.23	5.81		20.02	7.02	
645-16	28.26		21.95	6.31		21.93	6.33		20.96	7.30	
645-17	27.27		21.02	6.25		29.50	-2.23		19.93	7.34	
645-18	31.45		22.31	9.14		22.45	9.00		21.22	10.23	
645-19	28.34		21.30	7.04		21.37	6.97		20.84	7.50	
645-20	28.34		21.22	7.12		21.32	7.02		20.80	7.54	
645-21[3]	23.08		*			*			*		
645-22[3]	28.51		*			*			*		
645-23[3]	28.57		*			*			*		

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

		6/14/00[1]		5/25/00[2]			4/19/00[2]			3/13/00[1]	
Sample Point	Top of Casing Elevation (ft., msl)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)
645-1	28.55	17.63	10.92		16.60	11.95		9.44	19.11		16.21
645-2	29.52	18.58	10.94		17.61	11.91		10.46	19.06		17.20
645-3	29.78	18.74	11.04		17.70	12.08		10.94	18.84		17.37
645-4	25.32	15.53	9.79		14.88	10.44		0.00	25.32		13.41
645-5	30.06	16.35	13.71		15.92	14.14		15.51	14.55		15.87
645-6	31.26	17.75	13.51		17.33	13.93		15.82	15.44		17.02
645-7	27.81	18.61	9.20		20.27	7.54		17.38	10.43		19.84
645-8	29.59	17.74	11.85		15.67	13.92		12.08	17.51		15.87
645-9	29.78	22.75	7.03		21.78	8.00		17.10	12.68		21.70
645-10	27.86	20.70	7.16		20.25	7.61		17.47	10.39		19.89
645-11	29.72	22.52	7.20		20.74	8.98		17.60	12.12		21.54
645-12	29.39	21.83	7.56		21.09	8.30		12.72	16.67		21.40
645-13	29.81	22.43	7.38		20.93	8.88		15.31	14.50		21.37
645-14	28.10	18.97	9.13		20.42	7.68		17.73	10.37		20.11
645-15	27.04	28.50	-1.46		20.22	6.82		18.07	8.97		19.80
645-16	28.26	21.52	6.74		20.99	7.27		18.42	9.84		20.62
645-17	27.27	20.55	6.72		20.03	7.24		16.42	10.85		19.55
645-18	31.45	21.94	9.51		21.24	10.21		18.94	12.51		20.89
645-19	28.34	21.06	7.28		20.54	7.80		12.20	16.14		20.17
645-20	28.34	20.98	7.36		20.42	7.92		17.46	10.88		20.09
645-21[3]	23.08	*			*			*			*
645-22[3]	28.51	*			*			*			*
645-23[3]	28.57	*			*			*			*

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

			2/14/00[1]			1/18/00[1]			12/14/99[1]		
Sample Point	Top of Casing Elevation (ft., msl)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
645-1	28.55	12.34		14.33	14.22		15.85	12.70		16.70	11.85
645-2	29.52	12.32		15.18	14.34		16.98	12.54		17.65	11.87
645-3	29.78	12.41		15.35	14.43		17.50	12.28		17.75	12.03
645-4	25.32	11.91		12.20	13.12		13.05	12.27		14.35	10.97
645-5	30.06	14.19		14.85	15.21		16.50	13.56		15.88	14.18
645-6	31.26	14.24		15.47	15.79		17.72	13.54		17.25	14.01
645-7	27.81	7.97		19.16	8.65		19.32	8.49		19.35	8.46
645-8	29.59	13.72		14.60	14.99		15.98	13.61		16.08	13.51
645-9	29.78	8.08		20.89	8.89		18.82	10.96		21.23	8.55
645-10	27.86	7.97		19.03	8.83		18.96	8.90		19.37	8.49
645-11	29.72	8.18		20.75	8.97		18.66	11.06		21.06	8.66
645-12	29.39	7.99		19.55	9.84		15.65	13.74		20.36	9.03
645-13	29.81	8.44		20.66	9.15		16.15	13.66		20.90	8.91
645-14	28.10	7.99		19.25	8.85		19.25	8.85		19.48	8.62
645-15	27.04	7.24		19.16	7.88		Not Measured			19.18	7.86
645-16	28.26	7.64		19.81	8.45		18.58	9.68		20.02	8.24
645-17	27.27	7.72		19.02	8.25		18.41	8.86		19.01	8.26
645-18	31.45	10.56		20.22	11.23		18.95	12.50		20.40	11.05
645-19	28.34	8.17		19.30	9.04		19.47	8.87		19.59	8.75
645-20	28.34	8.25		19.22	9.12		19.32	9.02		19.50	8.84
645-21[3]	23.08			*			*			*	
645-22[3]	28.51			*			*			*	
645-23[3]	28.57			*			*			*	

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

		11/17/99[2]			9/22/99[1]			8/12/99[1]			
Sample Point	Top of Casing Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)
645-1	28.55		15.07	13.48		9.95	18.60		18.70	9.85	
645-2	29.52		15.80	13.72		10.02	19.50		19.56	9.96	
645-3	29.78		15.98	13.80		10.25	19.53		22.28	7.50	
645-4	25.32		13.19	12.13		Not Measured			15.50	9.82	
645-5	30.06		14.95	15.11		8.46	21.60		17.10	12.96	
645-6	31.26		15.98	15.28		8.40	22.86		18.38	12.88	
645-7	27.81		18.84	8.97		8.79	19.02		23.08	4.73	
645-8	29.59		15.00	14.59		8.53	21.06		18.55	11.04	
645-9	29.78		20.55	9.23		22.50	7.28		25.05	4.73	
645-10	27.86		18.85	9.01		20.62	7.24		23.12	4.74	
645-11	29.72		20.45	9.27		21.95	7.77		24.92	4.80	
645-12	29.39		19.45	9.94		24.50	4.89		24.41	4.98	
645-13	29.81		20.20	9.61		21.52	8.29		24.80	5.01	
645-14	28.10		19.10	9.00		18.92	9.18		23.32	4.78	
645-15	27.04		18.47	8.57		19.27	7.77		23.62	3.42	
645-16	28.26		19.38	8.88		21.06	7.20		24.13	4.13	
645-17	27.27		18.30	8.97		19.69	7.58		23.08	4.19	
645-18	31.45		20.78	10.67		21.30	10.15		24.33	7.12	
645-19	28.34		19.11	9.23		20.86	7.48		23.50	4.84	
645-20	28.34		18.99	9.35		20.45	7.89		Not Measured		
645-21[3]	23.08		*			*			*		
645-22[3]	28.51		*			*			*		
645-23[3]	28.57		*			*			*		

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

		7/28/99[2]		6/11/99[2]			5/5/99[2]			3/10/99[1]	
Sample Point	Top of Casing Elevation (ft., msl)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)
645-1	28.55	16.70	11.85		17.98	10.57		16.76	28.55		17.26
645-2	29.52	17.55	11.97		18.81	10.71		17.20	12.32		18.01
645-3	29.78	18.01	11.77		19.03	10.75		17.60	29.78		18.10
645-4	25.32	15.06	10.26		15.75	9.57		13.57	11.75		15.01
645-5	30.06	16.77	13.29		16.36	13.70		15.81	14.25		15.80
645-6	31.26	18.02	13.24		17.72	13.54		16.94	14.32		16.92
645-7	27.81	22.10	5.71		21.86	5.95		21.52	6.29		21.81
645-8	29.59	16.78	12.81		16.99	12.60		15.97	29.59		17.00
645-9	29.78	23.80	5.98		24.62	5.16		23.48	6.30		23.92
645-10	27.86	22.10	5.76		22.51	5.35		21.58	6.28		21.84
645-11	29.72	24.91	4.81		24.46	5.26		23.29	6.43		23.57
645-12	29.39	21.25	8.14		24.05	5.34		23.05	6.34		23.47
645-13	29.81	14.88	14.93		24.57	5.24		23.40	6.41		24.16
645-14	28.10	22.01	6.09		22.62	5.48		21.78	6.32		22.03
645-15	27.04	Not Measured			22.76	4.28		21.30	5.74		21.73
645-16	28.26	22.85	5.41		23.35	4.91		22.15	6.11		22.33
645-17	27.27	21.79	5.48		22.37	4.90		20.43	6.84		21.37
645-18	31.45	23.01	8.44		23.92	7.53		22.81	8.64		22.86
645-19	28.34	22.44	5.90		22.76	5.58		21.86	6.48		22.12
645-20	28.34	22.40	5.94		22.73	5.61		21.81	6.53		22.03
645-21[3]	23.08	*			*			*			*
645-22[3]	28.51	*			*			*			*
645-23[3]	28.57	*			*			*			*

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

			2/2/99[2]			1/12/99[2]			12/23/1998[2]		
Sample Point	Top of Casing Elevation (ft., msl)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
645-1	28.55	11.29		16.42	12.13		14.26	14.29		20.04	8.51
645-2	29.52	11.51		17.08	12.44		15.21	14.31		18.01	11.51
645-3	29.78	11.68		17.30	12.48		15.77	14.01		18.17	11.61
645-4	25.32	10.31		14.58	10.74		12.68	12.64		15.16	10.16
645-5	30.06	14.26		15.33	14.73		16.16	13.90		16.70	13.36
645-6	31.26	14.34		16.32	14.94		17.50	13.76		18.15	13.11
645-7	27.81	6.00		Not Measured			20.89	6.92		17.23	10.58
645-8	29.59	12.59		17.10	12.49		15.45	14.14		17.15	12.44
645-9	29.78	5.86		24.38	5.40		20.04	9.74		24.32	5.46
645-10	27.86	6.02		22.06	5.80		20.41	7.45		21.73	6.13
645-11	29.72	6.15		24.22	5.50		22.06	7.66		24.78	4.94
645-12	29.39	5.92		24.73	4.66		16.78	12.61		24.31	5.08
645-13	29.81	5.65		25.12	4.69		14.58	15.23		27.58	2.23
645-14	28.10	6.07		22.23	5.87		20.63	7.47		21.91	6.19
645-15	27.04	5.31		22.23	4.81		Not Measured			Not Measured	
645-16	28.26	5.93		22.73	5.53		20.79	7.47		23.09	5.17
645-17	27.27	5.90		17.82	9.45		18.13	9.14		20.62	6.65
645-18	31.45	8.59		23.69	7.76		21.30	10.15		23.32	8.13
645-19	28.34	6.22		22.26	6.08		20.51	7.83		22.06	6.28
645-20	28.34	6.31		22.25	6.09		20.6	7.74		21.93	6.41
645-21[3]	23.08			*			*			*	
645-22[3]	28.51			*			*			*	
645-23[3]	28.57			*			*			*	

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

		12/16/1998[1]			11/5/98[2]			10/30/98[2]			
Sample Point	Top of Casing Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)
645-1	28.55		17.47	11.08		15.23	13.32		14.09	14.46	
645-2	29.52		18.48	11.04		16.13	13.39		15.35	14.17	
645-3	29.78		18.46	11.32		16.45	13.33		Not Measured		
645-4	25.32		13.60	11.72		13.87	11.45		Not Measured		
645-5	30.06		16.61	13.45		16.02	14.04		15.92	14.14	
645-6	31.26		18.03	13.23		17.37	13.89		17.27	13.99	
645-7	27.81		21.34	6.47		19.31	8.50		18.63	9.18	
645-8	29.59		17.34	12.25		17.10	12.49		14.16	15.43	
645-9	29.78		25.66	4.12		20.92	8.86		Not Measured		
645-10	27.86		21.47	6.39		19.17	8.69		18.57	9.29	
645-11	29.72		25.22	4.50		20.87	8.85		18.20	11.52	
645-12	29.39		27.44	1.95		18.93	10.46		13.34	16.05	
645-13	29.81		27.50	2.31		18.55	11.26		8.87	20.94	
645-14	28.10		21.65	6.45		19.37	8.73		Not Measured		
645-15	27.04		21.92	5.12		Not Measured			Not Measured		
645-16	28.26		22.39	5.87		19.70	8.56		19.09	9.17	
645-17	27.27		22.19	5.08		18.30	8.97		16.47	10.80	
645-18	31.45		23.14	8.31		20.85	10.60		18.73	12.72	
645-19	28.34		21.96	6.38		20.30	8.04		18.83	9.51	
645-20	28.34		21.89	6.45		19.58	8.76		18.91	9.43	
645-21[3]	23.08		*			*			*		
645-22[3]	28.51		*			*			*		
645-23[3]	28.57		*			*			*		

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

		10/27/98[1]		9/15/98[2]			9/11/98[2]			9/10/98[2]	
Sample Point	Top of Casing Elevation (ft., msl)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)
645-1	28.55	17.57	10.98		10.08	18.47		8.60	19.95		10.05
645-2	29.52	18.01	11.51		9.93	19.59		9.02	20.50		9.52
645-3	29.78	18.07	11.71		10.39	19.39		9.23	20.55		9.99
645-4	25.32	14.60	10.72		9.06	16.26		8.90	16.42		Not Measured
645-5	30.06	15.88	14.18		10.26	19.80		9.64	20.42		9.58
645-6	31.26	17.22	14.04		10.28	20.98		9.48	21.78		9.17
645-7	27.81	20.05	7.76		19.00	8.81		18.57	9.24		19.49
645-8	29.59	16.68	12.91		10.12	19.47		8.35	21.24		9.23
645-9	29.78	21.80	7.98		22.20	7.58		13.92	15.86		20.87
645-10	27.86	20.08	7.78		19.00	8.86		18.22	9.64		19.45
645-11	29.72	21.58	8.14		21.80	7.92		14.80	14.92		20.78
645-12	29.39	21.07	8.32		18.16	11.23		11.02	18.37		19.45
645-13	29.81	21.51	8.30		12.30	17.51		7.52	22.29		19.79
645-14	28.10	20.31	7.79		Not Measured			18.51	9.59		19.66
645-15	27.04	Not Measured			Not Measured			Not Measured			Not Measured
645-16	28.26	20.46	7.80		19.78	8.48		18.44	9.82		20.95
645-17	27.27	19.32	7.95		18.84	8.43		16.04	11.23		18.85
645-18	31.45	20.98	10.47		20.42	11.03		18.24	13.21		21.05
645-19	28.34	20.20	8.14		19.12	9.22		17.29	11.05		19.42
645-20	28.34	20.39	7.95		19.06	9.28		17.23	11.11		19.68
645-21[3]	23.08	*			*			*			*
645-22[3]	28.51	*			*			*			*
645-23[3]	28.57	*			*			*			*

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

			7/30/98[1]		
Sample Point	Top of Casing Elevation (ft., msl)	Groundwater Elevation (ft., msl)	Depth to Hydrocarbon Product (ft. below toc)	Depth to Groundwater (ft. below toc)	Groundwater Elevation (ft., msl)
645-1	28.55	18.50		17.77	10.78
645-2	29.52	20.00		18.47	11.05
645-3	29.78	19.79		18.25	11.53
645-4	25.32			14.00	11.32
645-5	30.06	20.48		16.22	13.84
645-6	31.26	22.09		17.70	13.56
645-7	27.81	8.32		20.75	7.06
645-8	29.59	20.36		16.83	12.76
645-9	29.78	8.91		22.54	7.24
645-10	27.86	8.41		20.78	7.08
645-11	29.72	8.94		22.28	7.44
645-12	29.39	9.94		21.72	7.67
645-13	29.81	10.02		22.11	7.70
645-14	28.10	8.44		21.02	7.08
645-15	27.04			Not Measured	
645-16	28.26	7.31		21.32	6.94
645-17	27.27	8.42		20.29	6.98
645-18	31.45	10.40		21.81	9.64
645-19	28.34	8.92		21.07	7.27
645-20	28.34	8.66		21.01	7.33
645-21[3]	23.08			*	
645-22[3]	28.51			*	
645-23[3]	28.57			*	

Notes:

[1] System not operational during water level su

[2] System operational during water level surve

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

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ft = feet

toc = top of casing elevation

msl = mean sea level

Table 2-2
Building 645
Camp Lejeune, North Carolina
Water Level Measurement Summary

Sample Point	Top of Casing Elevation (ft., msl)
645-1	28.55
645-2	29.52
645-3	29.78
645-4	25.32
645-5	30.06
645-6	31.26
645-7	27.81
645-8	29.59
645-9	29.78
645-10	27.86
645-11	29.72
645-12	29.39
645-13	29.81
645-14	28.10
645-15	27.04
645-16	28.26
645-17	27.27
645-18	31.45
645-19	28.34
645-20	28.34
645-21[3]	23.08
645-22[3]	28.51
645-23[3]	28.57

Notes:

[1] System not operational during water level su

[2] System operational during water level surve:

3 Monitoring wells MW-21, MW-22, and MW-23 were installed week of 7

* Monitoring well not yet installed

ft = feet

toc = top of casing elevation

msl = mean sea level

APPENDIX D

ANALYTICAL DATA SUMMARY TABLES
POST-CAP THROUGH JUNE 2002

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW01						
Parameter	**NCDENR**	**Sample ID**	UST645-MW01-02B	UST645-MW01-02A	UST645-MW01-01D	UST645-MW01-01C	UST645-MW01-01B	UST645-MW01-01A	UST645-MW01-00D
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	6/10/2002 *#	3/11/2002 *#	12/11/2001 *#	9/17/2001 *#	6/13/2001	3/20/2001 *	12/11/2000 *#
Benzene	1		BQL	BQL	**8**	BQL	BQL	BQL	BQL
Ethylbenzene	29		**150**	**14**	**140**	**240**	**95**	**170**	**360**
Toluene	1000		**58**	**16**	**280**	**160**	**55**	**130**	**180**
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		**468**	**490**	**1,120**	**1,310**	**310**	**550**	**1,100**
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		**39**	**20**	**30**	**79**	**37**	**44**	**92**
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	**13**	BQL	**14**	**25**
2-Methylnaphthalene	28		**11**	BQL	BQL	**18**	**13**	**16**	**26**
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		**28**	**61**	**16**	**47**	BQL	BQL	**10**
2,4-Dimethylphenol	Detection Limit		**30**	BQL	**140**	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW01						
Parameter	**NCDENR**	**Sample ID**	UST645-MW01-00C	UST645-MW01-00B	UST645-MW01-00A	UST645-MW01-99D	UST645-MW01-99C	UST645-MW01-99B	UST645-MW01-99A
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	9/11/2000 *#	6/13/2000 *#	3/13/2000 *#	12/13/1999	9/21/1999 *	6/10/1999 *	3/11/1999 *
Benzene	1		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		**180**	**97**	**190**	**540**	**590**	**590**	**1,400**
Toluene	1000		**120**	**160**	**79**	**430**	**460**	**1,100**	**2,400**
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		**960**	**610**	**780**	**2,260**	**3,280**	**5,900**	**12,900**
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		**71**	BQL	**29**	**130**	**200**	**160**	**440**
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		**37**	BQL	BQL	**45**	**64**	**47**	BQL
2-Methylnaphthalene	28		**43**	BQL	BQL	**39**	**98**	**46**	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	BQL	BQL	**43**	BQL	**79**	**91**
2,4-Dimethylphenol	Detection Limit		BQL	**33**	**12**	**42**	BQL	**68**	**71**
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW01				MW02		
Parameter	**NCDENR**	**Sample ID**	UST645-MW01-98D3	UST645-MW01-98D2	UST645-MW01-98D1	UST645-MW01-98C1	UST645-MW02-02B	UST645-MW02-02A	UST645-MW02-01D
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	12/16/1998	11/24/1998	10/27/1998	7/29/1998	6/10/2002 *#	3/11/2002 *#	12/11/2001 *#
Benzene	1		BQL	BQL	**100**	BQL	BQL	BQL	BQL
Ethylbenzene	29		**900**	**2,200**	**1,600**	**1,000**	**580**	**190**	**350**
Toluene	1000		**2,400**	**4,100**	**2,000**	**1,200**	**450**	**100**	**620**
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		**9,300**	**12,700**	**7,800**	**4,800**	**4,000**	**1,260**	**4,100**
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		**110**	**180**	**87**	**22**	**140**	**43**	**17**
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		**25**	**35**	**11**	BQL	**32**	**13**	BQL
2-Methylnaphthalene	28		**30**	**30**	BQL	BQL	**41**	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		**49**	**120**	**16**	BQL	**13**	BQL	BQL
2,4-Dimethylphenol	Detection Limit		BQL	**180**	BQL	BQL	**13**	**11**	**29**
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW02						
Parameter	NCDENR	Sample ID	UST645-MW02-01C	UST645-MW02-01B	UST645-MW02-01A	UST645-MW02-00D	UST645-MW02-00C	UST645-MW02-00B	UST645-MW02-00A
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	9/17/2001 *#	6/13/2001	3/20/2001 *	12/11/2000 *#	9/11/2000 *#	6/13/2000 *#	3/13/2000 *#
Benzene	1		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		**310**	**270**	**290**	**340**	**330**	**510**	**500**
Toluene	1000		**99**	**86**	**95**	**91**	**55**	**230**	**140**
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		**1,990**	**1,680**	**1,870**	**2,210**	**2,530**	**3,200**	**3,360**
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		**110**	**41**	**100**	**160**	**180**	**130**	**120**
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	**58**	**86**	**96**	**55**	**45**
2-Methylnaphthalene	28		BQL	**14**	**76**	**120**	**130**	**60**	**55**
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		**26**	BQL	BQL	BQL	BQL	BQL	BQL
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW02						
Parameter	**NCDENR**	**Sample ID**	UST645-MW02-99D	UST645-MW02-99C	UST645-MW02-99B	UST645-MW02-99A	UST645-MW02-98D3	UST645-MW02-98D2	UST645-MW02-98D1
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	12/13/1999	9/21/1999 *	6/10/1999 *	3/11/1999 *	12/16/1998	11/24/1998	10/27/1998
Benzene	1		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		**440**	**76**	**720**	**570**	**320**	**650**	**680**
Toluene	1000		BQL	**19**	**520**	**340**	**380**	**680**	**420**
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	**380**	BQL	BQL
Total Xylenes	530		**2,880**	**520**	**4,400**	**4,000**	**2,520**	**4,800**	**4,500**
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		**140**	**30**	**50**	**100**	**22**	**74**	**140**
Nitrobenzene	Detection Limit		BQL	BQL	BQL	**41**	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		**65**	**16**	**17**	BQL	BQL	**12**	**56**
2-Methylnaphthalene	28		**76**	**22**	BQL	BQL	BQL	BQL	**87**
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2,4-Dimethylphenol	Detection Limit		**30**	BQL	**26**	**14**	BQL	**36**	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW02	MW03					
Parameter	**NCDENR**	**Sample ID**	UST645-MW02-98C1	UST645-MW03-02B	UST645-MW03-02A	UST645-MW03-01D	UST645-MW03-01C	UST645-MW03-01B	UST645-MW03-01A
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	7/29/1998	6/10/2002 *#	3/11/2002 *#	12/11/2001 *#	9/17/2001 *#	6/13/2001	3/20/2001 *
Benzene	1		BQL	BQL	**4**	BQL	BQL	BQL	**2**
Ethylbenzene	29		**320**	BQL	**210**	**10**	**65**	**25**	**10**
Toluene	1000		**270**	**1**	**280**	**15**	**39**	**21**	**6**
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		**2,050**	**8**	**900**	**82**	**670**	**280**	**105**
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		**40**	BQL	**26**	BQL	**23**	BQL	BQL
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		**16**	BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		**20**	BQL	BQL	BQL	BQL	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	**21**	**28**	**11**	BQL	BQL	BQL
2,4-Dimethylphenol	Detection Limit		BQL	BQL	**71**	BQL	BQL	**10**	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW03						
Parameter	**NCDENR**	**Sample ID**	UST645-MW03-00D	UST645-MW03-00C	UST645-MW03-00B	UST645-MW03-00A	UST645-MW03-99D	UST645-MW03-99C	UST645-MW03-99B
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	12/11/2000 *#	9/11/2000 *#	6/13/2000 *#	3/13/2000 *#	12/13/1999	9/21/1999 *	6/11/1999 *
Benzene	1		**1**	BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		**19**	**26**	**220**	**99**	**100**	**36**	**92**
Toluene	1000		**9**	**9**	**220**	**110**	**82**	**18**	**170**
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		**112**	**156**	**1,520**	**630**	**550**	**260**	**1,310**
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		BQL	BQL	**11**	**31**	BQL	**10**	**14**
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	**11**	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	**12**	BQL	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2,4-Dimethylphenol	Detection Limit		BQL	BQL	**25**	**12**	BQL	BQL	**22**
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW03					MW04	
Parameter	**NCDENR**	**Sample ID**	UST645-MW03-99A	UST645-MW03-98D3	UST645-MW03-98D2	UST645-MW03-98D1	UST645-MW03-98C1	UST645-MW04-01B	UST645-MW04-00B
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	3/11/1999 *	12/16/1998	11/24/1998	10/27/1998	7/29/1998	6/13/2001	6/14/2000 *#
Benzene	1		BQL	**44**	**39**	**20**	BQL	BQL	BQL
Ethylbenzene	29		**320**	**230**	**210**	**260**	**550**	BQL	BQL
Toluene	1000		**450**	**660**	**270**	**150**	**260**	**150**	**390**
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		**3,200**	**1,610**	**1,190**	**940**	**2,560**	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		**30**	**22**	BQL	**34**	BQL	NA	NA
Nitrobenzene	Detection Limit		**50**	**24**	BQL	BQL	BQL	NA	NA
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	**12**	BQL	NA	NA
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	NA	NA
Bis (2-chloroethoxy)methane	Detection Limit		BQL	**13**	BQL	BQL	BQL	NA	NA
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	BQL	BQL	BQL	BQL	NA	NA
2,4-Dimethylphenol	Detection Limit		**45**	**63**	**24**	BQL	BQL	NA	NA
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	NA	NA

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW04						
Parameter	**NCDENR**	**Sample ID**	UST645-MW04-00A	UST645-MW04-99D	UST645-MW04-99A	UST645-MW04-98D3	UST645-MW04-98D2	UST645-MW04-98D1	UST645-MW04-98C1
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	3/14/2000 *#	12/13/1999	3/11/1999 *	12/16/1998	11/24/1998	10/27/1998	7/29/1998
Benzene	1		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Toluene	1000		**2**	**2**	BQL	BQL	BQL	BQL	BQL
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW05						
Parameter	**NCDENR**	**Sample ID**	UST645-MW05-02B	UST645-MW05-01B	UST645-MW05-00B	UST645-MW05-00A	UST645-MW05-99D	UST645-MW05-99C	UST645-MW05-99B
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	6/10/2002 *#	6/13/2001	6/13/2000 *#	3/13/2000 *#	12/13/1999	9/22/1999 *	6/10/1999 *
Benzene	1		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Toluene	1000		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		**64**	BQL	BQL	BQL	BQL	BQL	BQL
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW05					MW06	
Parameter	**NCDENR**	**Sample ID**	UST645-MW05-99A	UST645-MW05-98D3	UST645-MW05-98D2	UST645-MW05-98D1	UST645-MW05-98C1	UST645-MW06-02B	UST645-MW06-01D
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	3/10/1999 *	12/16/1998	11/24/1998	10/27/1998	7/29/1998	6/10/2002 *#	12/12/2001 *#
Benzene	1		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Toluene	1000		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	BQL	BQL	BQL	BQL	**100**	**120**
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW06						
Parameter	**NCDENR**	**Sample ID**	UST645-MW06-01B	UST645-MW06-00D	UST645-MW06-00B	UST645-MW06-00A	UST645-MW06-99D	UST645-MW06-99C	UST645-MW06-99B
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	6/13/2001	12/11/2000 *#	6/13/2000 *#	3/14/2000 *#	12/14/1999	9/21/1999 *	6/10/1999 *
Benzene	1		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Toluene	1000		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW06					MW07	MW08
Parameter	**NCDENR**	**Sample ID**	UST645-MW06-99A	UST645-MW06-98D3	UST645-MW06-98D2	UST645-MW06-98D1	UST645-MW06-98C1	UST645-MW07-98C1	UST645-MW08-02B
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	3/10/1999 *	12/16/1998	11/24/1998	10/28/1998	7/30/1998	7/29/1998	6/10/2002 *#
Benzene	1		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Toluene	1000		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	**480**
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW08						
Parameter	**NCDENR**	**Sample ID**	UST645-MW08-01B	UST645-MW08-00B	UST645-MW08-00A	UST645-MW08-99D	UST645-MW08-99C	UST645-MW08-99B	UST645-MW08-99A
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	6/13/2001	6/13/2000 *#	3/14/2000 *#	12/13/1999	9/21/1999 *	6/10/1999 *	3/10/1999 *
Benzene	1		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Toluene	1000		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		**15**	BQL	BQL	BQL	BQL	BQL	BQL
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW08				MW09		
Parameter	**NCDENR**	**Sample ID**	UST645-MW08-98D3	UST645-MW08-98D2	UST645-MW08-98D1	UST645-MW08-98C1	UST645-MW09-02B	UST645-MW09-02A	UST645-MW09-01D
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	12/16/1998	11/24/1998	10/27/1998	7/29/1998	6/10/2002 *#	3/11/2002 *#	12/11/2001 *#
Benzene	1		BQL	BQL	BQL	BQL	BQL	**2**	BQL
Ethylbenzene	29		BQL	BQL	BQL	BQL	**2**	**6**	**8**
Toluene	1000		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		BQL	BQL	BQL	BQL	**10**	**13**	BQL
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	**10**	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	**12**	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	BQL	BQL	BQL	**72**	**92**	**100**
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW09						
Parameter	**NCDENR**	**Sample ID**	UST645-MW09-01C	UST645-MW09-01B	UST645-MW09-01A	UST645-MW09-00D	UST645-MW09-00C	UST645-MW09-00B	UST645-MW09-00A
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	9/17/2001 *#	6/13/2001	3/20/2001 *	12/11/2000 *#	9/11/2000 *#	6/13/2000 *#	3/14/2000 *#
Benzene	1		BQL	BQL	BQL	**4**	BQL	BQL	BQL
Ethylbenzene	29		BQL	BQL	BQL	**25**	BQL	BQL	BQL
Toluene	1000		BQL	BQL	BQL	BQL	**1**	BQL	BQL
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL	BQL	BQL	**11**	**8**	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		BQL	BQL	BQL	**19**	BQL	BQL	BQL
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		**95**	**30**	BQL	**42**	**61**	BQL	BQL
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW09						
Parameter	**NCDENR**	**Sample ID**	UST645-MW09-99D	UST645-MW09-99C	UST645-MW09-99B	UST645-MW09-99A	UST645-MW09-98D3	UST645-MW09-98D2	UST645-MW09-98D1
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	12/13/1999	9/21/1999 *	6/11/1999 *	3/11/1999 *	12/16/1998	11/24/1998	10/27/1998
Benzene	1		**2**	BQL	BQL	**3**	**35**	**21**	**64**
Ethylbenzene	29		**12**	BQL	BQL	**13**	**150**	**83**	**260**
Toluene	1000		**20**	BQL	BQL	**2**	**130**	**30**	**480**
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		**33**	BQL	BQL	BQL	**129**	**54**	**580**
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		BQL	BQL	BQL	BQL	**33**	BQL	**61**
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	**14**
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL	22
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	BQL	BQL	**12**	**36**	**74**	**40**
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW09	MW10					
Parameter	**NCDENR**	**Sample ID**	UST645-MW09-98C1	UST645-MW10-02B	UST645-MW10-01B	UST645-MW10-00B	UST645-MW10-00A	UST645-MW10-99D	UST645-MW10-99C
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	7/29/1998	6/11/2002 *#	6/13/2001	6/12/2000 *#	3/15/2000 *#	12/14/1999	9/22/1999 *
Benzene	1		**180**	BQL	BQL	**2**	**3**	**3**	**1**
Ethylbenzene	29		**220**	BQL	BQL	BQL	BQL	BQL	BQL
Toluene	1000		**1,300**	BQL	BQL	BQL	BQL	BQL	BQL
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	**2**
Total Xylenes	530		**1,610**	BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		**34**	BQL	BQL	BQL	BQL	BQL	BQL
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		**40**	**70**	**46**	BQL	BQL	BQL	BQL
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW10						MW11
Parameter	**NCDENR**	**Sample ID**	UST645-MW10-99B	UST645-MW10-99A	UST645-MW10-98D3	UST645-MW10-98D2	UST645-MW10-98D1	UST645-MW10-98C1	UST645-MW11-02B
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	6/10/1999 *	3/11/1999 *	12/16/1998	11/24/1998	10/28/1998	7/29/1998	6/10/2002 *#
Benzene	1		**2**	**3**	**1**	**1**	**2**	**1**	BQL
Ethylbenzene	29		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Toluene	1000		BQL	BQL	BQL	BQL	**4**	BQL	BQL
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL	BQL	BQL	BQL	**3**	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	BQL	**15**	BQL	**33**	BQL	**7,800**
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW11						
Parameter	**NCDENR**	**Sample ID**	UST645-MW11-01D	UST645-MW11-01B	UST645-MW11-00D	UST645-MW11-00B	UST645-MW11-00A	UST645-MW11-99D	UST645-MW11-99C
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	12/12/2001 *#	6/13/2001	12/11/2000 *#	6/13/2000 *#	3/14/2000 *#	12/13/1999	9/21/1999 *
Benzene	1		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Toluene	1000		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L									
Naphthalene	21		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis (2-chloroethoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		**68**	**68**	BQL	BQL	BQL	BQL	BQL
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-1 (continued)
Summary of Detected Concentrations
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina

		Sample Location	MW11					
Parameter	**NCDENR**	**Sample ID**	UST645-MW11-99B	UST645-MW11-99A	UST645-MW11-98D3	UST645-MW11-98D2	UST645-MW11-98D1	UST645-MW11-98C1
Volatile Aromatic Hydrocarbons by USEPA method 602, ug/L	**Regulatory Limit**	**Sample Date**	6/10/1999 *	3/10/1999 *	12/16/1998	11/24/1998	10/27/1998	7/29/1998
Benzene	1		BQL	BQL	BQL	BQL	BQL	BQL
Ethylbenzene	29		BQL	BQL	BQL	BQL	BQL	BQL
Toluene	1000		BQL	BQL	BQL	BQL	BQL	BQL
Methyl-tert-butyl-ether	200		BQL	BQL	BQL	BQL	BQL	BQL
Total Xylenes	530		BQL	BQL	BQL	BQL	BQL	BQL
Semivolatile Organic Compounds by USEPA method 625/8270C, ug/L								
Naphthalene	21		BQL	BQL	BQL	BQL	BQL	BQL
Nitrobenzene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL
1-Methylnaphthalene	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL
2-Methylnaphthalene	28		BQL	BQL	BQL	BQL	BQL	BQL
Bis (2-chlorocthoxy)methane	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL
Bis(2-ethylhexyl)phthalate	Detection Limit		BQL	**32**	BQL	**23**	**120**	BQL
2,4-Dimethylphenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL
Phenol	Detection Limit		BQL	BQL	BQL	BQL	BQL	BQL

Notes:
Detected concentrations are indicated in boldface type.
Detected concentrations above the regulatory limits are indicated by shading.
NA indicates that the sample was not analyzed for the constituent.
BQL = Below Laboratory Quantitation Limit
* verified with laboratory data package
# verified with electronic data deliverable

Table 3-2 (continued)
Summary of Detected Concentrations
Treatment System Samples
Building 645
Camp Lejeune, North Carolina

Parameter	Sample Location	SVE-1				
	Sample ID	UST645-SVE-I-02B	UST645-SVE-I-02A	UST645-SVE-I-01D	UST645-SVE1-01B	UST645-SVE1-01A
Volatile Aromatic Hydrocarbons by USEPA Method 18, mg/m ^{3}	**Sample Date**	6/4/2002	3/4/2002	12/3/2001	6/7/2001 *	3/6/2001
Benzene		BQL	BQL	BQL	BQL	BQL
Ethylbenzene		BQL	BQL	BQL	BQL	BQL
Toluene		BQL	BQL	BQL	BQL	**0.76**
Total Xylenes		BQL	BQL	**0.6**	BQL	**0.75**

Notes:
SVE-E Sample collected from Soil Vapor Extraction System Effluent
SVE-1 Sample collected from Soil Vapor Extraction System Influent
SVE-2, SVE-3, SVE-4 Samples collected from Soil Vapor Extraction Well Vaults
BQL = Below Laboratory Quantitation Limit
Bold type indicates detected concentrations above laboratory quantitation limits.
* verified with laboratory data

Table 3-2 (continued)
Summary of Detected Concentrations
Treatment System Samples
Building 645
Camp Lejeune, North Carolina

Parameter	Sample Location	SVE2		SVE3		SVE4
	Sample ID	UST645-SVE2-01B	UST645-SVE2-01A	UST645-SVE3-01B	UST645-SVE3-01A	UST645-SVE4-01B
Volatile Aromatic Hydrocarbons by USEPA Method 18, mg/m^3	Sample Date	6/7/2001 *	3/6/2001	6/7/2001 *	3/6/2001	6/7/2001 *
Benzene		BQL	BQL	BQL	BQL	BQL
Ethylbenzene		BQL	BQL	BQL	BQL	BQL
Toluene		BQL	BQL	BQL	BQL	BQL
Total Xylenes		BQL	BQL	BQL	BQL	BQL

Notes:
SVE-E Sample collected from Soil Vapor Extraction System Effluent
SVE-1 Sample collected from Soil Vapor Extraction System Influent
SVE-2, SVE-3, SVE-4 Samples collected from Soil Vapor Extraction Well Vaults
BQL = Below Laboratory Quantitation Limit
Bold type indicates detected concentrations above laboratory quantitation limits.
* verified with laboratory data

Table 3-2 (continued)
Summary of Detected Concentrations
Treatment System Samples
Building 645
Camp Lejeune, North Carolina

Parameter	Sample Location	SVE4	SVE-E			
	Sample ID	UST645-SVE4-01A	UST645-SVE-E-00D	UST645-SVE-E-00C	UST645-SVE-E-00B	UST645-SVE-E-00A
Volatile Aromatic Hydrocarbons by USEPA Method 18, mg/m³	Sample Date	3/6/2001	12/5/2000	9/6/2000	6/5/2000	3/6/2000
Benzene		BQL	BQL	BQL	BQL	BQL
Ethylbenzene		BQL	BQL	BQL	BQL	BQL
Toluene		BQL	BQL	BQL	BQL	**96**
Total Xylenes		BQL	BQL	BQL	BQL	**25**

Notes:
SVE-E Sample collected from Soil Vapor Extraction System Effluent
SVE-1 Sample collected from Soil Vapor Extraction System Influent
SVE-2, SVE-3, SVE-4 Samples collected from Soil Vapor Extraction Well Vaults
BQL = Below Laboratory Quantitation Limit
Bold type indicates detected concentrations above laboratory quantitation limits.
* verified with laboratory data

Table 3-2 (continued)
Summary of Detected Concentrations
Treatment System Samples
Building 645
Camp Lejeune, North Carolina

Parameter	Sample Location	SVE-E				
	Sample ID	UST645-SVE-E-99D	UST645-SVE-E-99C	UST645-SVE-E-99B	UST645-SVE-E-99A	UST645-SVE-E-98D3
Volatile Aromatic Hydrocarbons by USEPA Method 18, mg/m ^{3}	**Sample Date**	12/6/1999	9/9/1999	6/6/1999	3/4/1999	12/10/1998
Benzene		BQL	BQL	BQL	BQL	BQL
Ethylbenzene		BQL	BQL	BQL	BQL	BQL
Toluene		BQL	BQL	BQL	BQL	BQL
Total Xylenes		BQL	BQL	BQL	BQL	BQL

Notes:
SVE-E Sample collected from Soil Vapor Extraction System Effluent
SVE-1 Sample collected from Soil Vapor Extraction System Influent
SVE-2, SVE-3, SVE-4 Samples collected from Soil Vapor Extraction Well Vaults
BQL = Below Laboratory Quantitation Limit
Bold type indicates detected concentrations above laboratory quantitation limits.
* verified with laboratory data

Table 3-2 (continued)
Summary of Detected Concentrations
Treatment System Samples
Building 645
Camp Lejeune, North Carolina

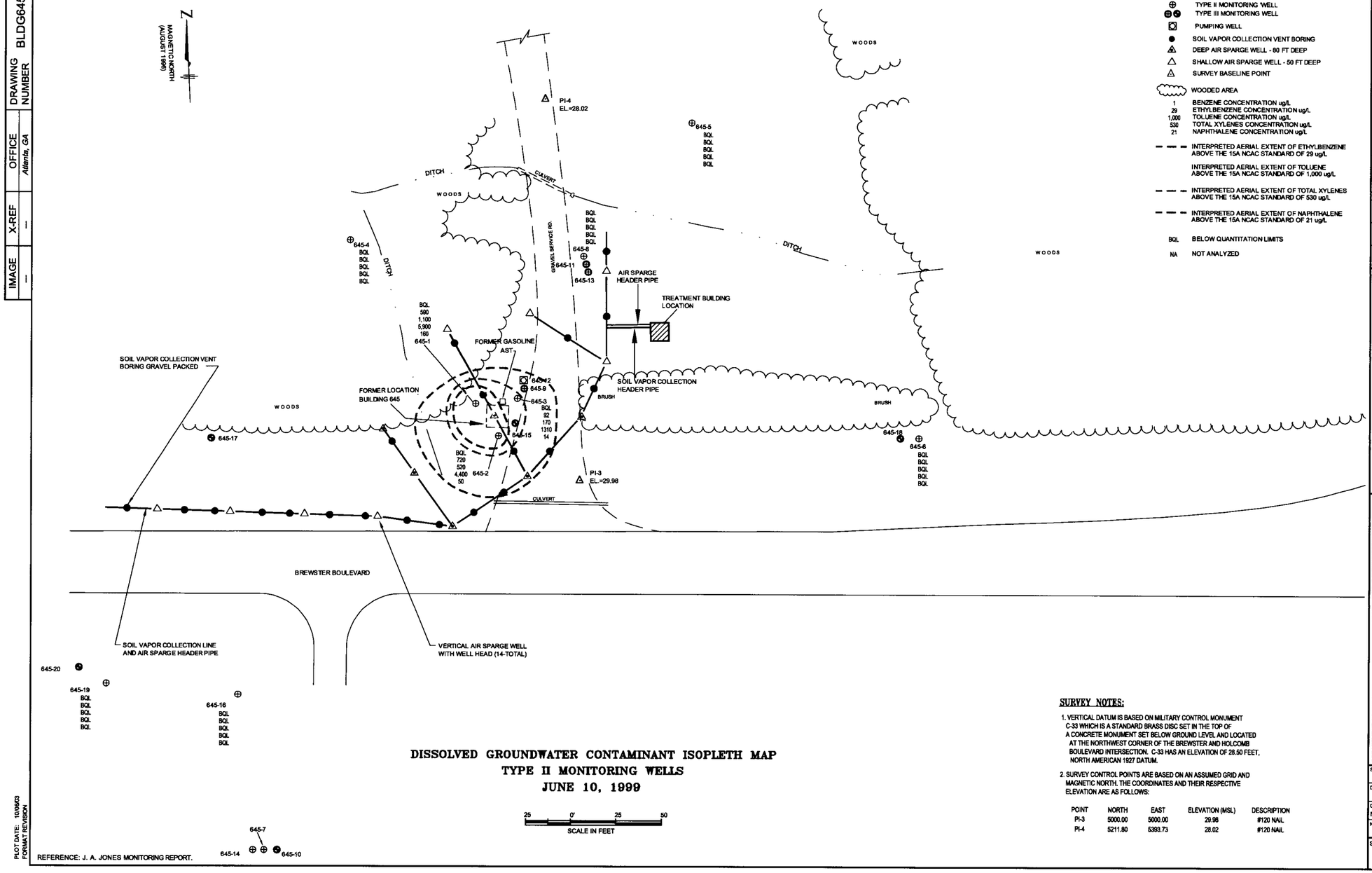
Parameter	Sample Location	SVE-E		
	Sample ID	UST645-SVE-E-98D2	UST645-SVE-E-98D1	UST645-SVE-E-98C3
Volatile Aromatic Hydrocarbons by USEPA Method 18, mg/m^3	**Sample Date**	11/19/1998	10/13/1998	9/10/1998
Benzene		BQL	BQL	BQL
Ethylbenzene		BQL	BQL	**0.5**
Toluene		BQL	BQL	**2.2**
Total Xylenes		BQL	BQL	**2.2**

Notes:
SVE-E Sample collected from Soil Vapor Extraction System Effluent
SVE-1 Sample collected from Soil Vapor Extraction System Influent
SVE-2, SVE-3, SVE-4 Samples collected from Soil Vapor Extraction Well Vaults
BQL = Below Laboratory Quantitation Limit
Bold type indicates detected concentrations above laboratory quantitation limits.
* verified with laboratory data

APPENDIX E

ANALYTICAL DATA SUMMARY FIGURES
POST-CAP THROUGH JUNE 2002

IMAGE	X-REF	OFFICE	DRAWING NUMBER
—	—	*Atlanta, GA*	BLDG645-FIG4-1



LEGEND

- BUILDING
- TYPE II MONITORING WELL
- TYPE III MONITORING WELL
- PUMPING WELL
- SOIL VAPOR COLLECTION VENT BORING
- DEEP AIR SPARGE WELL - 80 FT DEEP
- SHALLOW AIR SPARGE WELL - 50 FT DEEP
- SURVEY BASELINE POINT
- WOODED AREA
- 1 BENZENE CONCENTRATION ug/L
- 29 ETHYLBENZENE CONCENTRATION ug/L
- 1,000 TOLUENE CONCENTRATION ug/L
- 530 TOTAL XYLENES CONCENTRATION ug/L
- 21 NAPHTHALENE CONCENTRATION ug/L
- INTERPRETED AERIAL EXTENT OF ETHYLBENZENE ABOVE THE 15A NCAC STANDARD OF 29 ug/L
- INTERPRETED AERIAL EXTENT OF TOLUENE ABOVE THE 15A NCAC STANDARD OF 1,000 ug/L
- INTERPRETED AERIAL EXTENT OF TOTAL XYLENES ABOVE THE 15A NCAC STANDARD OF 530 ug/L
- INTERPRETED AERIAL EXTENT OF NAPHTHALENE ABOVE THE 15A NCAC STANDARD OF 21 ug/L
- BQL BELOW QUANTITATION LIMITS
- NA NOT ANALYZED

DISSOLVED GROUNDWATER CONTAMINANT ISOPLETH MAP
TYPE II MONITORING WELLS
JUNE 10, 1999

25 0' 25 50
SCALE IN FEET

REFERENCE: J. A. JONES MONITORING REPORT.

PLOT DATE: 10/06/03
FORMAT REVISION

SURVEY NOTES:

1. VERTICAL DATUM IS BASED ON MILITARY CONTROL MONUMENT C-33 WHICH IS A STANDARD BRASS DISC SET IN THE TOP OF A CONCRETE MONUMENT SET BELOW GROUND LEVEL AND LOCATED AT THE NORTHWEST CORNER OF THE BREWSTER AND HOLCOMB BOULEVARD INTERSECTION. C-33 HAS AN ELEVATION OF 28.50 FEET, NORTH AMERICAN 1927 DATUM.
2. SURVEY CONTROL POINTS ARE BASED ON AN ASSUMED GRID AND MAGNETIC NORTH. THE COORDINATES AND THEIR RESPECTIVE ELEVATION ARE AS FOLLOWS:

POINT	NORTH	EAST	ELEVATION (MSL)	DESCRIPTION
PI-3	5000.00	5000.00	29.98	#120 NAIL
PI-4	5211.80	5393.73	28.02	#120 NAIL

REVISIONS

REV	DATE	BY	CHKD	APRVD	DESCRIPTION/ISSUE

PROJECT NO. 645823

DESIGNED BY	RBK	CHECKED BY	
DRAWN BY	JEL	APPROVED BY	

Shaw Environmental, Inc.

DEPARTMENT OF THE NAVY
NAVAL STATION

NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA

ANNUAL MONITORING REPORT
BUILDING 645
CAMP GEIGER, NORTH CAROLINA

DISSOLVED GROUNDWATER CONTAMINANT ISOPLETH MAP
TYPE II MONITORING WELLS-JUNE 10, 1999

SCALE:	SIZE:
AS SHOWN	D

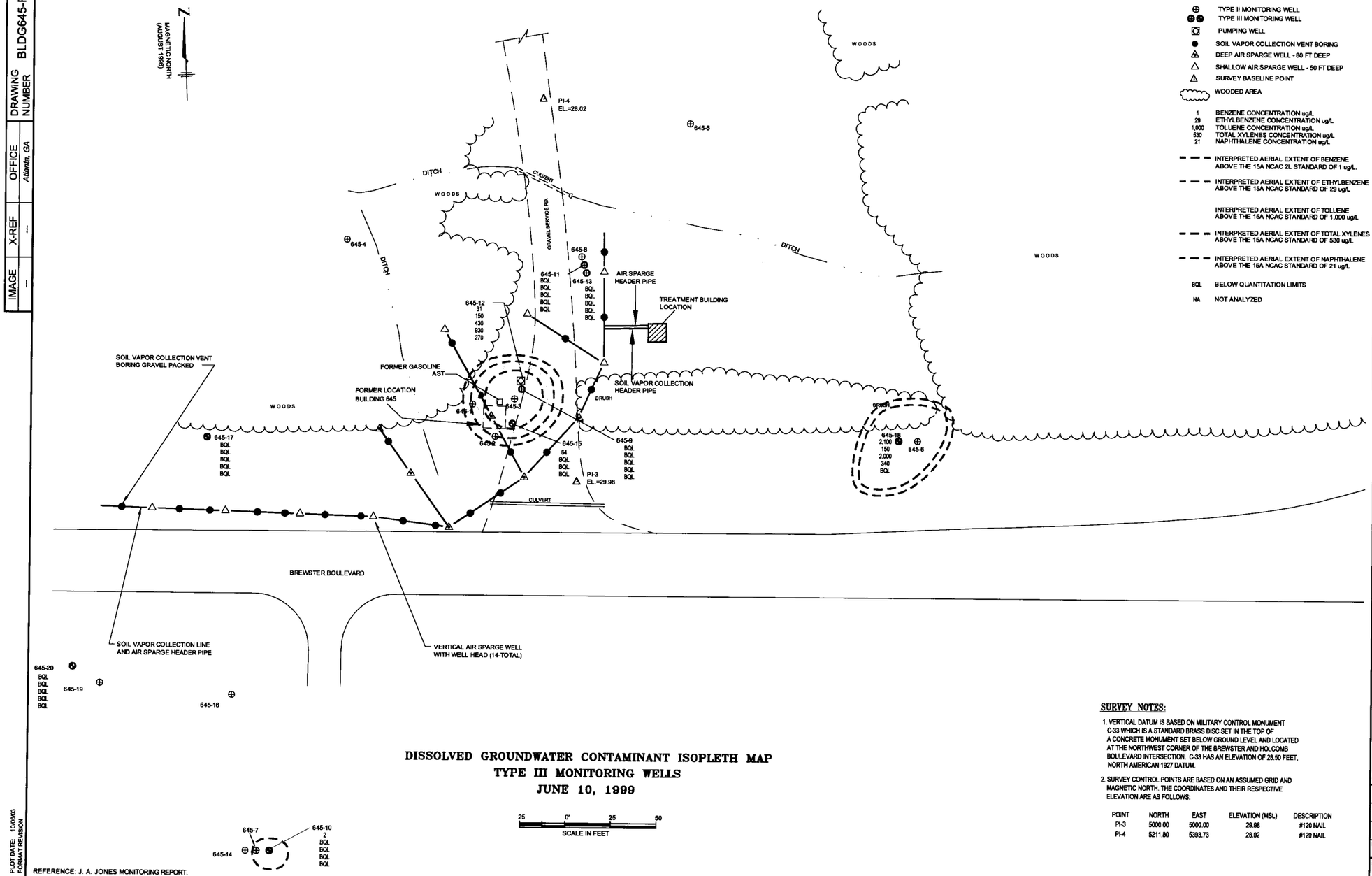
DELIVERY ORDER NO.
0011

CONSTR. CONTRACT NO.
N62470-02-D-3260

NAVFAC DRAWING NO.
7

SHEET I.D.
4-1

IMAGE	X-REF	OFFICE	DRAWING NUMBER
–	–	*Atlanta, GA*	BLDG645-FIG3-2



LEGEND

- BUILDING
- TYPE II MONITORING WELL
- TYPE III MONITORING WELL
- PUMPING WELL
- SOIL VAPOR COLLECTION VENT BORING
- DEEP AIR SPARGE WELL - 60 FT DEEP
- SHALLOW AIR SPARGE WELL - 50 FT DEEP
- SURVEY BASELINE POINT
- WOODED AREA

1 BENZENE CONCENTRATION ug/L
29 ETHYLBENZENE CONCENTRATION ug/L
1,000 TOLUENE CONCENTRATION ug/L
530 TOTAL XYLENES CONCENTRATION ug/L
21 NAPHTHALENE CONCENTRATION ug/L

- INTERPRETED AERIAL EXTENT OF BENZENE ABOVE THE 15A NCAC 2L STANDARD OF 1 ug/L.
- INTERPRETED AERIAL EXTENT OF ETHYLBENZENE ABOVE THE 15A NCAC STANDARD OF 29 ug/L.
- INTERPRETED AERIAL EXTENT OF TOLUENE ABOVE THE 15A NCAC STANDARD OF 1,000 ug/L.
- INTERPRETED AERIAL EXTENT OF TOTAL XYLENES ABOVE THE 15A NCAC STANDARD OF 530 ug/L.
- INTERPRETED AERIAL EXTENT OF NAPHTHALENE ABOVE THE 15A NCAC STANDARD OF 21 ug/L.

BQL BELOW QUANTITATION LIMITS
NA NOT ANALYZED

DISSOLVED GROUNDWATER CONTAMINANT ISOPLETH MAP
TYPE III MONITORING WELLS
JUNE 10, 1999

25 0' 25 50
SCALE IN FEET

SURVEY NOTES:

1. VERTICAL DATUM IS BASED ON MILITARY CONTROL MONUMENT C-33 WHICH IS A STANDARD BRASS DISC SET IN THE TOP OF A CONCRETE MONUMENT SET BELOW GROUND LEVEL AND LOCATED AT THE NORTHWEST CORNER OF THE BREWSTER AND HOLCOMB BOULEVARD INTERSECTION. C-33 HAS AN ELEVATION OF 28.50 FEET, NORTH AMERICAN 1927 DATUM.
2. SURVEY CONTROL POINTS ARE BASED ON AN ASSUMED GRID AND MAGNETIC NORTH. THE COORDINATES AND THEIR RESPECTIVE ELEVATION ARE AS FOLLOWS:

POINT	NORTH	EAST	ELEVATION (MSL)	DESCRIPTION
PI-3	5000.00	5000.00	29.98	#120 NAIL
PI-4	5211.80	5393.73	28.02	#120 NAIL

REFERENCE: J. A. JONES MONITORING REPORT.

PLOT DATE: 10/06/03
FORMAT REVISION

REV	DATE	BY	CHKD	APPVD	DESCRIPTION/ISSUE
					REVISIONS

PROJECT NO. 845823
DESIGNED BY RBK
DRAWN BY JEL
CHECKED BY RBK
APPROVED BY

Shaw Environmental, Inc.

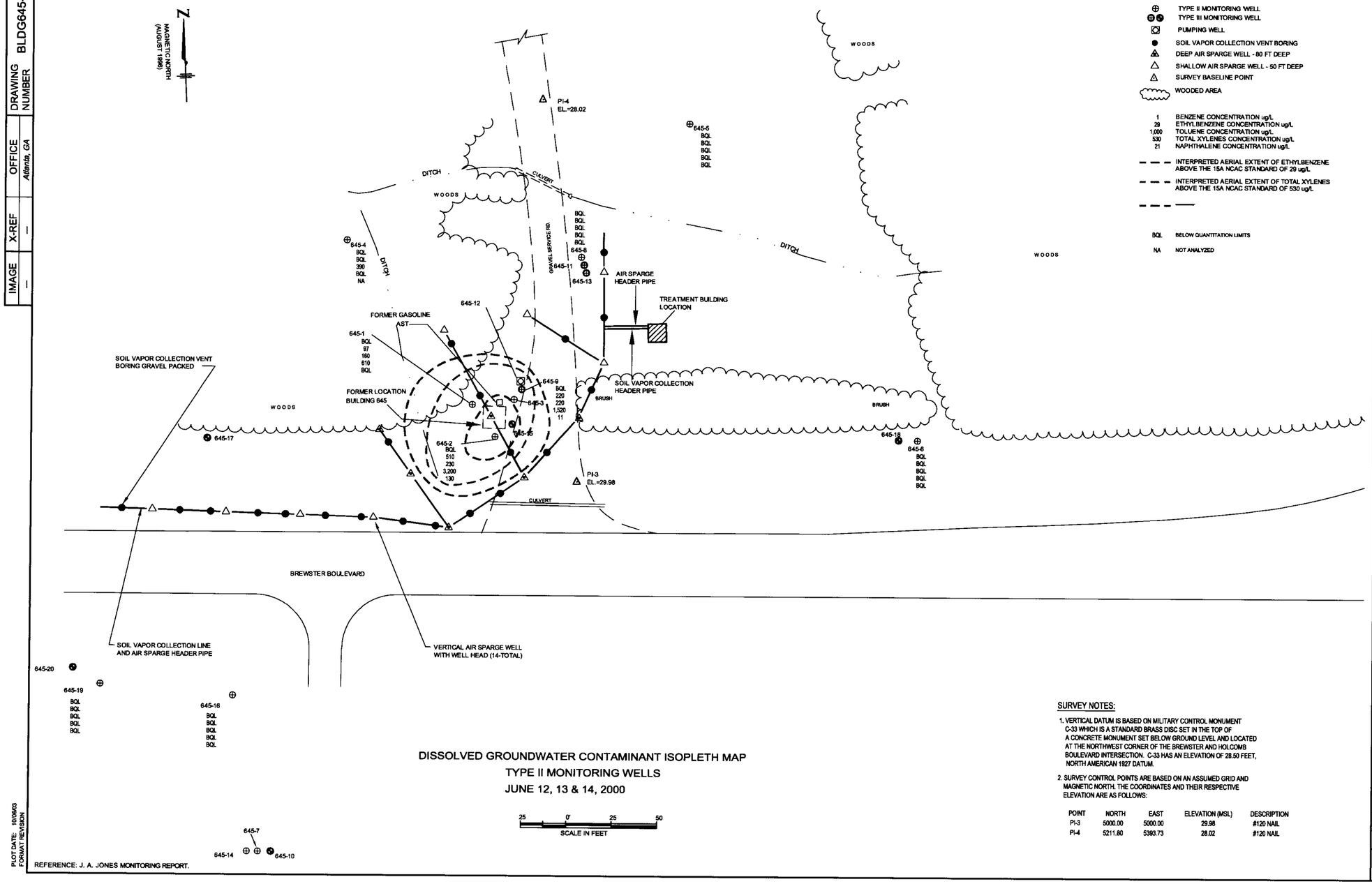
DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION ATLANTIC DIVISION NORFOLK, VIRGINIA

ANNUAL MONITORING REPORT
BUILDING 645
CAMP GEIGER, NORTH CAROLINA

DISSOLVED GROUNDWATER CONTAMINANT ISOPLETH MAP
TYPE III MONITORING WELLS–JUNE 10, 1999

SCALE: AS SHOWN
SIZE: D
DELIVERY ORDER NO. 0011
CONSTR. CONTRACT NO. N62470-02-D-3260
NAVFAC DRAWING NO. ?
SHEET I.D. 4-2

IMAGE	X-REF	OFFICE	DRAWING NUMBER
—	—	*Atlanta, GA*	BLDG645-FIG4-3



LEGEND

- BUILDING
- TYPE II MONITORING WELL
- TYPE III MONITORING WELL
- PUMPING WELL
- SOIL VAPOR COLLECTION VENT BORING
- DEEP AIR SPARGE WELL - 80 FT DEEP
- SHALLOW AIR SPARGE WELL - 50 FT DEEP
- SURVEY BASELINE POINT
- WOODED AREA

1 BENZENE CONCENTRATION ug/L
29 ETHYLBENZENE CONCENTRATION ug/L
1,000 TOLUENE CONCENTRATION ug/L
530 TOTAL XYLENES CONCENTRATION ug/L
21 NAPHTHALENE CONCENTRATION ug/L

- - - INTERPRETED AERIAL EXTENT OF ETHYLBENZENE ABOVE THE 15A NCAC STANDARD OF 29 ug/L.
- - - INTERPRETED AERIAL EXTENT OF TOTAL XYLENES ABOVE THE 15A NCAC STANDARD OF 530 ug/L.

BQL BELOW QUANTITATION LIMITS

NA NOT ANALYZED

DISSOLVED GROUNDWATER CONTAMINANT ISOPLETH MAP
TYPE II MONITORING WELLS
JUNE 12, 13 & 14, 2000

25 0' 25 50
SCALE IN FEET

REFERENCE: J. A. JONES MONITORING REPORT.

SURVEY NOTES:

1. VERTICAL DATUM IS BASED ON MILITARY CONTROL MONUMENT C-33 WHICH IS A STANDARD BRASS DISC SET IN THE TOP OF A CONCRETE MONUMENT SET BELOW GROUND LEVEL AND LOCATED AT THE NORTHWEST CORNER OF THE BREWSTER AND HOLCOMB BOULEVARD INTERSECTION. C-33 HAS AN ELEVATION OF 28.50 FEET, NORTH AMERICAN 1927 DATUM.
2. SURVEY CONTROL POINTS ARE BASED ON AN ASSUMED GRID AND MAGNETIC NORTH. THE COORDINATES AND THEIR RESPECTIVE ELEVATION ARE AS FOLLOWS:

POINT	NORTH	EAST	ELEVATION (MSL)	DESCRIPTION
PI-3	5000.00	5000.00	29.98	#120 NAIL
PI-4	5211.80	5393.73	28.02	#120 NAIL

PLOT DATE: 10/06/03
FORMAT REVISION

REVISIONS				
REV	DATE	BY	CHKD	APPVD

DESCRIPTION/ISSUE

PROJECT NO. 845823

DESIGNED BY	RBK	
DRAWN BY	JEL	
CHECKED BY	RBK	
APPROVED BY		

Shaw

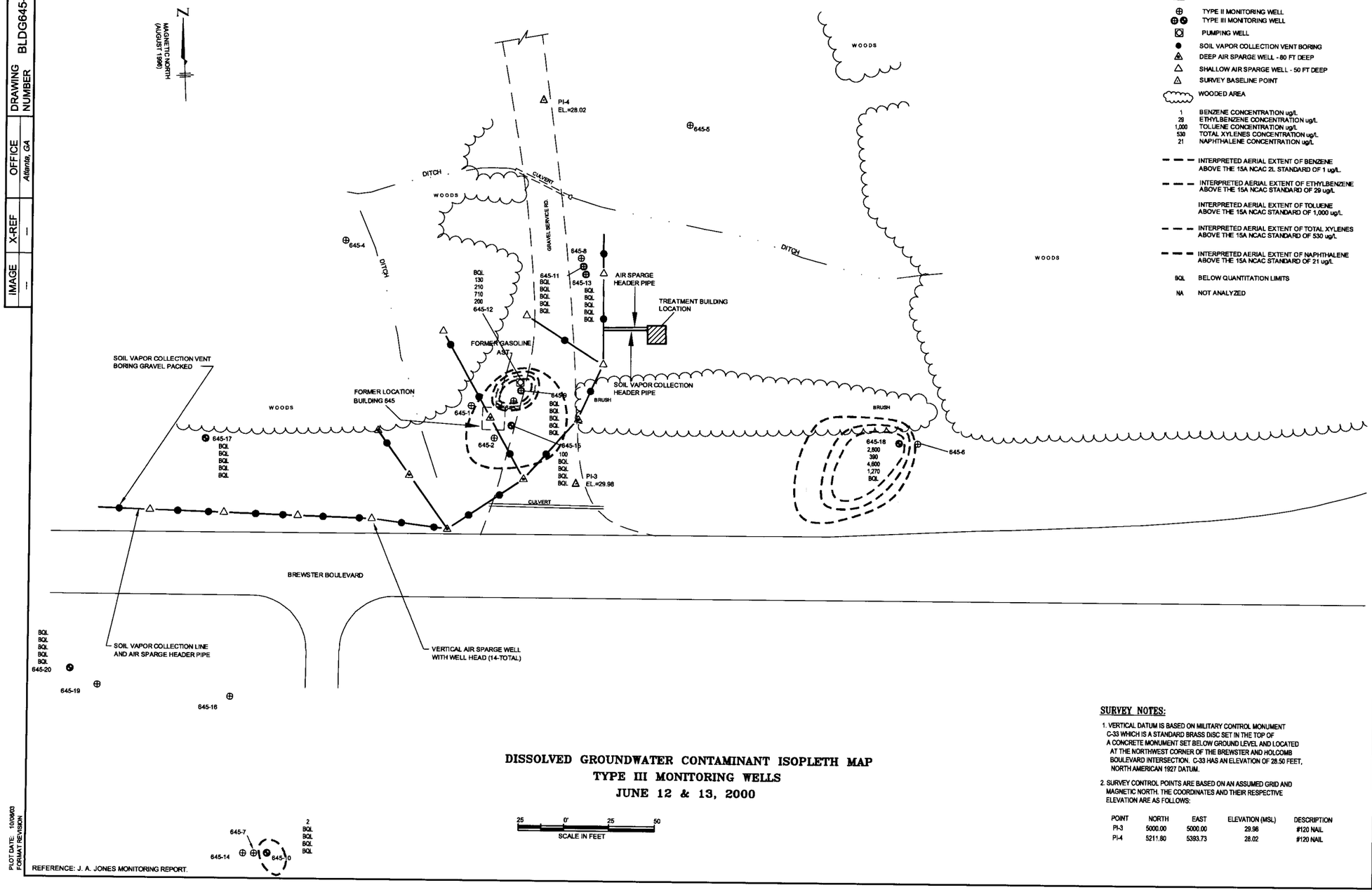
DEPARTMENT OF THE NAVY
NAVAL STATION
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA

ANNUAL MONITORING REPORT
BUILDING 645
CAMP GEIGER, NORTH CAROLINA

DISSOLVED GROUNDWATER CONTAMINANT ISOPLETH MAP
TYPE II MONITORING WELLS-JUNE 12, 13, & 14, 2000

SCALE: AS SHOWN	SIZE: D
DELIVERY ORDER NO. 0011	
CONSTR. CONTRACT NO. N62470-02-D-3260	
NAVFAC DRAWING NO. ?	
SHEET I.D. 4-3	

IMAGE	X-REF	OFFICE	DRAWING NUMBER
—	—	Atlanta, GA	BLDG645-FIG4-4



LEGEND

- BUILDING
- TYPE II MONITORING WELL
- TYPE III MONITORING WELL
- PUMPING WELL
- SOIL VAPOR COLLECTION VENT BORING
- DEEP AIR SPARGE WELL - 80 FT DEEP
- SHALLOW AIR SPARGE WELL - 50 FT DEEP
- SURVEY BASELINE POINT
- WOODED AREA

1 BENZENE CONCENTRATION ug/L
29 ETHYLBENZENE CONCENTRATION ug/L
1,000 TOLUENE CONCENTRATION ug/L
530 TOTAL XYLENES CONCENTRATION ug/L
21 NAPHTHALENE CONCENTRATION ug/L

- - - INTERPRETED AERIAL EXTENT OF BENZENE ABOVE THE 15A NCAC 2L STANDARD OF 1 ug/L.
- - - INTERPRETED AERIAL EXTENT OF ETHYLBENZENE ABOVE THE 15A NCAC STANDARD OF 29 ug/L.
INTERPRETED AERIAL EXTENT OF TOLUENE ABOVE THE 15A NCAC STANDARD OF 1,000 ug/L.
- - - INTERPRETED AERIAL EXTENT OF TOTAL XYLENES ABOVE THE 15A NCAC STANDARD OF 530 ug/L.
- - - INTERPRETED AERIAL EXTENT OF NAPHTHALENE ABOVE THE 15A NCAC STANDARD OF 21 ug/L.

BQL BELOW QUANTITATION LIMITS
NA NOT ANALYZED

SURVEY NOTES:

1. VERTICAL DATUM IS BASED ON MILITARY CONTROL MONUMENT C-33 WHICH IS A STANDARD BRASS DISC SET IN THE TOP OF A CONCRETE MONUMENT SET BELOW GROUND LEVEL AND LOCATED AT THE NORTHWEST CORNER OF THE BREWSTER AND HOLCOMB BOULEVARD INTERSECTION. C-33 HAS AN ELEVATION OF 28.50 FEET, NORTH AMERICAN 1927 DATUM.
2. SURVEY CONTROL POINTS ARE BASED ON AN ASSUMED GRID AND MAGNETIC NORTH. THE COORDINATES AND THEIR RESPECTIVE ELEVATION ARE AS FOLLOWS:

POINT	NORTH	EAST	ELEVATION (MSL)	DESCRIPTION
PI-3	5000.00	5000.00	29.98	#120 NAIL
PI-4	5211.80	5393.73	28.02	#120 NAIL

DISSOLVED GROUNDWATER CONTAMINANT ISOPLETH MAP
TYPE III MONITORING WELLS
JUNE 12 & 13, 2000

25 0' 25 50
SCALE IN FEET

REFERENCE: J. A. JONES MONITORING REPORT.

PLOT DATE: 10/09/03
FORMAT REVISION

REVISIONS					
REV	DATE	BY	CHKD	APPRVD	DESCRIPTION/ISSUE

PROJECT NO. 645823

DESIGNED BY	RBK	JEL
DRAWN BY	CHECKED BY	RBK
	APPROVED BY	

Shaw Environmental, Inc.

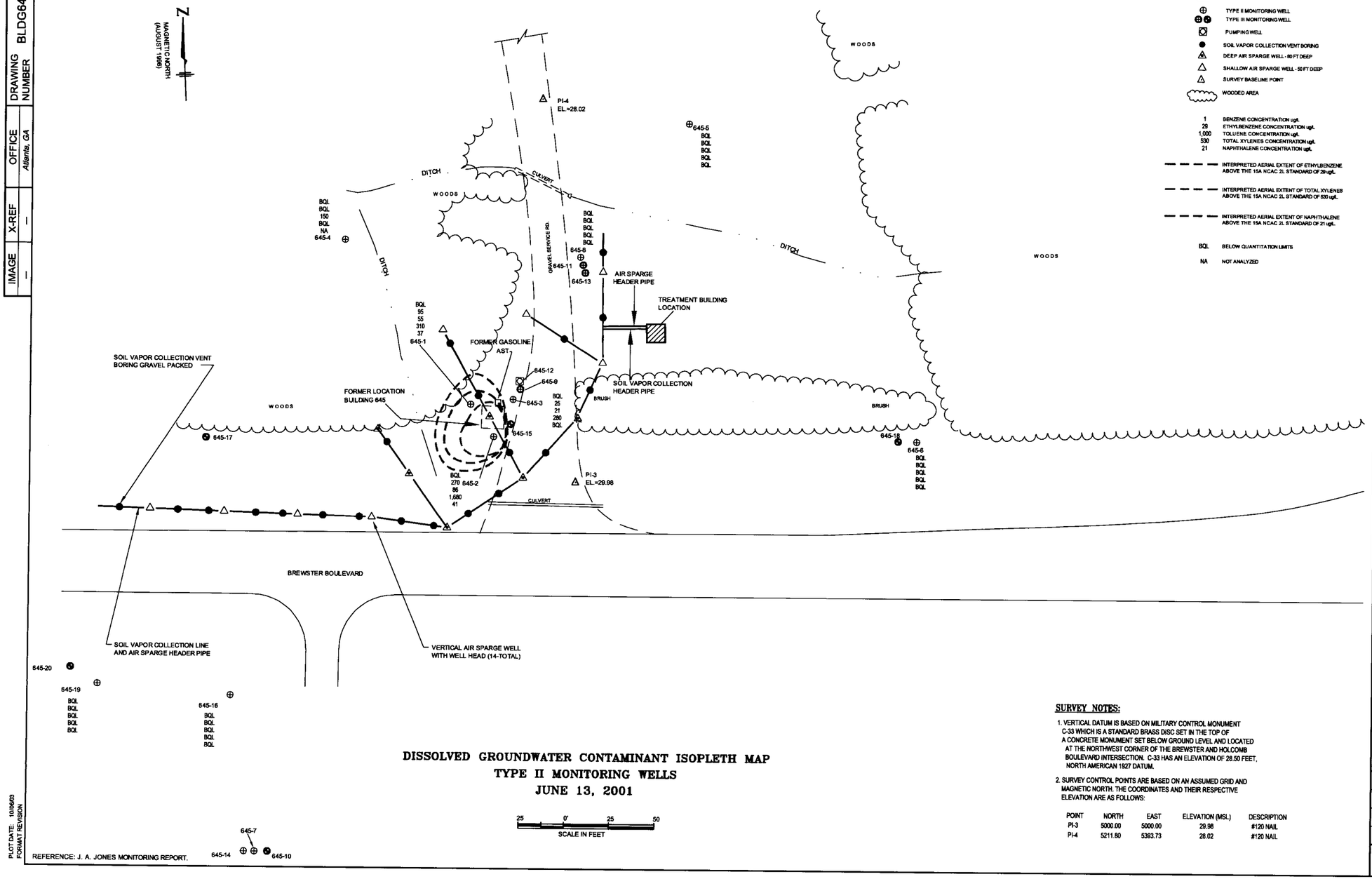
DEPARTMENT OF THE NAVY
NAVAL STATION
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA

ANNUAL MONITORING REPORT
BUILDING 645
CAMP GEIGER, NORTH CAROLINA

DISSOLVED GROUNDWATER CONTAMINANT ISOPLETH MAP
TYPE III MONITORING WELLS-JUNE 12 & 13, 2000

SCALE: AS SHOWN	SIZE: D
DELIVERY ORDER NO. 0011	
CONSTR. CONTRACT NO. N62470-02-D-3260	
NAVFAC DRAWING NO. ?	
SHEET I.D. 4-4	

IMAGE	X-REF	OFFICE	DRAWING NUMBER
—	—	*Atlanta, GA*	BLDG645-FIG4-5



DISSOLVED GROUNDWATER CONTAMINANT ISOPLETH MAP
TYPE II MONITORING WELLS
JUNE 13, 2001

25 0' 25 50
SCALE IN FEET

REFERENCE: J. A. JONES MONITORING REPORT.

PLOT DATE: 10/04/03
FORMAT REVISION

LEGEND

- BUILDING
- TYPE II MONITORING WELL
- TYPE III MONITORING WELL
- PUMPING WELL
- SOIL VAPOR COLLECTION VENT BORING
- DEEP AIR SPARGE WELL - 80 FT DEEP
- SHALLOW AIR SPARGE WELL - 50 FT DEEP
- SURVEY BASELINE POINT
- WOODED AREA

1	BENZENE CONCENTRATION ug/L
29	ETHYLBENZENE CONCENTRATION ug/L
1,000	TOLUENE CONCENTRATION ug/L
530	TOTAL XYLENES CONCENTRATION ug/L
21	NAPHTHALENE CONCENTRATION ug/L

- INTERPRETED AERIAL EXTENT OF ETHYLBENZENE ABOVE THE 15A NCAC 2L STANDARD OF 29 ug/L
- INTERPRETED AERIAL EXTENT OF TOTAL XYLENES ABOVE THE 15A NCAC 2L STANDARD OF 530 ug/L
- INTERPRETED AERIAL EXTENT OF NAPHTHALENE ABOVE THE 15A NCAC 2L STANDARD OF 21 ug/L

BQL BELOW QUANTITATION LIMITS
NA NOT ANALYZED

SURVEY NOTES:

1. VERTICAL DATUM IS BASED ON MILITARY CONTROL MONUMENT C-33 WHICH IS A STANDARD BRASS DISC SET IN THE TOP OF A CONCRETE MONUMENT SET BELOW GROUND LEVEL AND LOCATED AT THE NORTH-WEST CORNER OF THE BREWSTER AND HOLCOMB BOULEVARD INTERSECTION. C-33 HAS AN ELEVATION OF 28.50 FEET, NORTH AMERICAN 1927 DATUM.
2. SURVEY CONTROL POINTS ARE BASED ON AN ASSUMED GRID AND MAGNETIC NORTH. THE COORDINATES AND THEIR RESPECTIVE ELEVATION ARE AS FOLLOWS:

POINT	NORTH	EAST	ELEVATION (MSL.)	DESCRIPTION
PI-3	5000.00	5000.00	29.98	#120 NAIL
PI-4	5211.80	5393.73	28.02	#120 NAIL

REVISIONS					
REV	DATE	BY	CHKD	APPVD	DESCRIPTION/ISSUE

PROJECT NO. 645923

DESIGNED BY	RBK	CHECKED BY	
DRAWN BY	JEL	APPROVED BY	

Shaw Environmental, Inc.

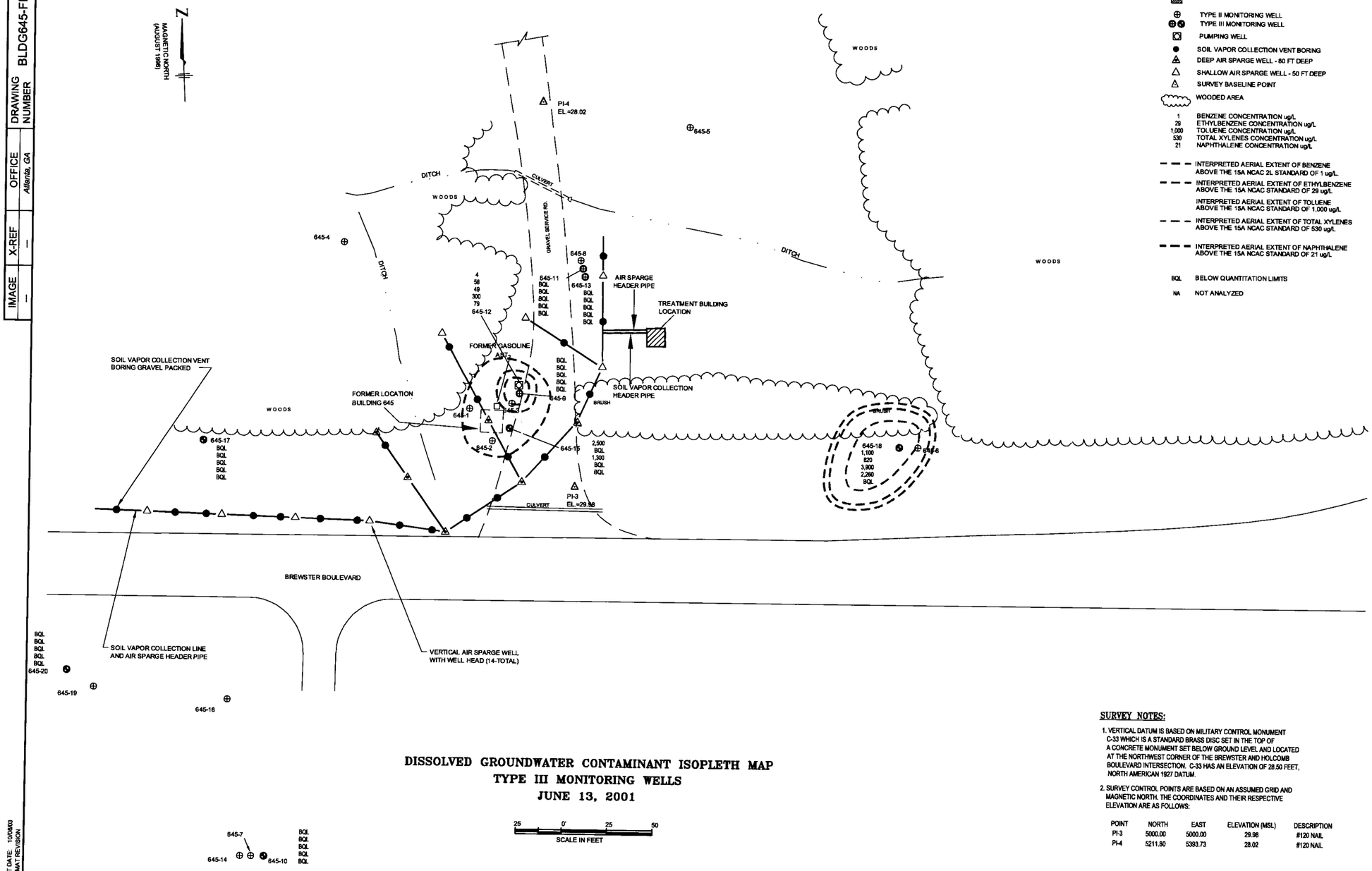
DEPARTMENT OF THE NAVY
NAVAL STATION
NAVAL FACILITIES ENGINEERING COMMAND
ATLANTIC DIVISION
NORFOLK, VIRGINIA

ANNUAL MONITORING REPORT
BUILDING 645
CAMP GEIGER, NORTH CAROLINA

DISSOLVED GROUNDWATER CONTAMINANT ISOPLETH MAP
TYPE II MONITORING WELLS-JUNE 13, 2001

SCALE: AS SHOWN	SIZE: D
DELIVERY ORDER NO. 0011	
CONSTR. CONTRACT NO. N62470-02-D-3260	
NAVFAC DRAWING NO. ?	
SHEET I.D. 4-5	

IMAGE	X-REF	OFFICE	DRAWING NUMBER
—	—	Atlanta, GA	BLDG645-FIG4-6



DISSOLVED GROUNDWATER CONTAMINANT ISOPLETH MAP
TYPE III MONITORING WELLS
JUNE 13, 2001

LEGEND

- BUILDING
- TYPE II MONITORING WELL
- TYPE III MONITORING WELL
- PUMPING WELL
- SOIL VAPOR COLLECTION VENT BORING
- DEEP AIR SPARGE WELL - 80 FT DEEP
- SHALLOW AIR SPARGE WELL - 50 FT DEEP
- SURVEY BASELINE POINT
- WOODED AREA

1 BENZENE CONCENTRATION ug/L
29 ETHYLBENZENE CONCENTRATION ug/L
1,000 TOLUENE CONCENTRATION ug/L
530 TOTAL XYLENES CONCENTRATION ug/L
21 NAPHTHALENE CONCENTRATION ug/L

- INTERPRETED AERIAL EXTENT OF BENZENE ABOVE THE 15A NCAC 2L STANDARD OF 1 ug/L
- INTERPRETED AERIAL EXTENT OF ETHYLBENZENE ABOVE THE 15A NCAC STANDARD OF 29 ug/L
- INTERPRETED AERIAL EXTENT OF TOLUENE ABOVE THE 15A NCAC STANDARD OF 1,000 ug/L
- INTERPRETED AERIAL EXTENT OF TOTAL XYLENES ABOVE THE 15A NCAC STANDARD OF 530 ug/L
- INTERPRETED AERIAL EXTENT OF NAPHTHALENE ABOVE THE 15A NCAC STANDARD OF 21 ug/L

BQL BELOW QUANTITATION LIMITS

NA NOT ANALYZED

SURVEY NOTES:

1. VERTICAL DATUM IS BASED ON MILITARY CONTROL MONUMENT C-33 WHICH IS A STANDARD BRASS DISC SET IN THE TOP OF A CONCRETE MONUMENT SET BELOW GROUND LEVEL AND LOCATED AT THE NORTHWEST CORNER OF THE BREWSTER AND HOLCOMB BOULEVARD INTERSECTION. C-33 HAS AN ELEVATION OF 28.50 FEET, NORTH AMERICAN 1927 DATUM.
2. SURVEY CONTROL POINTS ARE BASED ON AN ASSUMED GRID AND MAGNETIC NORTH. THE COORDINATES AND THEIR RESPECTIVE ELEVATION ARE AS FOLLOWS:

POINT	NORTH	EAST	ELEVATION (MSL)	DESCRIPTION
PI-3	5000.00	5000.00	29.98	#120 NAIL
PI-4	5211.80	5393.73	28.02	#120 NAIL

PLOT DATE: 10/08/03
FORMAT REVISION

REFERENCE: J. A. JONES MONITORING REPORT.

REVISIONS

REV	DATE	BY	CHKD	APPVD	DESCRIPTION/ISSUE

PROJECT NO. 645623

CHECKED BY	RBK	
APPROVED BY		
DESIGNED BY	RBK	JEL
DRAWN BY		

Shaw Environmental, Inc.

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING COMMAND
NAVAL STATION ATLANTIC DIVISION NORFOLK, VIRGINIA
ANNUAL MONITORING REPORT
BUILDING 645
CAMP GEIGER, NORTH CAROLINA
DISSOLVED GROUNDWATER CONTAMINANT ISOPLETH MAP
TYPE III MONITORING WELLS-JUNE 13, 2001

SCALE: AS SHOWN	SIZE: D
DELIVERY ORDER NO. 0011	
CONSTR. CONTRACT NO. N62470-02-D-3260	
NAVFAC DRAWING NO. ?	
SHEET I.D. 4-6	

APPENDIX F

RISK CLASSIFICATION AND LAND USE FORM

A. RISK CHARACTERIZATION

NOTE: *Source area means point of release from a UST system.*

Risk Classification and Land Use Form

Part I - Groundwater/Surface Water/Vapor Impacts
High Risk

1. *Has the release contaminated any water supply well including any used for non-drinking purposes?* **YES** NO
   Water supply well HP-645 was confirmed to have been impacted by petroleum constituents. The closest identified potential source was the AST utilized to supply the emergency generator located at Building 645. The well was inactivated in 1985 after petroleum impact was identified and permanently abandoned in 1995.

2. *Is a water supply well used for drinking water located within 1,000 feet of the source area of the discharge or release?* YES **NO**

   No active (or inactive) water supply wells were identified within 1,000 feet of the project site.

3. *Is a water supply well not used for drinking water (e.g., irrigation, washing cars, industrial cooling water, filling swimming pools) located within 250 feet of the source area of the release?* YES **NO**

4. *Does groundwater within 500 feet of the source area of the release have the potential for future use (there is no other source of water supply other than the groundwater)?* YES **NO**

5. *Do vapors from the release pose a threat of explosion because of accumulation of the vapors in a confined space or pose any other serious threat to public health, public safety or the environment? If YES describe.* YES **NO**
   All buildings formerly located at the project site were demolished and removed in 1995. The building that housed the remedial equipment is a portable style building without a foundation.

6. *Are there any other factors that would cause the discharge or release to pose an imminent danger to public health, public safety, or the environment? If YES describe.* YES **NO**

Intermediate Risk

7. *Is a surface water body located within 500 feet of the source area of the discharge or release?* **YES** NO
   *If **YES**, does the maximum groundwater contaminant concentration exceed the surface water quality standards and criteria found in 15A NCAC 2B.0200 by a factor of 10?* YES **NO**

   A drainage ditch crosses the subject site roughly 150 feet north of the release.

8. *Is the source area of the discharge or release located within an approved or planned wellhead protection area as defined in 42 USC 300h-7(e)? If YES describe.* **YES** NO
   MCB, Camp Lejeune has identified proposed wellhead protection areas on the base. The site is located in an area deemed as a wellhead protection area based the Zone 3 predicted 10-year capture zone calculated with maximum pumping presented in the Wellhead Protection Plan Update prepared by AH Consultants, dated August 2002. The site is not located within a calculated Zone 2 predicted 10-year capture zone calculated with average pumping rates.

9. *Is the release located in the Coastal Plain physiographic region as designated on a map entitled "Geology of North Carolina" published by the Department in 1985?* **YES** NO
   If YES, is the source area of the release located in an area in which there is recharge to an unconfined or semi-confined deeper aquifer that is being used or may be used as a source of drinking water? If YES describe. **YES** NO
   Groundwater samples collected from Type III monitoring wells at the site were found to contain levels of BTEX constituents. This indicates the potential that recharge to the deeper portions of the aquifer.

10. *Do the levels of groundwater contamination for any contaminant exceed the gross contamination levels established by the Department?* YES **NO**
    All contaminant levels from the December 2003 sampling event are below current GCLs. However, levels of 1-Methylnaphthalene have historically been identified at concentrations above laboratory detection limits. There is currently no GCL established for 1-Methylnaphthalene.

Part II - Land Use

Property Containing Source Area of Release

The questions below pertain to the property containing the source area of the release.

1. *Does the property contain one or more primary or secondary residences (permanent or temporary)? Describe.* YES **NO**

   The closest residences are located approximately 2,000 feet south of the subject site.

2. *Does the property contain a school, daycare center, hospital, playground, park, recreation area, church, nursing home, or other place of public assembly?* YES **NO**
Describe.
No structures remain on the subject site. However, an elementary school is located across Brewster Boulevard adjacent to the subject property.

3. *Does the property contain a commercial (e.g., retail, warehouse, office/business space, etc.) or industrial (e.g., manufacturing, utilities, industrial research and development, chemical/petroleum bulk storage, etc.) enterprise, an inactive commercial or industrial enterprise, or is the land undeveloped? Describe.* YES **NO**

   No structures remain on the subject site.

4. *Do children visit the property?* Explain. YES **NO**

   The subject site is a wooded area.

   Is access to the property reliably restricted consistent with its use (e.g., by fences, security personnel or both)? Explain. YES **NO**

   The site is located along the edge of a forested area aboard MCB, Camp Lejeune.

5. *Do pavement, buildings, or other structures cap the contaminated soil?* YES **NO**
Describe.

   No structures remain on the subject site.

   If YES, what mechanisms are in place or can be put into place to ensure that the contaminated soil will remain capped in the foreseeable future?

   N/A

6. *What is the zoning status of the property?*

   The MCB, Camp Lejeune is not subject to local or county zoning requirements.

7. *Is the use of the property likely to change in the next 20 years? Explain.*

   YES **NO**

   No. The designated use of the facility on the Base is not likely to change in the near future.

Property Surrounding Source Area of Release

The questions below pertain to the area within 1500 feet of the source area of the release (excludes property containing source area of the release):

1. *What is the distance from the source area of the release to the **nearest** primary or secondary residence (permanent or temporary)?*

   The nearest residence is located approximately 2,000 feet south of the subject site.

2. *What is the distance from the source area of the release to the **nearest** school, daycare center, hospital, playground, park, recreation area, church, nursing home or other place of public assembly?*
   An elementary school is located approximately 300 feet south southwest of the site. Across Brewster Boulevard.

3. *What is the zoning status of properties in the surrounding area?*

   As previously stated, MCB, Camp Lejeune is not subject to local or county zoning requirements. The surrounding property has been developed for military support purposes.

4. *Briefly characterize the use and activities of the land in the surrounding area.*

   The surrounding land is forested and used mainly for hunting.

B. RECEPTOR INFORMATION

1. Water Supply Wells

Seven active water supply wells were identified within 3,000 feet of the subject site. These include wells HP-643, HP-644, HP-646, HP-647, HP-703, HP-616, and HP-5186. The well locations are presented on the attached Figure 1. Two of the water supply wells, HP-644 and HP-646, are located within 1,500 feet of the subject site.

2. Public Water Supplies

Are public water supplies available within 1,500 feet of the source area of the release? **YES** NO

If YES, where is the location of the nearest public water lines and the source(s) of the public water supply (indicate on map). Describe.

Public water is provided to buildings within 1,500 feet of the subject site by water mains which carry treated potable water from the MCB water treatment system.

3. Surface Water

Identify all surface water bodies (e.g., ditch, pond, stream, lake, river) within 1,500 feet of the source area of the release. This information must be shown on the USGS topographic map.

A drainage ditch crosses the northern portion of the site and flows to the west into a tributary of Northeast Creek. See the attached Figure 1 for surface water locations.

4. Wellhead Protection Areas

Identify all planned or approved wellhead protection areas (e.g., ditch, pond, stream, lake, river) within 1,500 feet of the source area of the release. This information must be shown on the USGS topographic map. Wellhead protection areas are defined in 42 USC 300h-7(e).

According to the Wellhead Protection Plan – 2002 Update prepared by AH Environmental Consultants; the site is located within the interpreted 10-year capture zone calculated with maximum pumping rates. See the attached Figure 5-4 from the AH Environmental (2002) report for a graphical representation of the wellhead protection areas.

5. Deep Aquifers in the Coastal Plain Physiographic Region

(refer to page 19 of the guidelines) NOTE: This requirement only pertains to releases in the Coastal Plain physiographic region as designated on a map entitled "Geology of North Carolina" published by the Department in 1985.

As identified in the Geologic Map of North Carolina (North Carolina Department of Natural Resources and Community Development 1985), the subject site lies within the Coastal Plain physiographic province. Results of the groundwater analysis conducted on samples collected from the Type III monitoring wells indicates that the deeper portions of the aquifer have been impacted by petroleum constituents possibly associated with this site.

To some degree, seven of the ten aquifers identified to date in the North Carolina Coastal Plain are typically present beneath portions of the MCAS. In order of increasing depth, these aquifers include the Surficial, Castle Hayne, Beaufort, Peedee, Black Creek, and upper and lower Cape Fear aquifers. Both the Beaufort and Peedee Aquifers contain saltwater in portions of the MCB, Camp Lejeune and are not generally used for water supply. The Castle Hayne Aquifer contains freshwater and is the principal aquifer used in the area for water supply.

6. Subsurface Structures

Numerous underground utilities are present throughout the site. These utilities are located above the shallow groundwater table and are not considered potential receptors. Additionally, an active groundwater remediation system is currently in operation at the subject site.

7. Property Owners and Occupants

(see Table 6)

The subject site is owned and operated by the Commanding General – Marine Corps Base, Camp Lejeune.

APPENDIX G

ANALYTICAL DATA SUMMARY TABLES
DECEMBER 2002
THROUGH
DECEMBER 2003

Table 1
Summary of Laboratory Analyses for Groundwater
Building 645
December 2002

Sample Location	NCGWQS	MW-1	MW-2	MW-3	MW-4	MW-6	MW-9	MW-11	MW-12
Date Sampled		12/19/02	12/19/02	12/19/02	12/19/02	12/18/02	12/19/02	12/19/02	12/19/02
EPA 602 (µg/L)									
Benzene	1	**1.1**	<1.0	<1.0	<1.0	**0.81 J**	<1.0	<1.0	<1.0
Ethylbenzene	29	**44.5**	**5.9**	**2.7 J**	<1.0	**14.8**	**1.5**	<1.0	**1.8**
Toluene	1000	**6.5**	**1.1**	**0.7**	<1.0	**8.6**	<1.0	<1.0	<1.0
Xylenes (total)	530	**167**	**43.7**	**42.5**	<3.0	**36.6**	**1.6 J**	<3.0	**3.1**
Methyl Tert Butyl Ether	200	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total BTEX		**219.1**	**50.7**	**45.9**	**ND**	**60.8**	**3.1**	**ND**	**4.9**
EPA 610 (µg/L)									
Acenaphthene	80	<5.2	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
Acenaphthylene	210	<5.2	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
Anthracene	2100	<5.2	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
Benzo(a)anthracene	0.05	<5.2	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
Fluoranthene	280	<5.2	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
Fluorene	280	<5.2	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
1-Methylnaphthalene	RL	NR	NR	NR	NR	NR	NR	NR	NR
2-Methylnaphthalene	14	NR	NR	NR	NR	NR	NR	NR	NR
Naphthalene	21	**24**	**21.9**	**4.4 J**	<5.1	<5.1	<5.1	<5.1	<5.1
Phenanthrene	210	<5.2	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
Pyrene	210	<5.2	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1

Sample Location	NCGWQS	MW-13	MW-15	MW-16	MW-17	MW-18	MW-21	MW-22	MW-23
Date Sampled		12/19/02	12/19/02	12/18/02	12/18/02	12/18/02	12/19/02	12/19/02	12/19/02
EPA 602 (µg/L)									
Benzene	1	<1.0	<1.0	<1.0	<1.0	**78.4**	<1.0	**1.9 J**	<1.0
Ethylbenzene	29	<1.0	<1.0	<1.0	<1.0	**305**	<1.0	<2.0	<1.0
Toluene	1000	<1.0	<1.0	<1.0	<1.0	**351**	<1.0	<2.0	<1.0
Xylenes (total)	530	<3.0	<3.0	<3.0	<3.0	**730**	<3.0	<6.0	<3.0
Methyl Tert Butyl Ether	200	<1.0	**36.8**	<1.0	<1.0	<10	<1.0	**188**	<1.0
Total BTEX		**ND**	**ND**	**ND**	**ND**	**1464.4**	**ND**	**1.9**	**ND**
EPA 610 (µg/L)									
Acenaphthene	80	<5.1	<5.2	<5.3	<5.1	<5.1	<5.1	<5.6	<5.1
Acenaphthylene	210	<5.1	<5.2	<5.3	<5.1	<5.1	<5.1	<5.6	<5.1
Anthracene	2100	<5.1	<5.2	<5.3	<5.1	<5.1	<5.1	<5.6	<5.1
Benzo(a)anthracene	0.05	<5.1	<5.2	<5.3	<5.1	<5.1	<5.1	<5.6	<5.1
Fluoranthene	280	<5.1	<5.2	<5.3	<5.1	<5.1	<5.1	<5.6	<5.1
Fluorene	280	<5.1	<5.2	<5.3	<5.1	<5.1	<5.1	<5.6	<5.1
1-Methylnaphthalene	RL	NR	NR	NR	NR	NR	NR	NR	NR
2-Methylnaphthalene	14	NR	NR	NR	NR	NR	NR	NR	NR
Naphthalene	21	<5.1	<5.2	<5.3	<5.1	**8.9**	<5.1	<5.6	<5.1
Phenanthrene	210	<5.1	<5.2	<5.3	<5.1	<5.1	<5.1	<5.6	<5.1
Pyrene	210	<5.1	<5.2	<5.3	<5.1	<5.1	<5.1	<5.6	<5.1

ND: None detected; no benzene, toluene, ethylbenzene, or xylene isomers were detected

NR: Not reported; analyte not reported in source document

NCGWQS: North Carolina Groundwater Quality Standard

RL: Reporting Limit, no NCGWQS established for the consitituent; thereffore, the NCGWQS for the constituent is the reporting limit

µg/L: micrograms per liter

<#: not detected at the indicated reporting limit

J: estimated concentration less than reporting limit

Bold type indicates detectable concentrations.

Shaded area indicates detectable concentration above the North Carolina Groundwater Quality Standards

Table 1
Summary of Laboratory Analyses for Groundwater
Building 645
March 2003

Sample Location	**NCGWQS**	**MW-1**	**MW-2**	**MW-3**	**MW-9**	**MW-12**
Date Sampled		03/14/03	03/14/03	03/13/03	03/13/03	03/13/03
EPA 602 (µg/L)						
Benzene	1	**1.1**	**0.52 J**	<1.0	<1.0	**8.7**
Ethylbenzene	29	**26.9**	**18.3**	**6.9**	<1.0	**82.2**
Toluene	1000	**23**	**6.7**	**13.1**	<1.0	**230**
Xylenes (total)	530	**126**	**144**	**54.6**	<3.0	**806**
Methyl Tert Butyl Ether	200	<1.0	<2.0	<1.0	<1.0	<1.0
Total BTEX		**177.0**	**169.52**	**74.6**	**ND**	**1126.9**
EPA 610 (µg/L)						
Acenaphthene	80	<5.1	<5.0	<5.1	<5.1	<21
Acenaphthylene	210	<5.1	<5.0	<5.1	<5.1	<21
Anthracene	2100	<5.1	<5.0	<5.1	<5.1	<21
Benzo(a)anthracene	0.05	<5.1	<5.0	<5.1	<5.1	<21
Fluoranthene	280	<5.1	<5.0	<5.1	<5.1	<21
Fluorene	280	<5.1	<5.0	<5.1	<5.1	<21
1-Methylnaphthalene	RL	NR	NR	NR	NR	NR
2-Methylnaphthalene	14	NR	NR	NR	NR	NR
Naphthalene	21	**19.7**	**24.4**	**6.0**	<5.1 J	**113**
Phenanthrene	210	<5.1	<5.0	<5.1	<5.1	<21
Pyrene	210	<5.1	<5.0	<5.1	<5.1	<21

Sample Location	**NCGWQS**	**MW-15**	**MW-18**	**MW-21**	**MW-22**	**MW-23**
Date Sampled		03/14/03	03/14/03	03/13/03	03/13/03	03/13/03
EPA 602 (µg/L)						
Benzene	1	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	29	**3.8**	**0.65 J**	<1.0	**2.5**	**3.4**
Toluene	1000	**2.5**	**0.91 J**	<1.0	**2.3**	**6.3**
Xylenes (total)	530	**17.6**	**4.0**	<3.0	**16**	**24.8**
Methyl Tert Butyl Ether	200	**95**	<1.0	<1.0	**47.3**	<1.0
Total BTEX		**23.9**	**5.56**	**ND**	**20.8**	**34.5**
EPA 610 (µg/L)						
Acenaphthene	80	<5.1	<5.1	<5.1	<5.1	<5.1
Acenaphthylene	210	<5.1	<5.1	<5.1	<5.1	<5.1
Anthracene	2100	<5.1	<5.1	<5.1	<5.1	<5.1
Benzo(a)anthracene	0.05	<5.1	<5.1	<5.1	<5.1	<5.1
Fluoranthene	280	<5.1	<5.1	<5.1	<5.1	<5.1
Fluorene	280	<5.1	<5.1	<5.1	<5.1	<5.1
1-Methylnaphthalene	RL	NR	NR	NR	NR	NR
2-Methylnaphthalene	14	NR	NR	NR	NR	NR
Naphthalene	21	<5.1	<5.1	<5.1	**3.5 J**	**3.6 J**
Phenanthrene	210	<5.1	<5.1	<5.1	<5.1	<5.1
Pyrene	210	<5.1	<5.1	<5.1	<5.1	<5.1

ND: None detected; no benzene, toluene, ethylbenzene, or xylene isomers were detected

NR: Not reported; analyte not reported in source document

NCGWQS: North Carolina Groundwater Quality Standard

RL: Reporting Limit, no NCGWQS established for the consitituent; thereffore, the NCGWQS for the constituent is the reporting limit

µg/L: micrograms per liter

<#: not detected at the indicated reporting limit

J: estimated concentration less than reporting limit

Bold type indicates detectable concentrations.

Shaded area indicates detectable concentration above the North Carolina Groundwater Quality Standards

Table 1
Summary of Laboratory Analyses for Groundwater
Building 645
June 2003

Sample Location	NCGWQS	MW-1	MW-2	MW-3	MW-4	MW-6	MW-9	MW-11	MW-12
Date Sampled		06/25/03	06/25/03	06/24/03	06/25/03	06/24/03	06/24/03	06/24/03	06/24/03
EPA 602 (µg/L)									
Benzene	1	<5.0	<2.0	**1.2**	<1.0	**2.3**	<1.0	**0.96 J**	**3.7**
Ethylbenzene	29	**22.3**	**48.7**	**9.4**	**0.6 J**	**13.1**	**3.4**	**6.7**	**41.0**
Toluene	1000	**15.9**	**10.4**	**11.6**	**7.9**	**26.8**	**3.8**	**11.1**	**56.5**
Xylenes (total)	530	**83.8**	**311**	**44.5**	**2.8 J**	**44.3**	**15.6**	**23.5**	**211**
Methyl Tert Butyl Ether	200	<10	<20	**0.88 J**	<1.0	**2.3**	<1.0	**0.97 J**	<2.0
Total BTEX		**122.0**	**370.1**	**66.7**	**11.3**	**86.5**	**22.8**	**42.26**	**312.2**
EPA 610 (µg/L)									
Acenaphthene	80	<5.0	<5.0	<5.0	<5.1	<5.0	<5.0	<5.0	<25
Acenaphthylene	210	<5.0	<5.0	<5.0	<5.1	<5.0	<5.0	<5.0	<25
Anthracene	2100	<5.0	<5.0	<5.0	<5.1	<5.0	<5.0	<5.0	<25
Benzo(a)anthracene	0.05	<5.0	<5.0	<5.0	<5.1	<5.0	<5.0	<5.0	<25
Fluoranthene	280	<5.0	<5.0	<5.0	<5.1	<5.0	<5.0	<5.0	<25
Fluorene	280	<5.0	<5.0	<5.0	<5.1	<5.0	<5.0	<5.0	<25
1-Methylnaphthalene	RL	NR	NR	NR	NR	NR	NR	NR	NR
2-Methylnaphthalene	14	NR	NR	NR	NR	NR	NR	NR	NR
Naphthalene	21	**13.1**	**36.5**	<5.0	<5.1	<5.0	**2.2 J**	<5.0	**53**
Phenanthrene	210	<5.0	<5.0	<5.0	<5.1	<5.0	<5.0	<5.0	<25
Pyrene	210	<5.0	<5.0	<5.0	<5.1	<5.0	<5.0	<5.0	<25

Sample Location	NCGWQS	MW-13	MW-15	MW-16	MW-17	MW-18	MW-21	MW-22	MW-23
Date Sampled		06/24/03	06/25/03	06/25/03	06/24/03	06/24/03	06/25/03	06/24/03	06/24/03
EPA 602 (µg/L)									
Benzene	1	**0.88 J**	<1.0	<1.0	<1.0	**730**	<1.0	**4.0**	<1.0
Ethylbenzene	29	**7.0**	**1.3**	**0.84 J**	<1.0	**691.0**	**0.56 J**	**1.7**	**1.5**
Toluene	1000	**12.3**	**0.95 J**	**1.3**	<1.0	**2930**	<1.0	**3.3**	**2.3**
Xylenes (total)	530	**26.1**	**6.2**	**3.0**	<3.0	**2340**	**2.6 J**	**6.1**	**5.8**
Methyl Tert Butyl Ether	200	**1.1**	**89.4**	<1.0	<1.0	**123**	<1.0	**46.9**	<1.0
Total BTEX		**46.28**	**8.45**	**5.14**	**ND**	**6691**	**3.16**	**15.1**	**9.6**
EPA 610 (µg/L)									
Acenaphthene	80	<5.1	<5.0	<5.0	<5.0	<5.0	<5.1	<7.2	<5.0
Acenaphthylene	210	<5.1	<5.0	<5.0	<5.0	<5.0	<5.1	<7.2	<5.0
Anthracene	2100	<5.1	<5.0	<5.0	<5.0	<5.0	<5.1	<7.2	<5.0
Benzo(a)anthracene	0.05	<5.1	<5.0	<5.0	<5.0	<5.0	<5.1	<7.2	<5.0
Fluoranthene	280	<5.1	<5.0	<5.0	<5.0	<5.0	<5.1	<7.2	<5.0
Fluorene	280	<5.1	<5.0	<5.0	<5.0	<5.0	<5.1	<7.2	<5.0
1-Methylnaphthalene	RL	NR	NR	NR	NR	NR	NR	NR	NR
2-Methylnaphthalene	14	NR	NR	NR	NR	NR	NR	NR	NR
Naphthalene	21	<5.1	<5.0	<5.0	<5.0	**19.7**	<5.1	<7.2	<5.0
Phenanthrene	210	<5.1	<5.0	<5.0	<5.0	<5.0	<5.1	<7.2	<5.0
Pyrene	210	<5.1	<5.0	<5.0	<5.0	<5.0	<5.1	<7.2	<5.0

ND: None detected; no benzene, toluene, ethylbenzene, or xylene isomers were detected

NR: Not reported; analyte not reported in source document

NCGWQS: North Carolina Groundwater Quality Standard

RL: Reporting Limit, no NCGWQS established for the consitituent; thereffore, the NCGWQS for the constituent is the reporting limit

µg/L: micrograms per liter

<#: not detected at the indicated reporting limit

J: estimated concentration less than reporting limit

Bold type indicates detectable concentrations.

Shaded area indicates detectable concentration above the North Carolina Groundwater Quality Standards

Table 1
Summary of Laboratory Analyses for Groundwater
Building 645
September 2003

Sample Location	NCGWQS	MW-1	MW-2	MW-3	MW-9	MW-12	MW-15
Date Sampled		09/26/03	09/26/03	09/26/03	09/26/03	09/26/03	09/29/03
EPA 602 (µg/L)							
Benzene	1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Ethylbenzene	29	**81.1**	**80.2**	**6.4**	<1.0	**9.6**	<1.0
Toluene	1000	**113**	**18.8**	**0.76 J**	<1.0	**7.9**	<1.0
Xylenes (total)	530	**334**	**670**	**22.6**	<3.0	**47.6**	<3.0
Methyl Tert Butyl Ether	200	<10	<1.0	<1.0	<1.0	<1.0	**63.9**
Total BTEX		**528.1**	**769**	**29.76**	**ND**	**65.1**	**ND**
EPA 610 (µg/L)							
Acenaphthene	80	<5.0	<5.3	<5.1	<5.1	<5.3	<5.0
Acenaphthylene	210	<5.0	<5.3	<5.1	<5.1	<5.3	<5.0
Anthracene	2100	<5.0	<5.3	<5.1	<5.1	<5.3	<5.0
Benzo(a)anthracene	0.05	<5.0	<5.3	<5.1	<5.1	<5.3	<5.0
Fluoranthene	280	<5.0	<5.3	<5.1	<5.1	<5.3	<5.0
Fluorene	280	<5.0	<5.3	<5.1	<5.1	<5.3	<5.0
1-Methylnaphthalene	RL	**28.1**	**29.2**	**3.7 J**	<5.1	**3.7 J**	<5.0
2-Methylnaphthalene	14	**40.5**	**49.9**	**5.1**	<5.1	**4.4 J**	<5.0
Naphthalene	21	**46.6**	**52.1**	**7.9**	<5.1	**11.3**	<5.0
Phenanthrene	210	<5.0	<5.3	<5.1	<5.1	<5.3	<5.0
Pyrene	210	<5.0	<5.3	<5.1	<5.1	<5.3	<5.0

Sample Location	NCGWQS	MW-18	MW-21	MW-22	MW-23	MW-23D
Date Sampled		09/29/03	09/29/03	09/29/03	09/26/03	09/26/03
EPA 602 (µg/L)						
Benzene	1	**755**	<1.0	**5.7**	<1.0	<1.0
Ethylbenzene	29	**761**	<1.0	<1.0	<1.0	<1.0
Toluene	1000	**3420**	<1.0	<1.0	<1.0	<1.0
Xylenes (total)	530	**2490**	<3.0	<3.0	<3.0	<3.0
Methyl Tert Butyl Ether	200	<50	<1.0	**42.9**	<1.0	<1.0
Total BTEX		**7426**	**ND**	**5.7**	**ND**	**ND**
EPA 610 (µg/L)						
Acenaphthene	80	<5.0	<5.1	<5.1	<5.3	<5.1
Acenaphthylene	210	<5.0	<5.1	<5.1	<5.3	<5.1
Anthracene	2100	<5.0	<5.1	<5.1	<5.3	<5.1
Benzo(a)anthracene	0.05	<5.0	<5.1	<5.1	<5.3	<5.1
Fluoranthene	280	<5.0	<5.1	<5.1	<5.3	<5.1
Fluorene	280	<5.0	<5.1	<5.1	<5.3	<5.1
1-Methylnaphthalene	RL	<5.0	<5.1	<5.1	<5.3	<5.1
2-Methylnaphthalene	14	<5.0	<5.1	<5.1	<5.3	<5.1
Naphthalene	21	**15.5**	<5.1	<5.1	<5.3	<5.1
Phenanthrene	210	<5.0	<5.1	<5.1	<5.3	<5.1
Pyrene	210	<5.0	<5.1	<5.1	<5.3	<5.1

MW-23D is a duplicate sample collected at well MW-23

ND: None detected; no benzene, toluene, ethylbenzene, or xylene isomers were detected

NCGWQS: North Carolina Groundwater Quality Standard

RL: Reporting Limit, no NCGWQS established for the consitituent; thereffore, the NCGWQS for the constituent is the reporting limit

µg/L: micrograms per liter

<#: not detected at the indicated reporting limit

J: estimated concentration less than reporting limit

Bold type indicates detectable concentrations.

Shaded area indicates detectable concentration above the North Carolina Groundwater Quality Standards

Table 1
Summary of Laboratory Analyses for Groundwater
Building 645
December 2003

Sample Location	NCGWQS	MW-1	MW-2	MW-3	MW-6	MW-9	MW-11	MW-12	MW-12D
Date Sampled		12/08/03	12/08/03	12/09/03	12/10/03	12/09/03	12/10/03	12/09/03	12/09/03
EPA 602 (µg/L)									
Benzene	1	<1.0	**2.4**	**0.94 J**	<1.0	<1.0	<1.0	**0.68 J**	**0.65 J**
Ethylbenzene	29	**94.3**	**110**	**22.1**	<1.0	<1.0	<1.0	**9.2**	**9.0**
Toluene	1000	**81.2**	**28.2**	**1.6**	<1.0	<1.0	<1.0	**9.8**	**9.7**
Xylenes (total)	530	**273**	**716**	**52.5**	**2.3 J**	<3.0	<3.0	**42.6**	**41.9**
Methyl Tert Butyl Ether	200	**7.2**	**11.7**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
Total BTEX		**448.5**	**856.6**	**77.14**	**2.3**	**ND**	**ND**	**62.28**	**61.25**
EPA 625 (µg/L)									
Acenaphthene	80	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
Acenaphthylene	210	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
Anthracene	2100	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
Benzo(a)anthracene	0.05	<5.1 *	<5.1 *	<5.1 *	<5.1 *	<5.1 *	<5.1 *	<5.1 *	<5.1 *
Fluoranthene	280	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
Fluorene	280	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
1-Methylnaphthalene	RL	**23.4**	**30.0**	**7.4**	<5.1	<5.1	<5.1	**2.0 J**	**2.1 J**
2-Methylnaphthalene	14	**34.3**	**42.9**	**8.3**	<5.1	<5.1	<5.1	**2.6 J**	**3.0 J**
Naphthalene	21	**32.2**	**45.1**	**18.9**	<5.1	<5.1	<5.1	**7.9**	**8.3**
Phenanthrene	210	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1
Pyrene	210	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1	<5.1

Sample Location	NCGWQS	MW-13	MW-15	MW-16	MW-17	MW-18	MW-21	MW-22	MW-23
Date Sampled		12/10/03	12/08/03	12/10/03	12/11/03	12/10/03	12/12/03	12/09/03	12/09/03
EPA 602 (µg/L)									
Benzene	1	<1.0	<1.0	<1.0	<1.0	**788**	<1.0	**6.9**	<1.0
Ethylbenzene	29	<1.0	<1.0	**0.87 J**	<1.0	**838**	<1.0	**0.72 J**	<1.0
Toluene	1000	<1.0	<1.0	**0.94 J**	<1.0	**3570**	<1.0	**1.4**	<1.0
Xylenes (total)	530	<3.0	<3.0	**1.4 J**	<3.0	**2260**	<3.0	<3.0	<3.0
Methyl Tert Butyl Ether	200	<1.0	**49.8**	<1.0	<1.0	<50	<1.0	**35.7**	<1.0
Total BTEX		**ND**	**ND**	**3.21**	**ND**	**7456**	**ND**	**9.02**	**ND**
EPA 625 (µg/L)									
Acenaphthene	80	<5.1	<5.1	<5.1	<5.0	<5.1	<5.0	<5.1	<5.1
Acenaphthylene	210	<5.1	<5.1	<5.1	<5.0	<5.1	<5.0	<5.1	<5.1
Anthracene	2100	<5.1	<5.1	<5.1	<5.0	<5.1	<5.0	<5.1	<5.1
Benzo(a)anthracene	0.05	<5.1	<5.1	<5.1	<5.0	<5.1	<5.0	<5.1	<5.1
Fluoranthene	280	<5.1	<5.1	<5.1	<5.0	<5.1	<5.0	<5.1	<5.1
Fluorene	280	<5.1	<5.1	<5.1	<5.0	<5.1	<5.0	<5.1	<5.1
1-Methylnaphthalene	RL	<5.1	<5.1	<5.1	<5.0	<5.1	<5.0	<5.1	<5.1
2-Methylnaphthalene	14	<5.1	<5.1	<5.1	<5.0	<5.1	<5.0	<5.1	<5.1
Naphthalene	21	<5.1	<5.1	<5.1	<5.0	**15.1**	<5.0	<5.1	<5.1
Phenanthrene	210	<5.1	<5.1	<5.1	<5.0	<5.1	<5.0	<5.1	<5.1
Pyrene	210	<5.1	<5.1	<5.1	<5.0	<5.1	<5.0	<5.1	<5.1

MW-12D is a duplicate sample collected at well MW-12

ND: None detected; no benzene, toluene, ethylbenzene, or xylene isomers were detected

NCGWQS: North Carolina Groundwater Quality Standard

RL: Reporting Limit, no NCGWQS established for the consitituent; thereffore, the NCGWQS for the constituent is the reporting limit

µg/L: micrograms per liter

<#: not detected at the indicated reporting limit

J: estimated concentration less than reporting limit

* = Method detection limit higher than North Carolina Groundwater Quality Standards

Bold type indicates detectable concentrations.

Shaded area indicates detectable concentration above the North Carolina Groundwater Quality Standards

APPENDIX H

GRAPHICAL REPRESENTATION OF HISTORICAL CONTAMINANT LEVELS

FIGURE 3-2
Groundwater Monitoring Well Samples
Building 645 Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW01
Benzene, ug/L

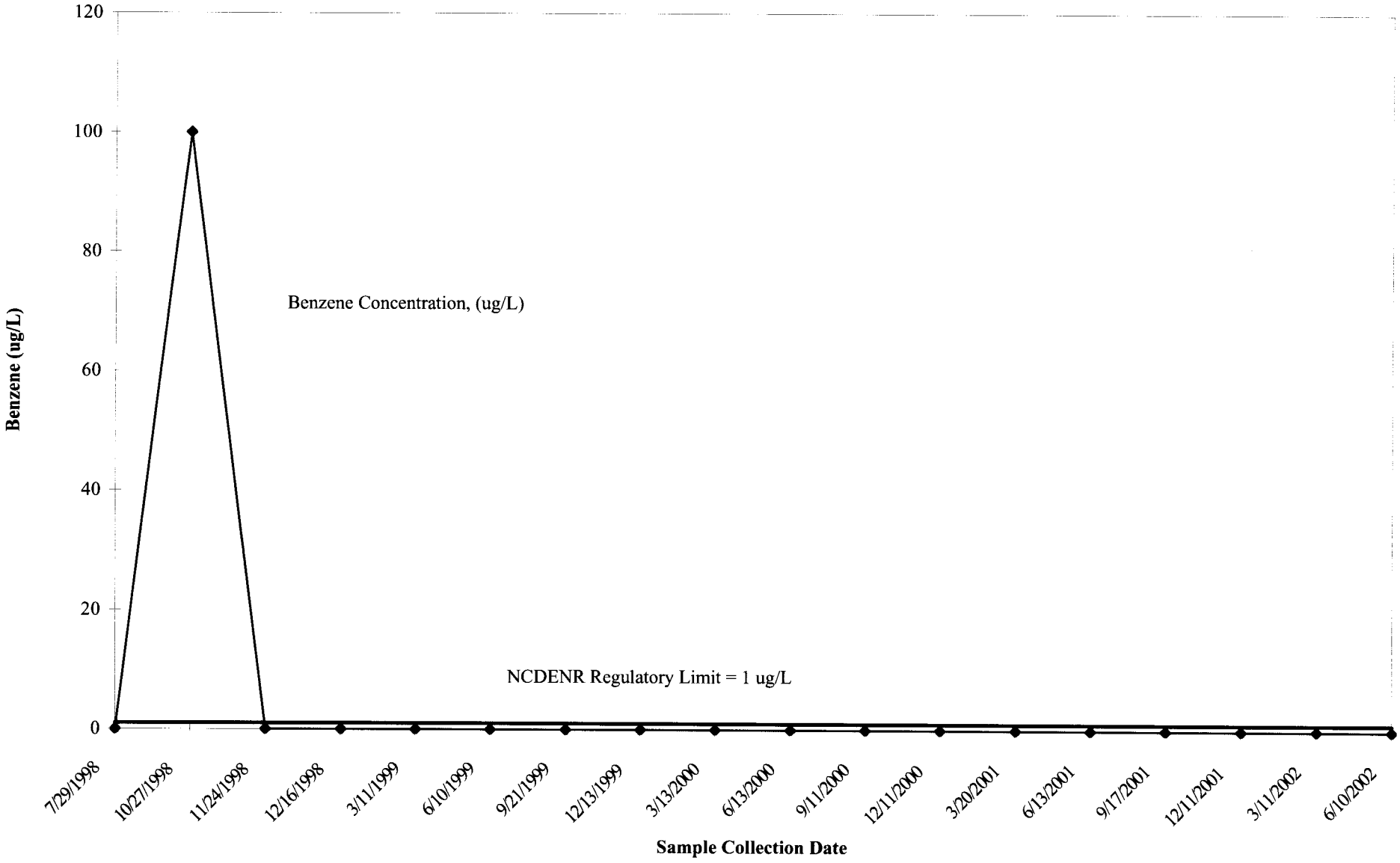


FIGURE 3-3
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW01
Ethylbenzene, ug/L

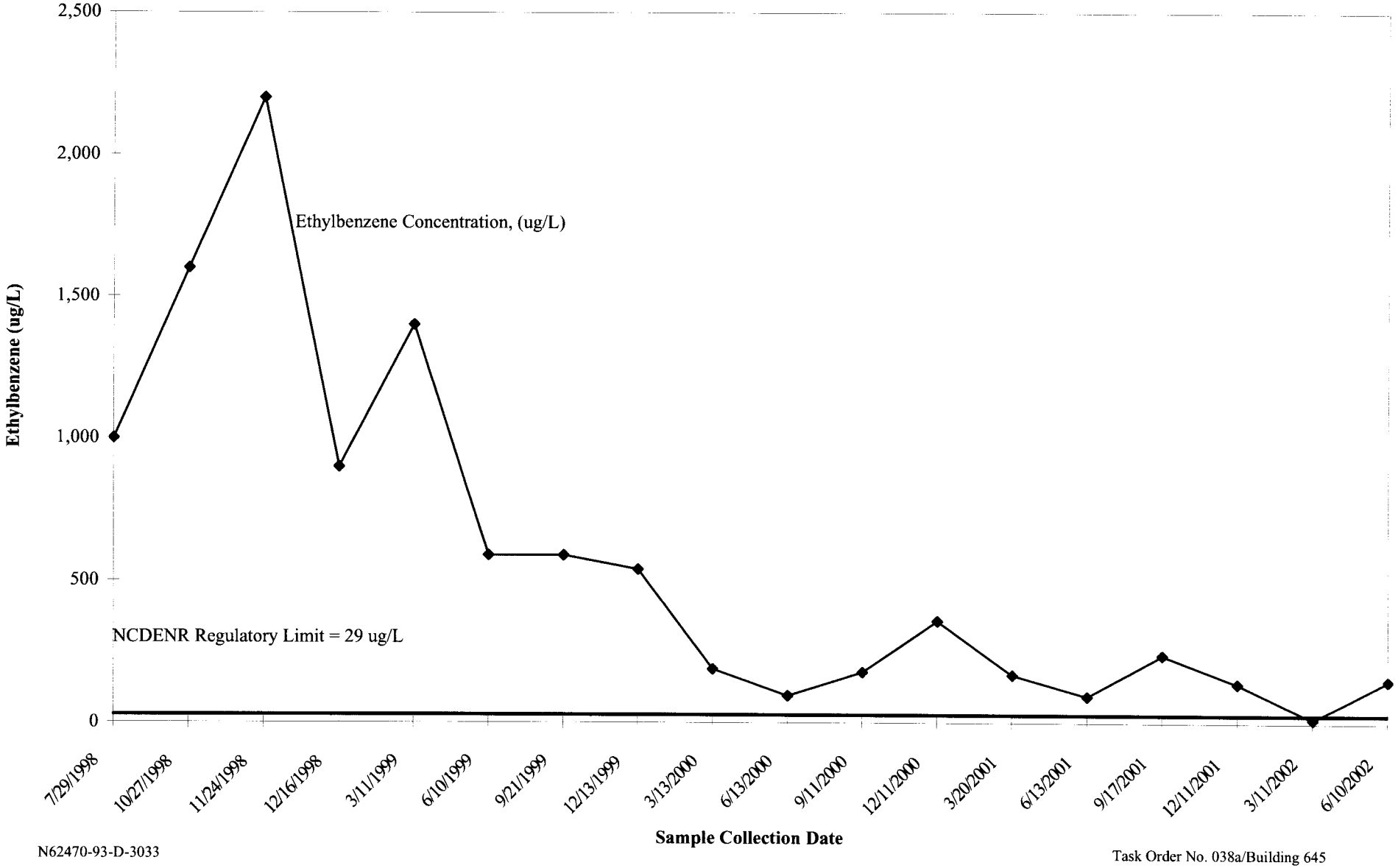


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FIGURE 3-4
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW01
Toluene, ug/L

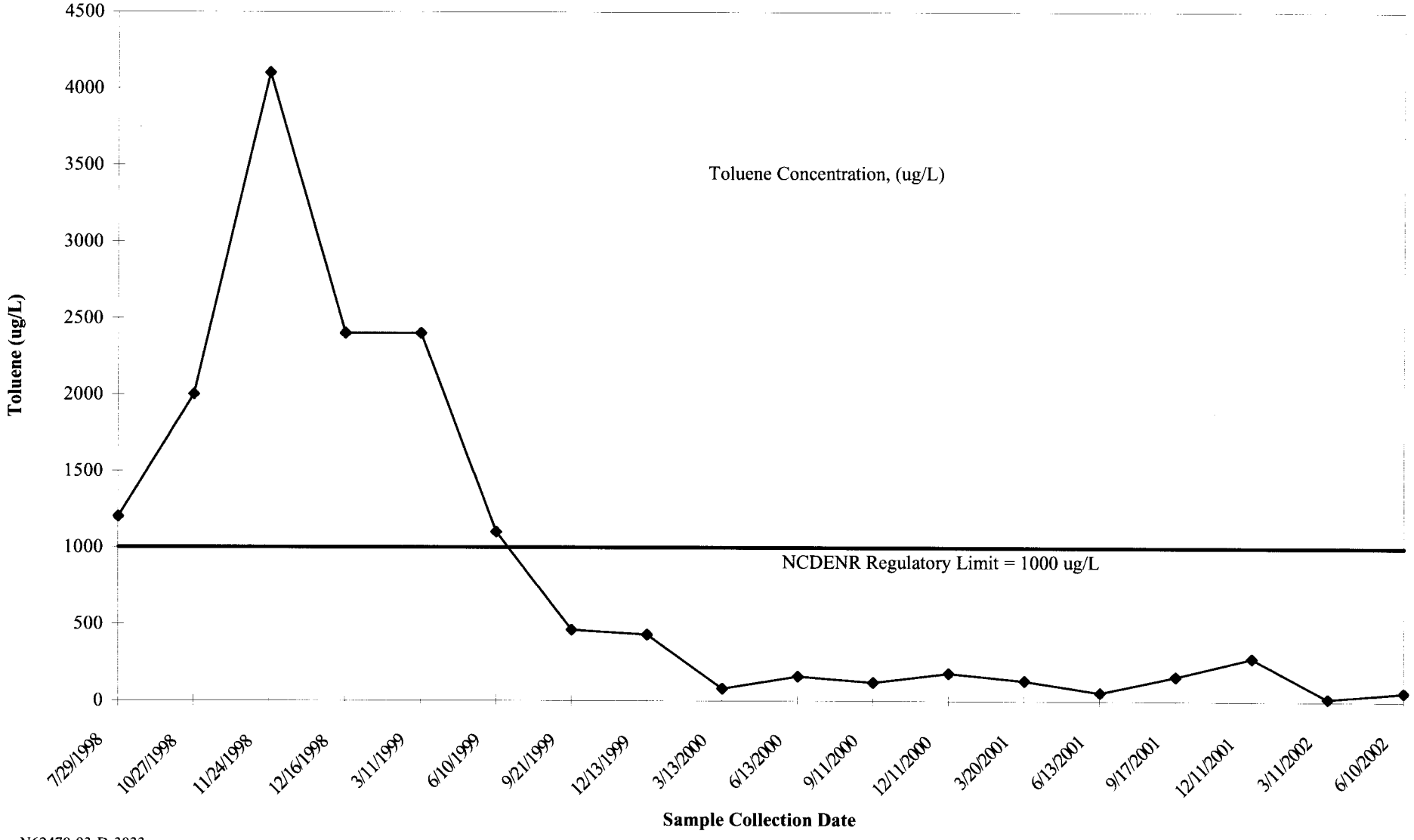

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FIGURE 3-5
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW01
Total Xylenes, ug/L

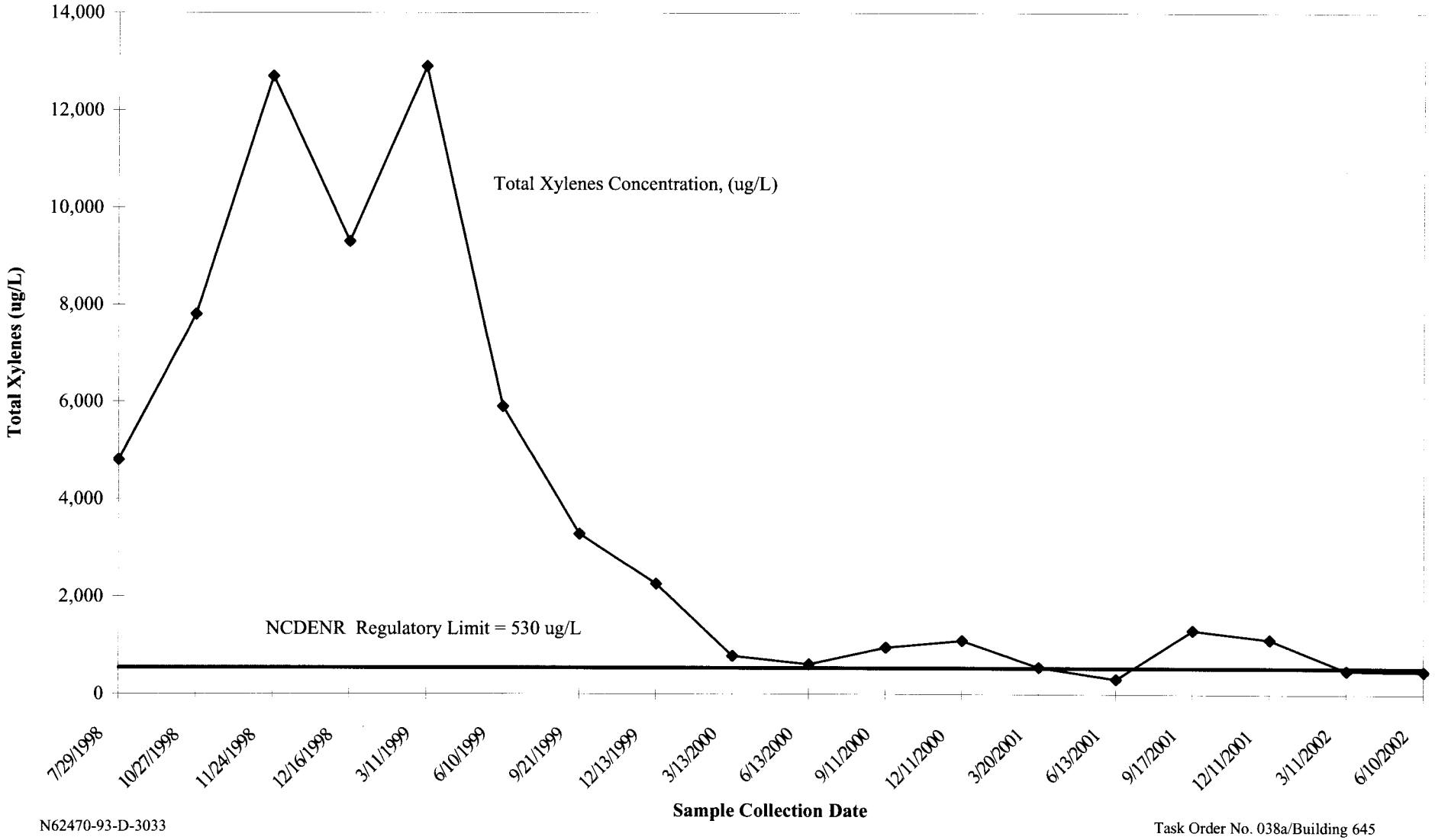

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FIGURE 3-6
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW01
Total VOCs, ug/L

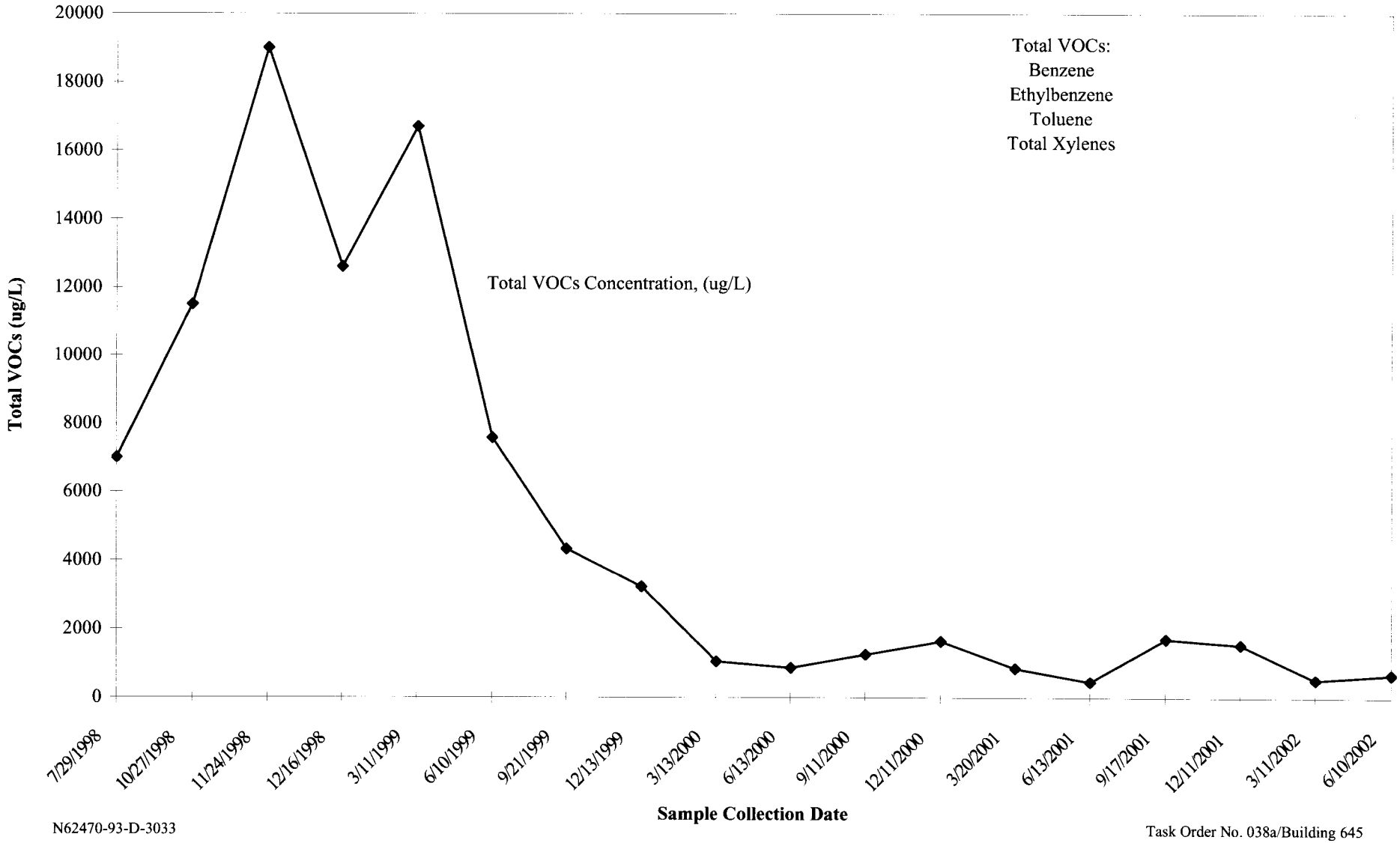

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FIGURE 3-7
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW01
Naphthalene, ug/L

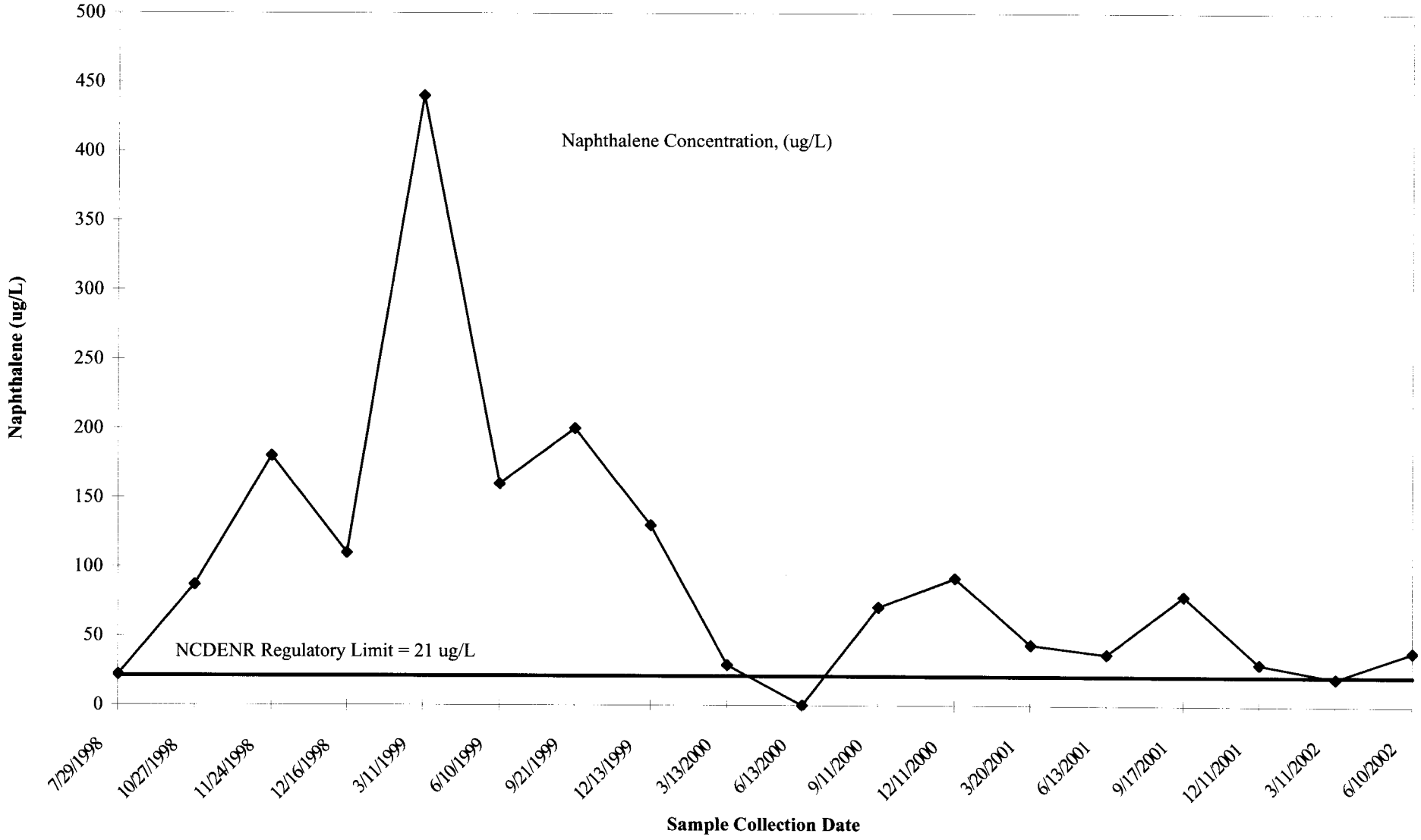

FIGURE 3-8
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW01
1-Methylnaphthalene, ug/L

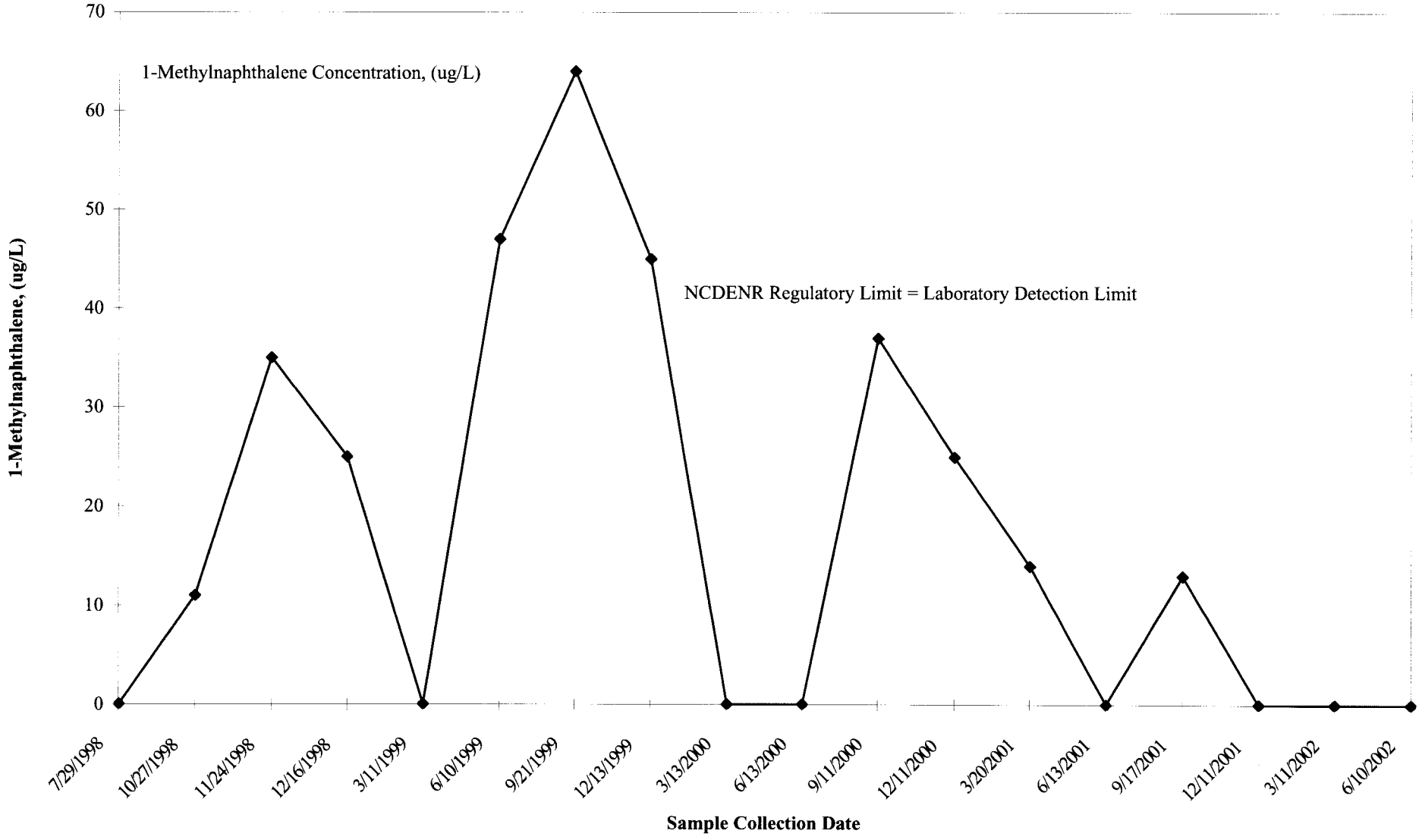

FIGURE 3-9
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW01
Bis(2-ethylhexyl)phthlalate, ug/L

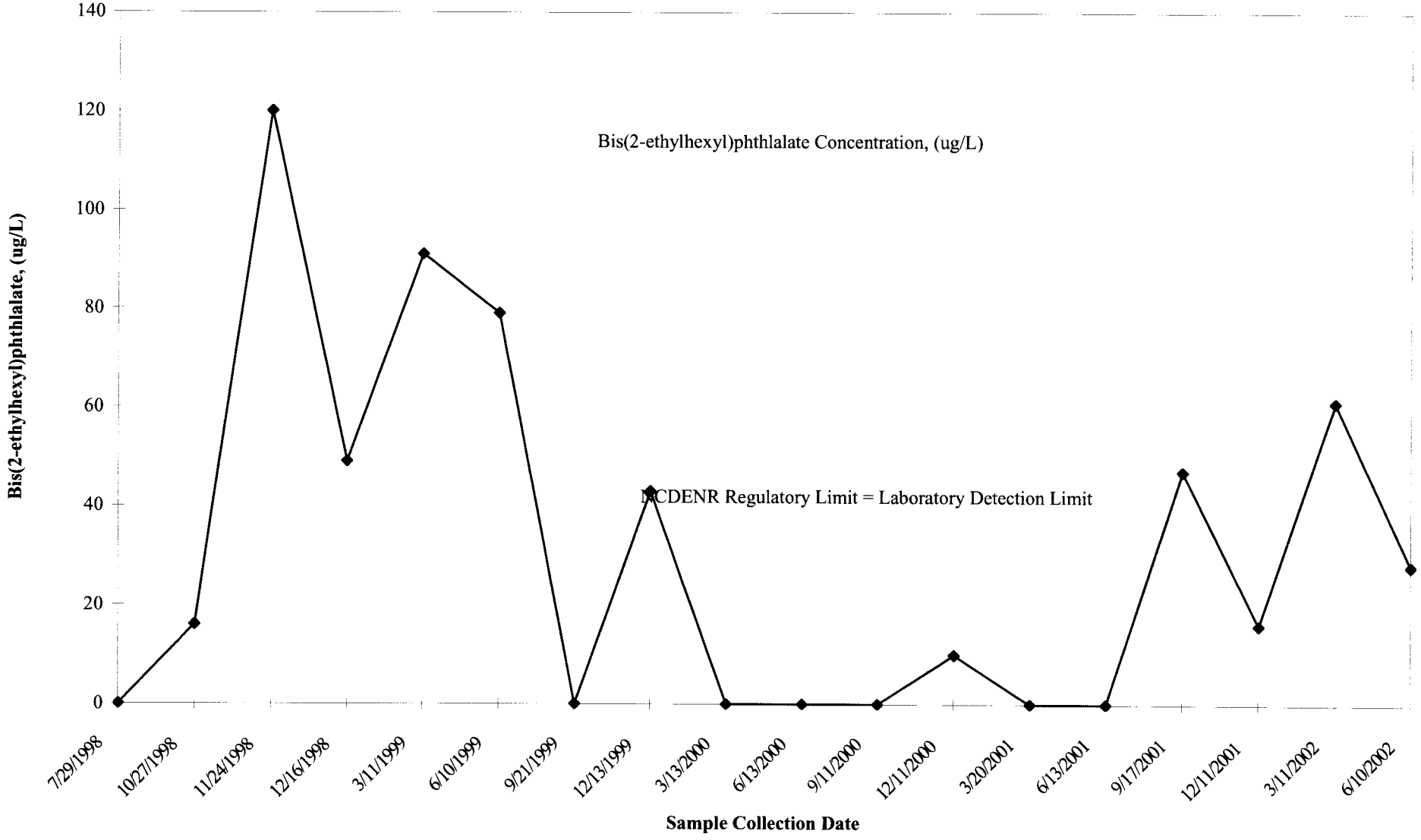

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FIGURE 3-10
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW02
Ethylbenzene, ug/L

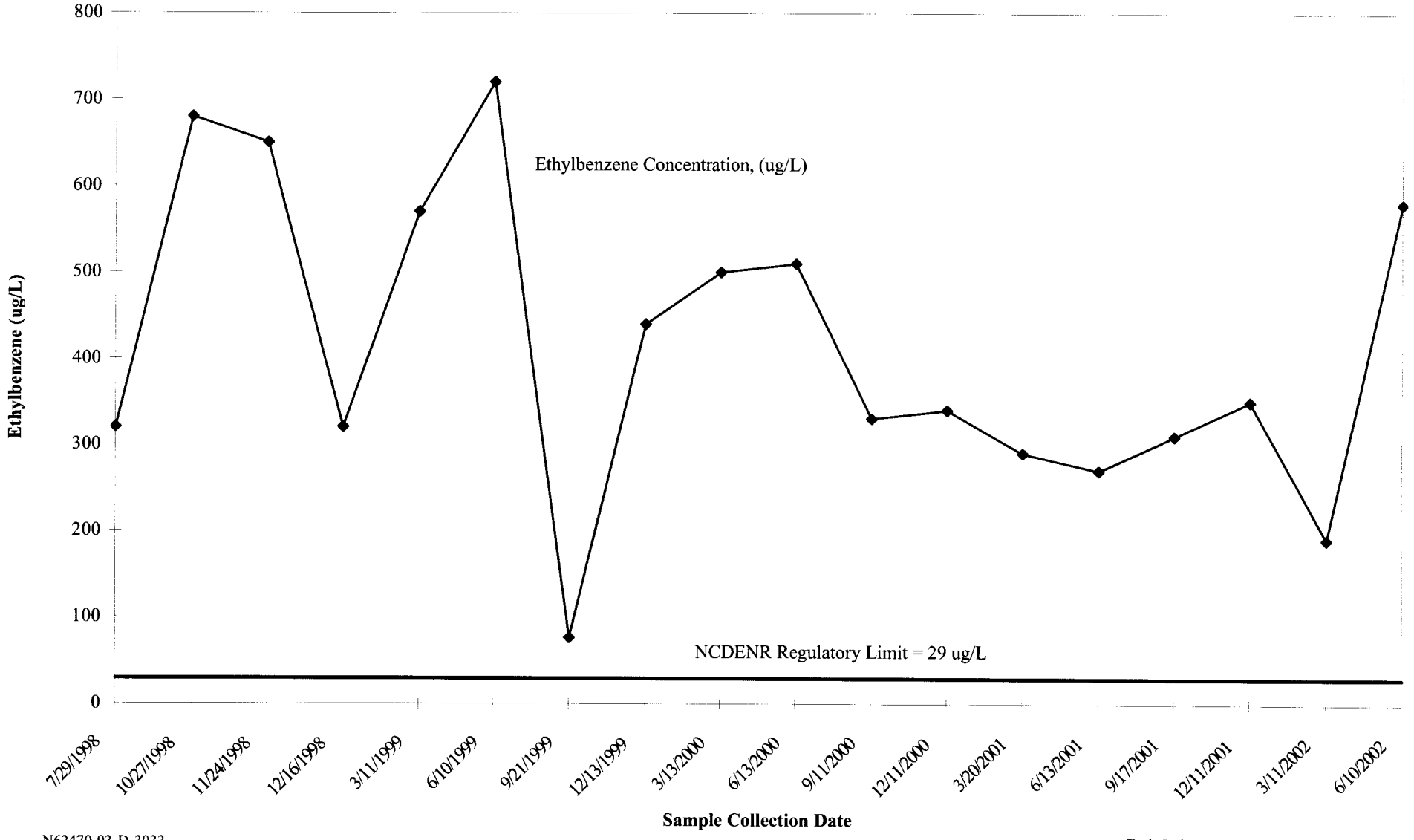

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FIGURE 3-11
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW02
Toluene, ug/L

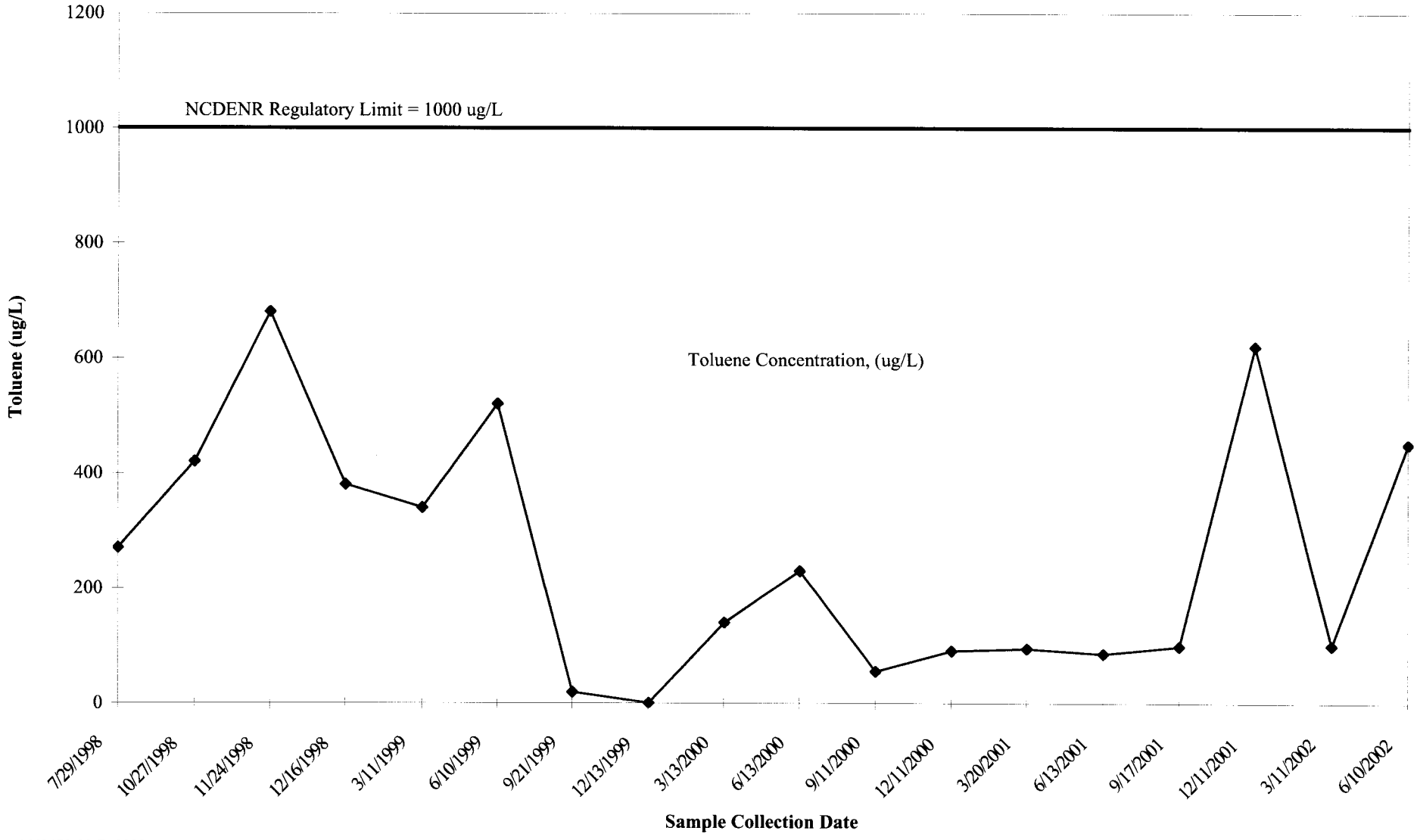

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FIGURE 3-12
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW02
Total Xylenes, ug/L

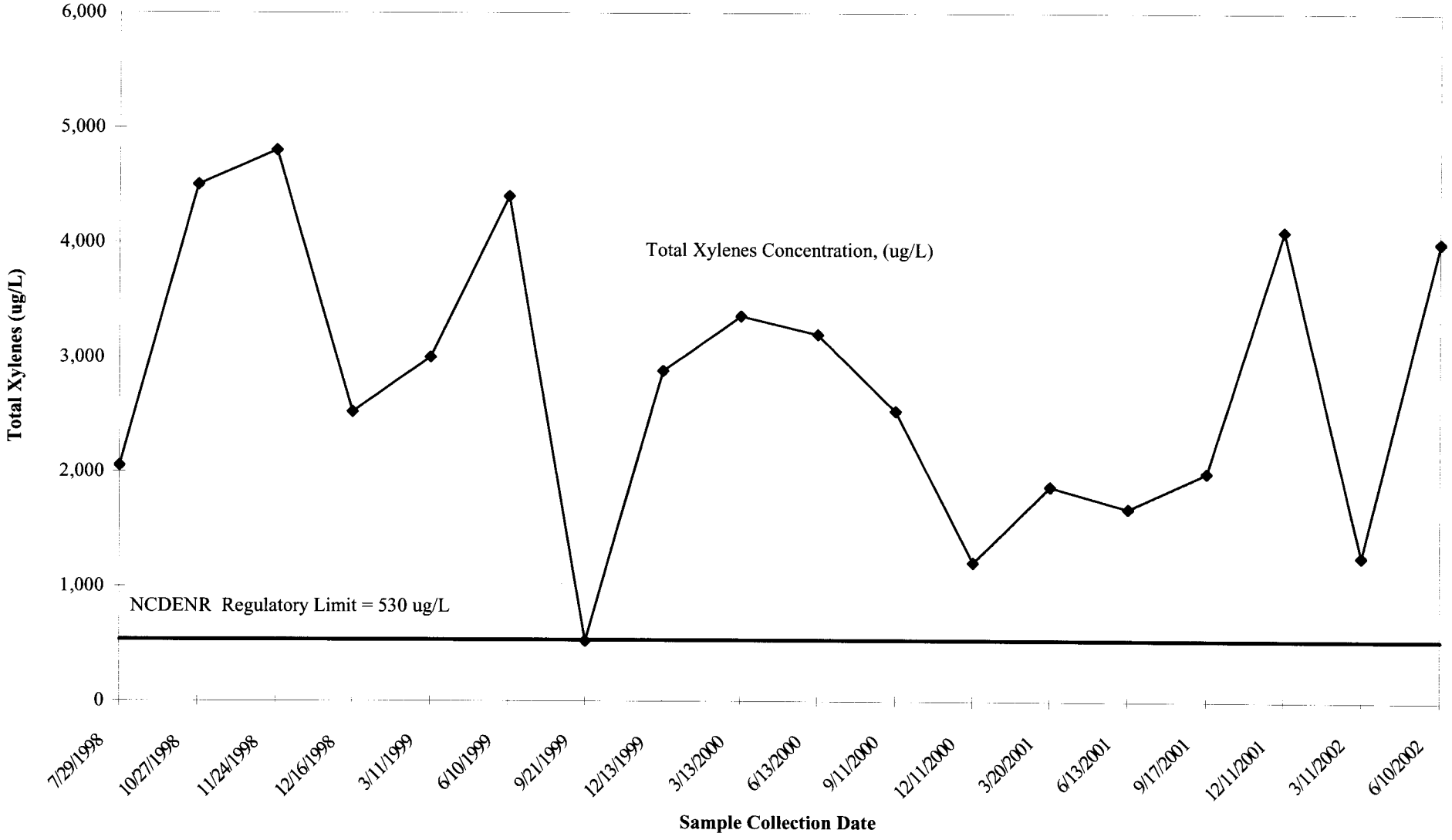

FIGURE 3-13
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW02
Total VOCs, ug/L

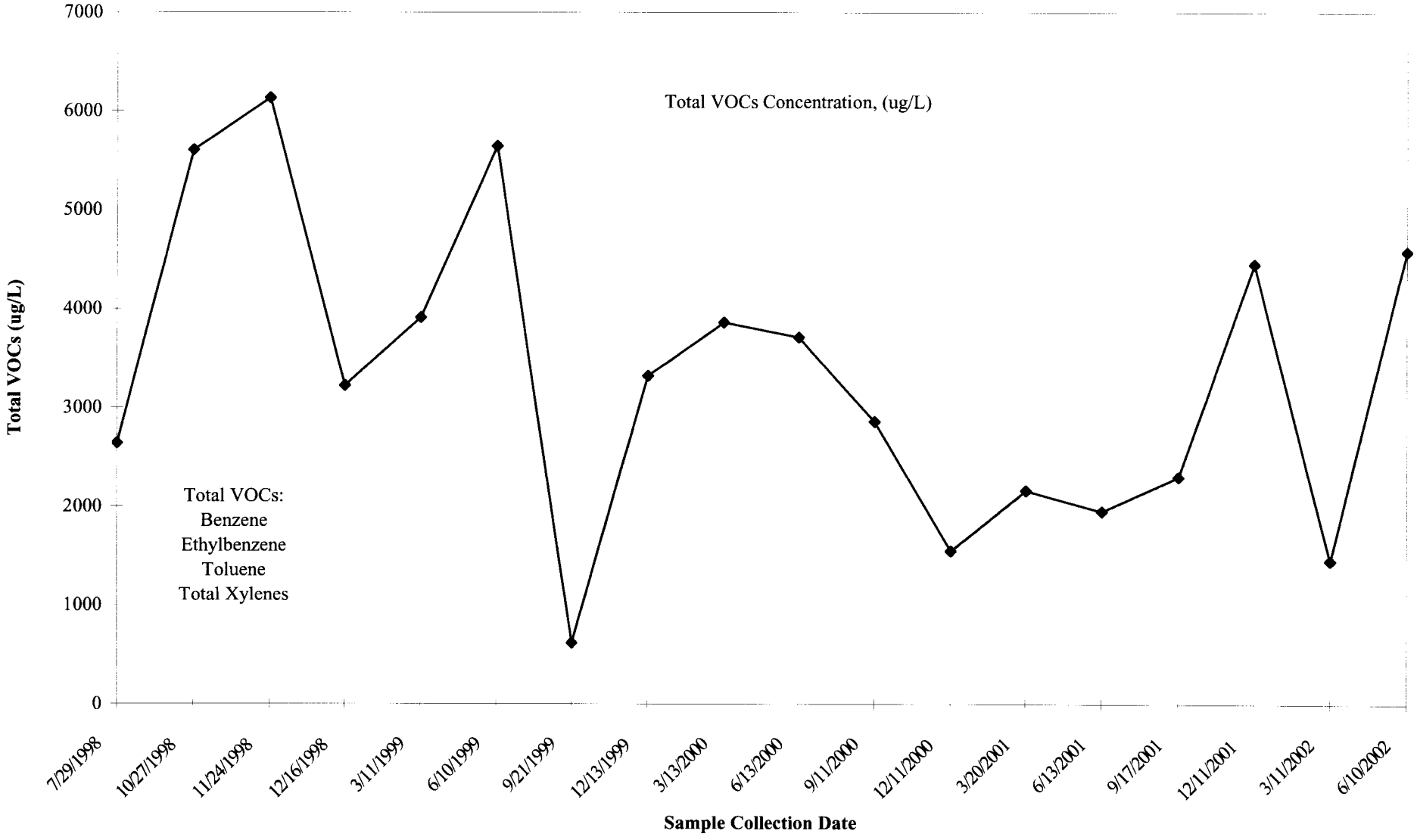

FIGURE 3-14
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW02
Naphthalene, ug/L

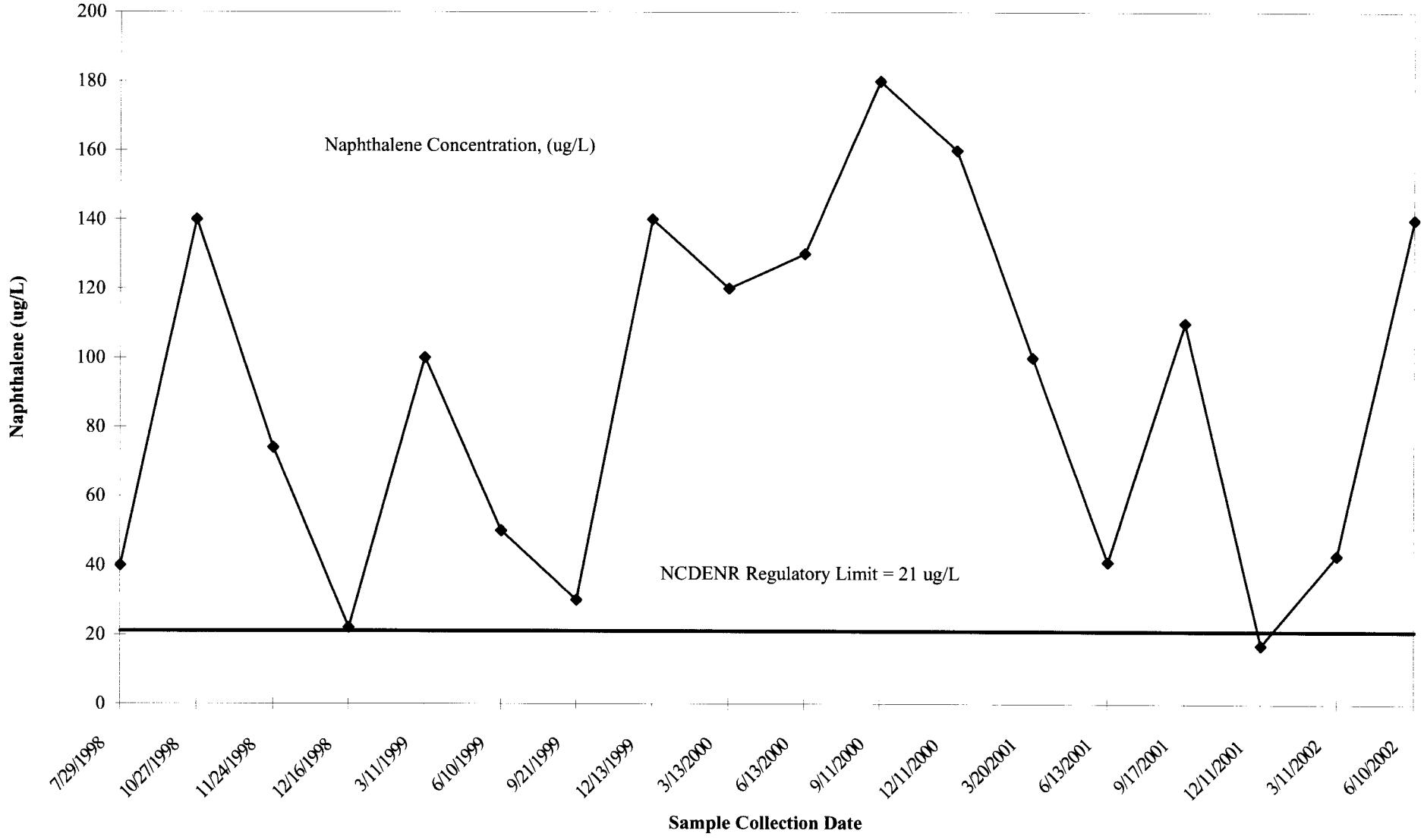

FIGURE 3-15
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW02
1-Methylnaphthalene, ug/L

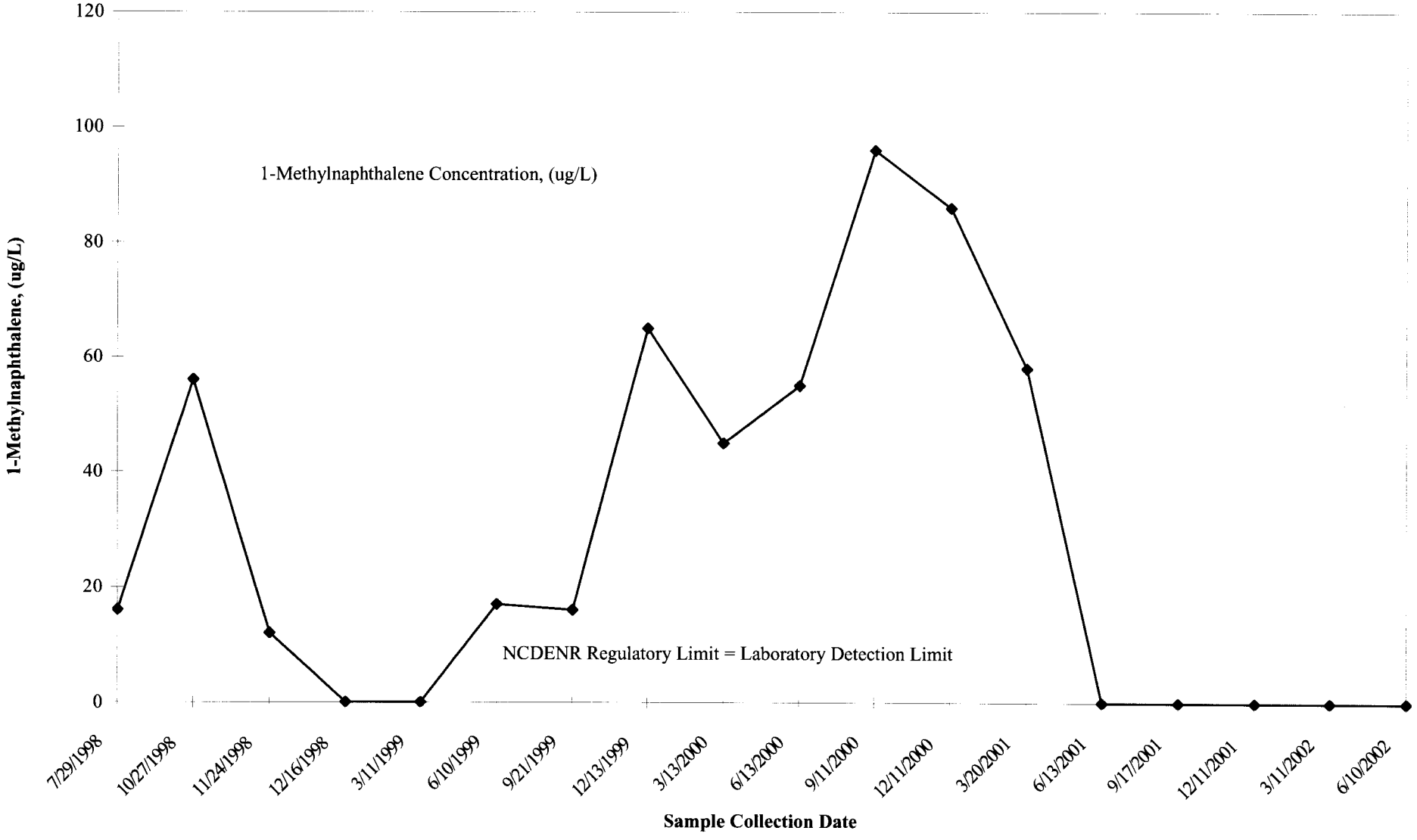

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FIGURE 3-16
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW02
2-Methylnaphthalene, ug/L

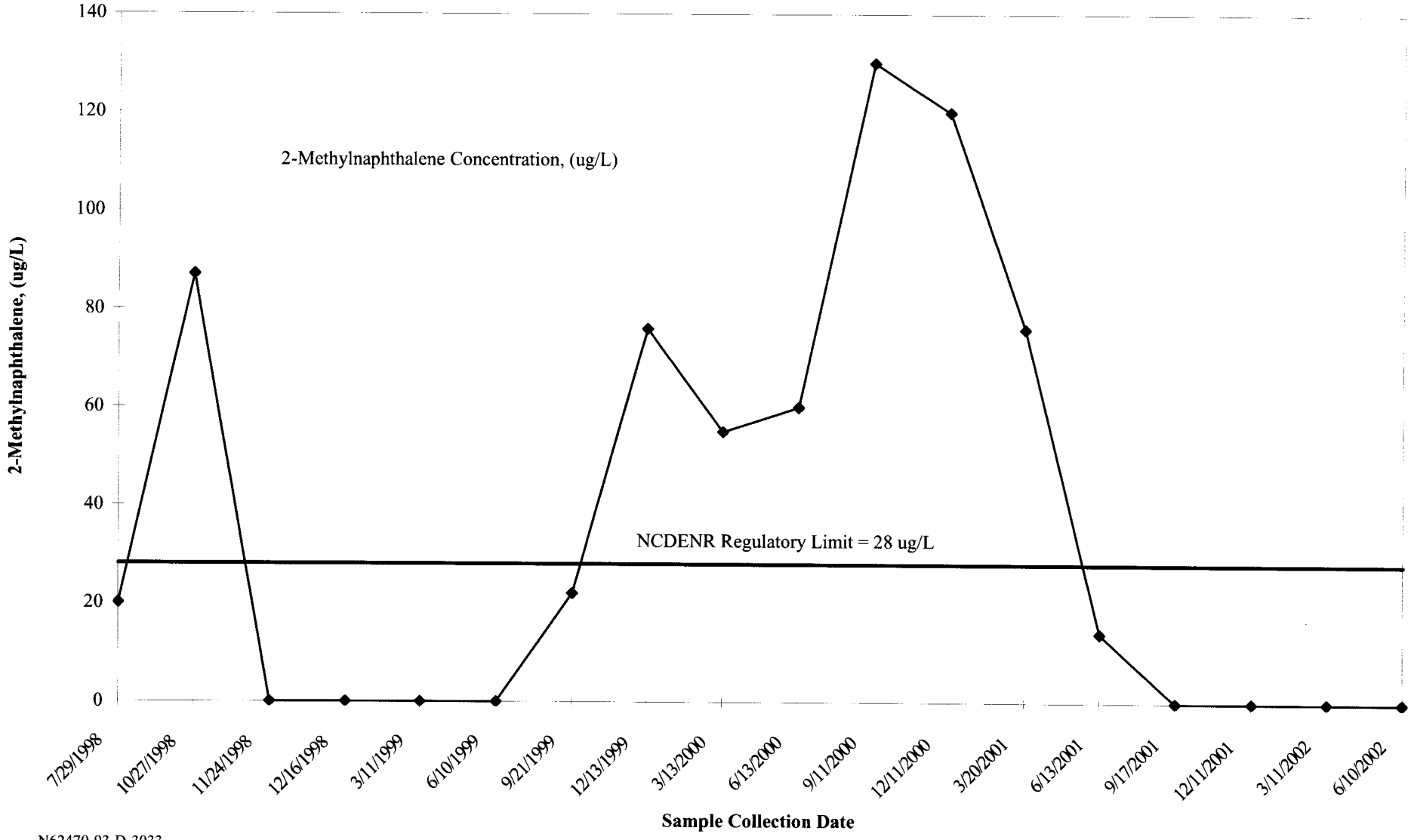

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FIGURE 3-17
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW02
2,4-Dimethylphenol, ug/L

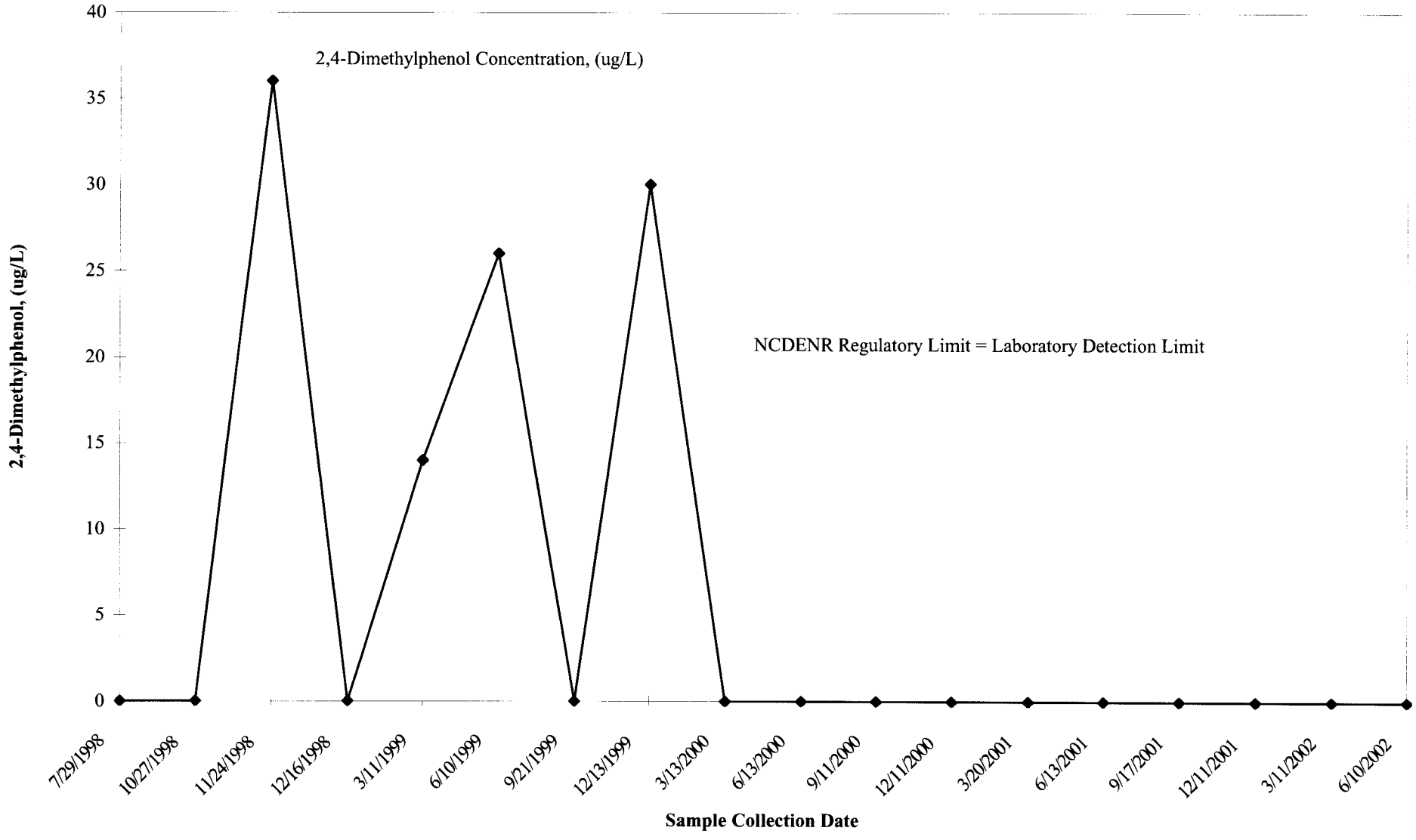

FIGURE 3-18
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW03
Benzene, ug/L

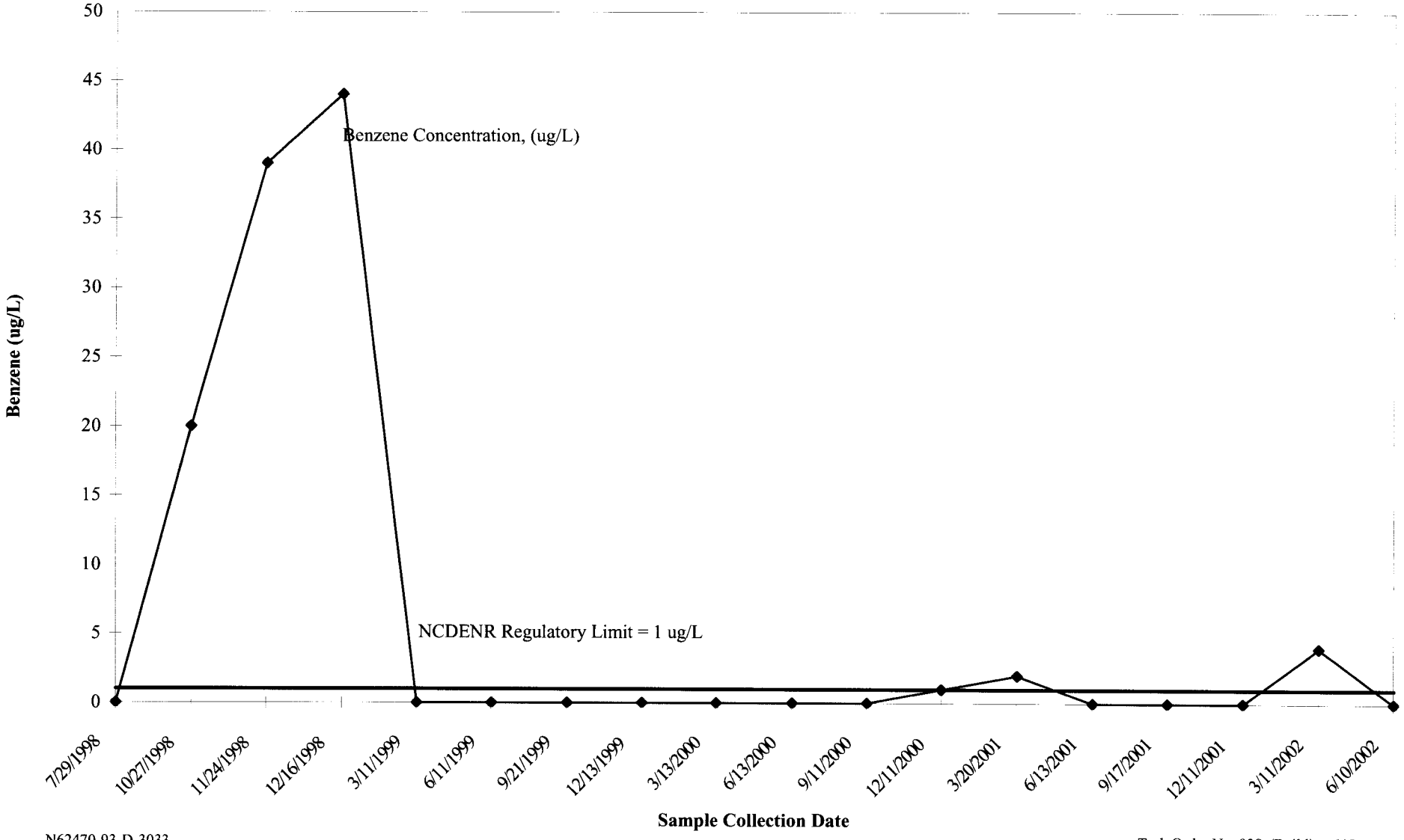

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FIGURE 3-19
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW03
Ethylbenzene, ug/L

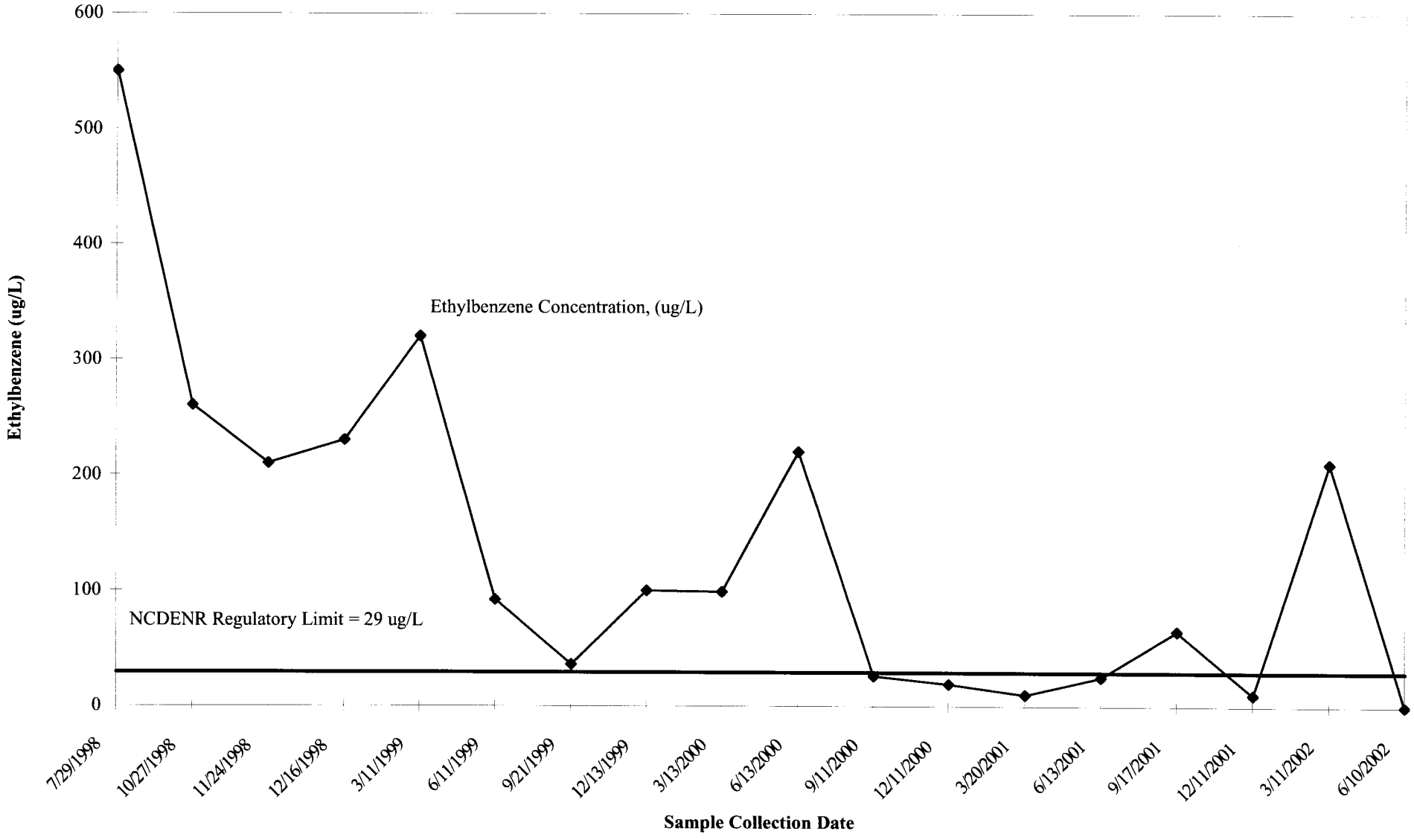

FIGURE 3-20
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW03
Toluene, ug/L

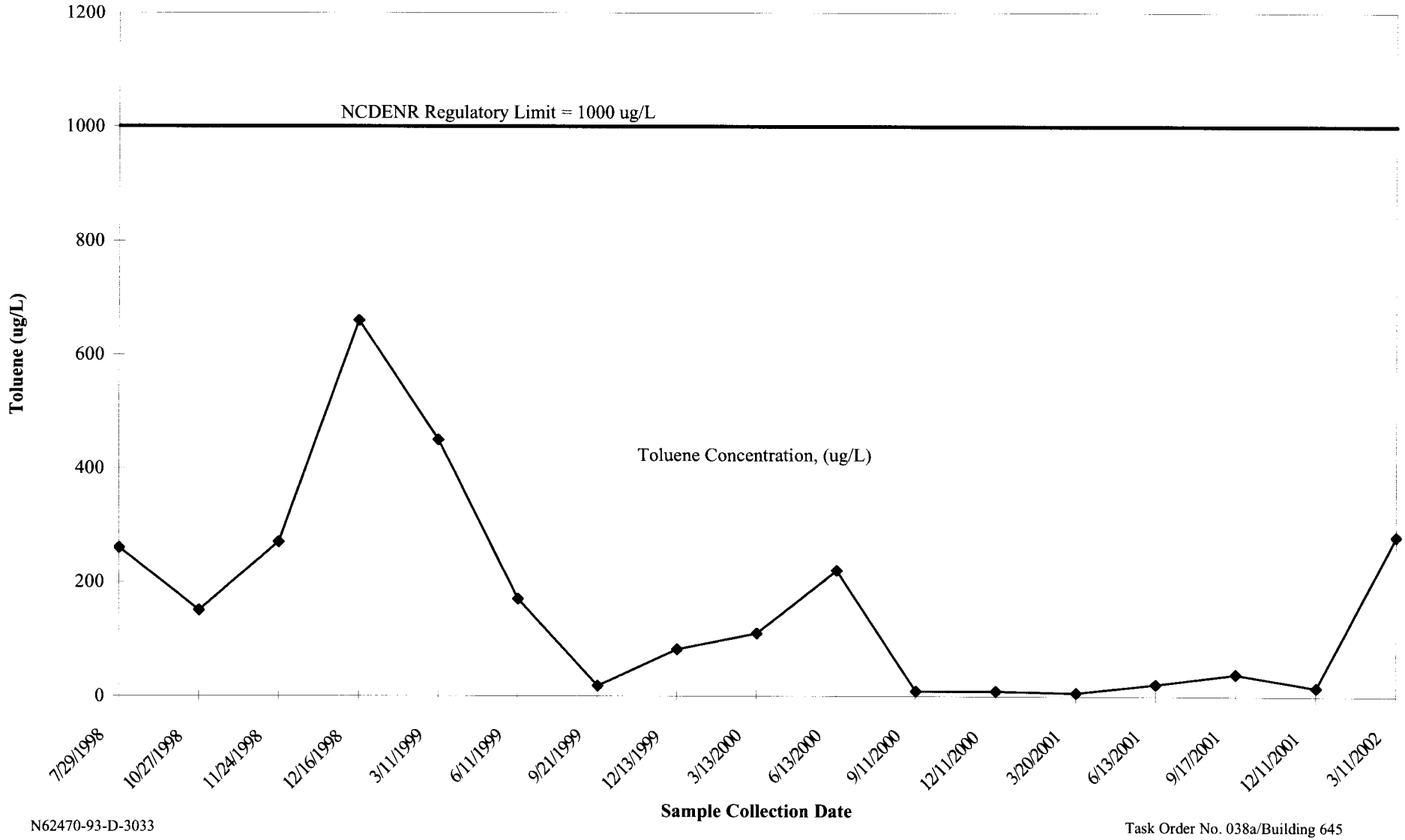

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FIGURE 3-22
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW03
Total VOCs, ug/L

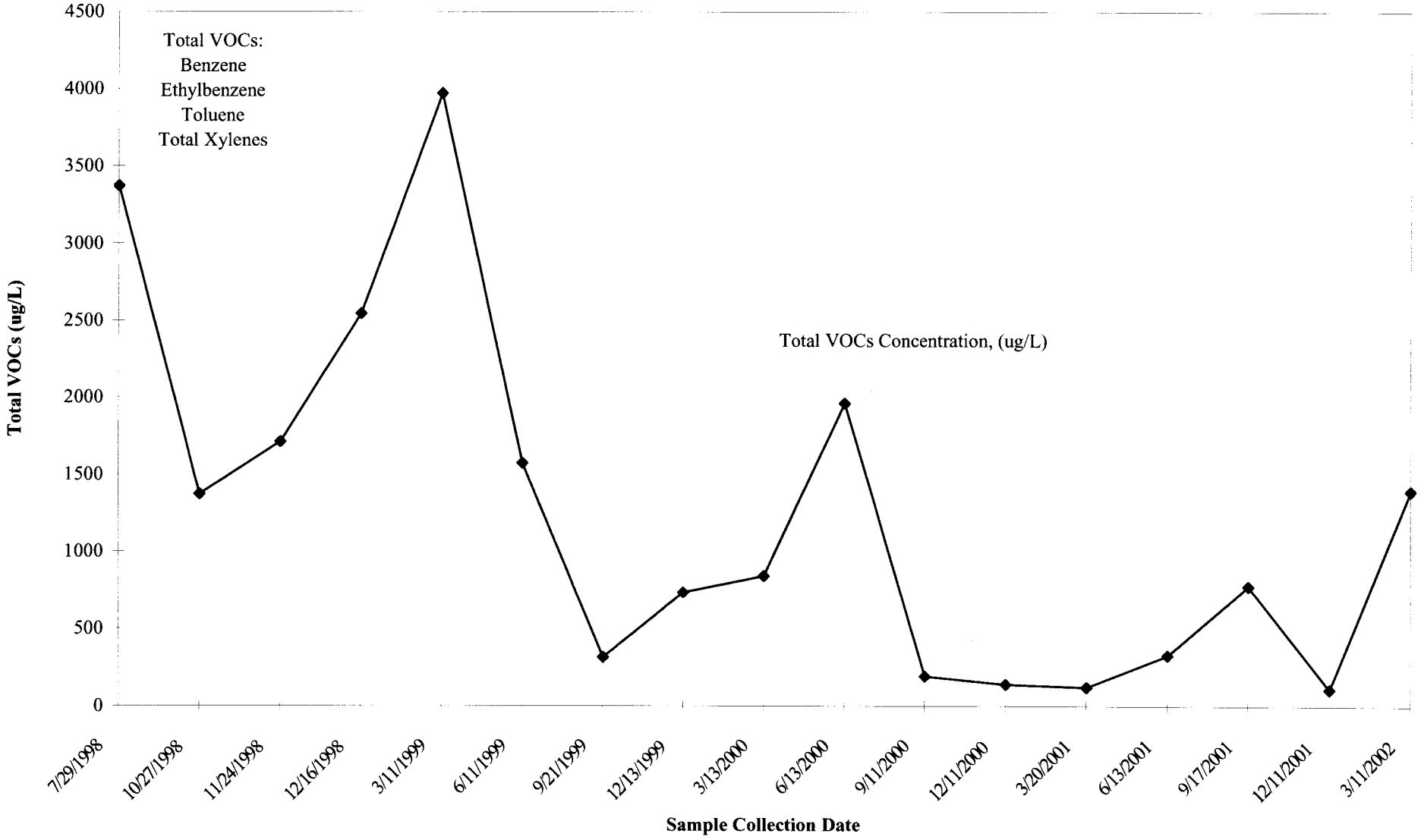

FIGURE 3-23
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW03
Naphthalene, ug/L

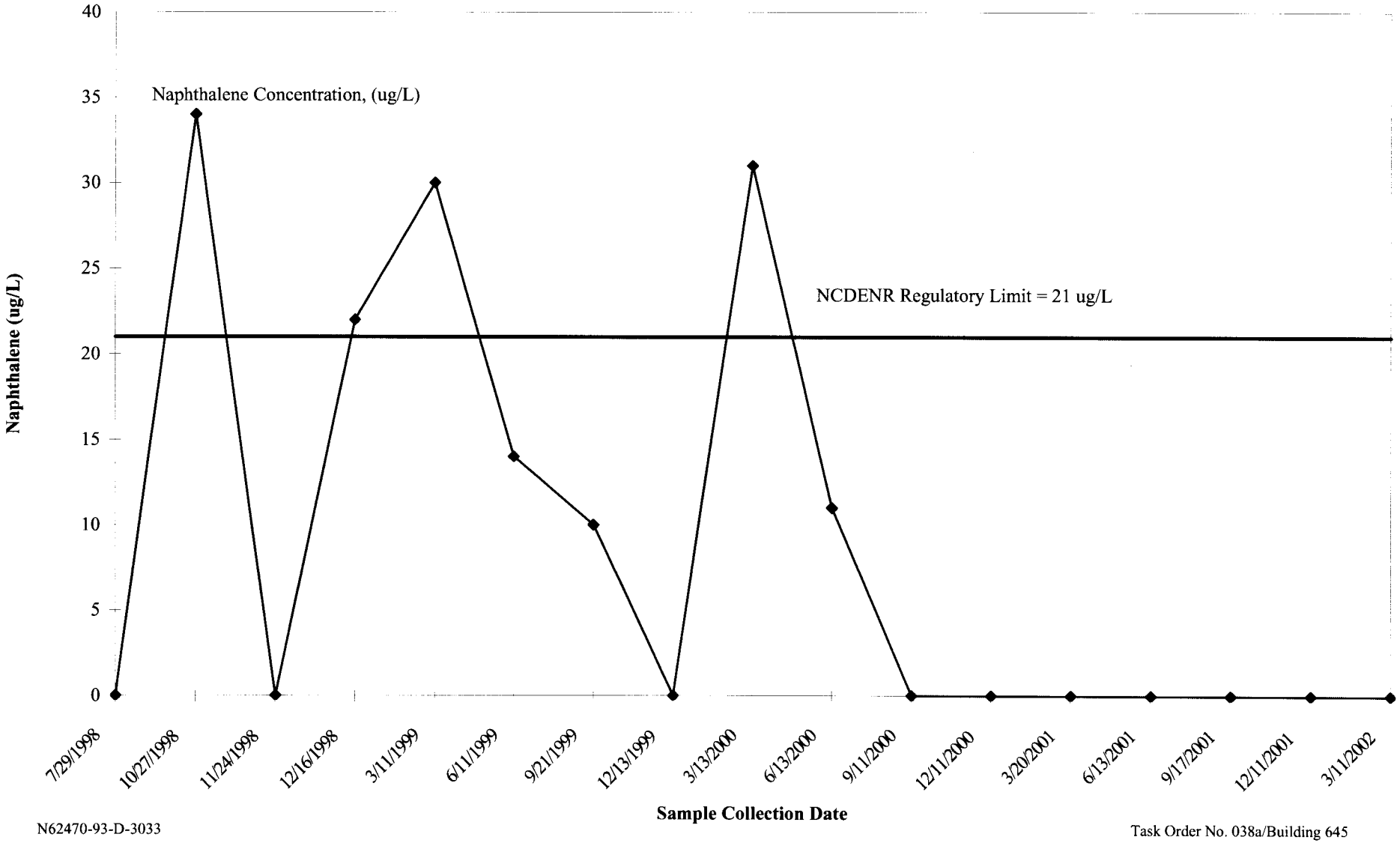

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FIGURE 3-24
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW03
1-Methylnaphthalene, ug/L

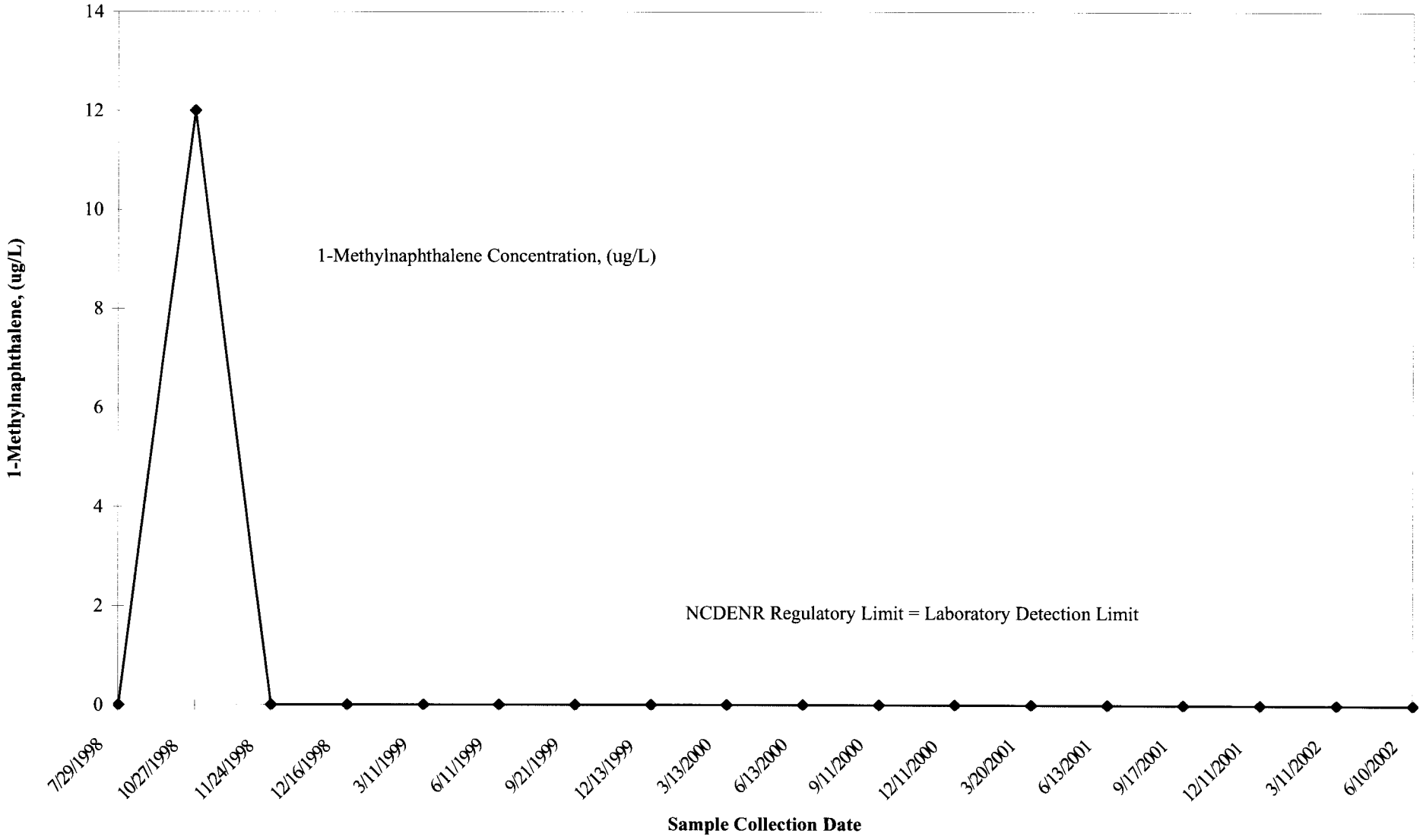

FIGURE 3-25
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW03
2,4-Dimethylphenol, ug/L

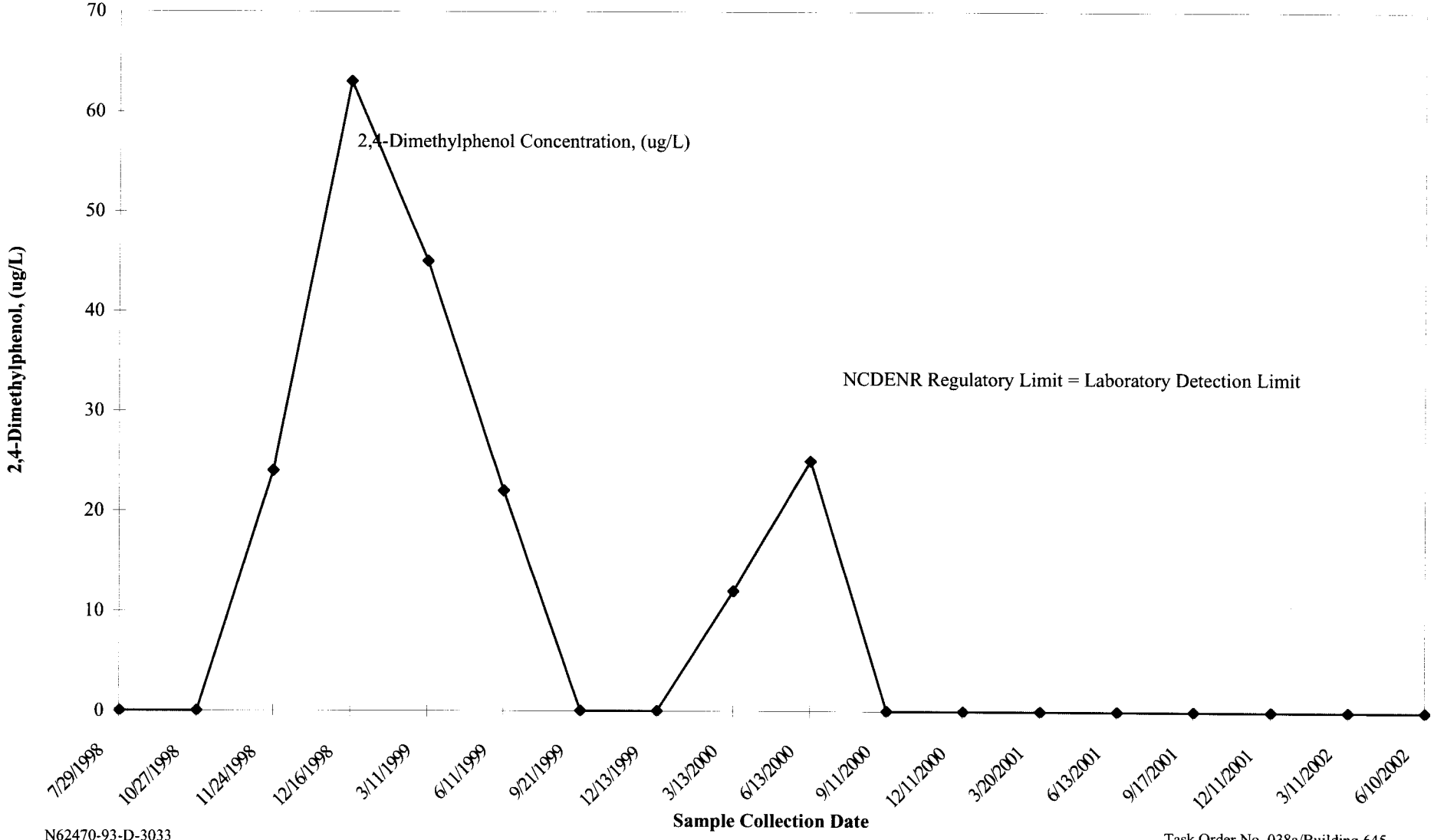

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FIGURE 3-21
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW03
Total Xylenes, ug/L

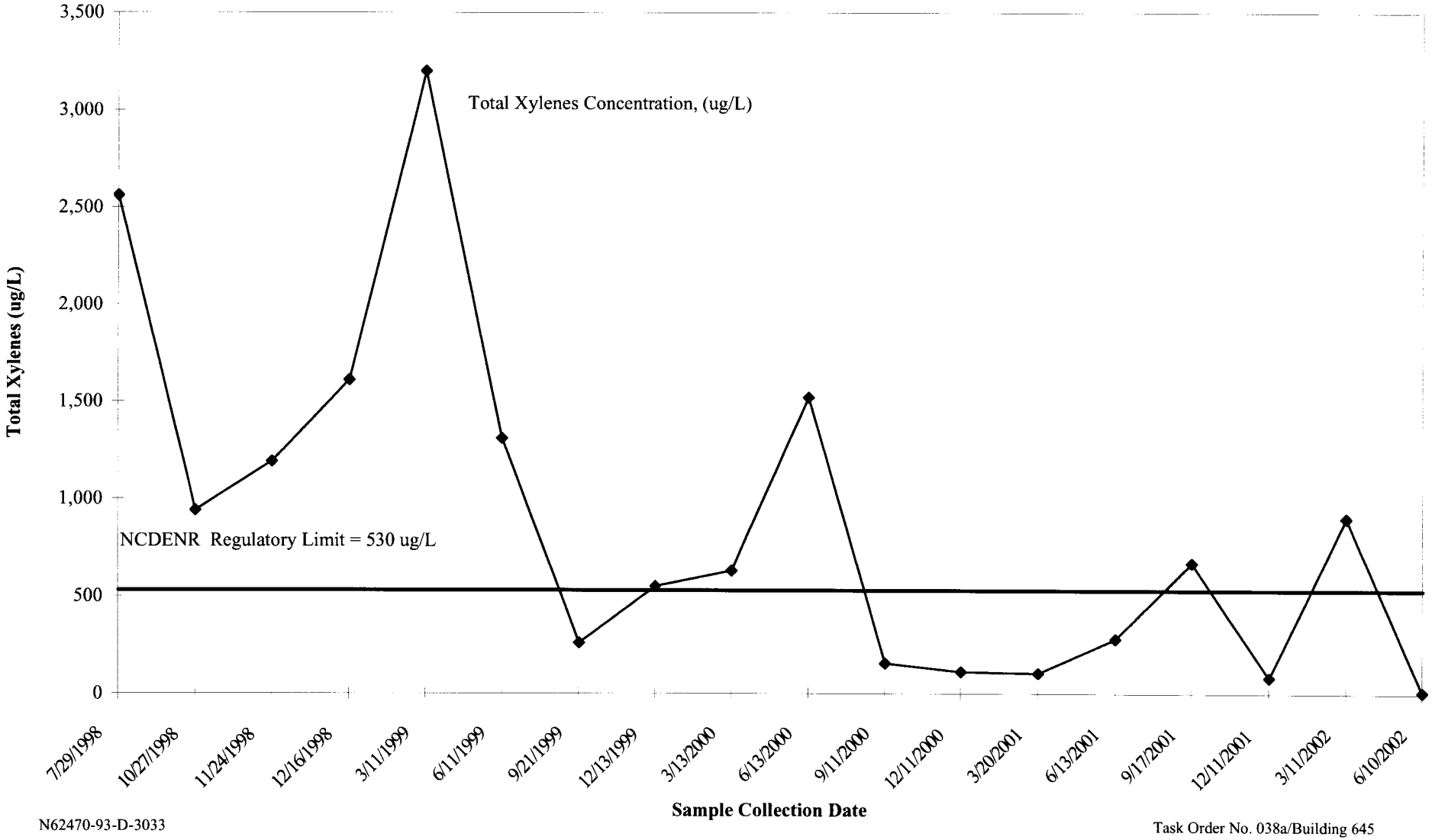

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FIGURE 3-33
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW09
2-Methylnaphthalene, ug/L

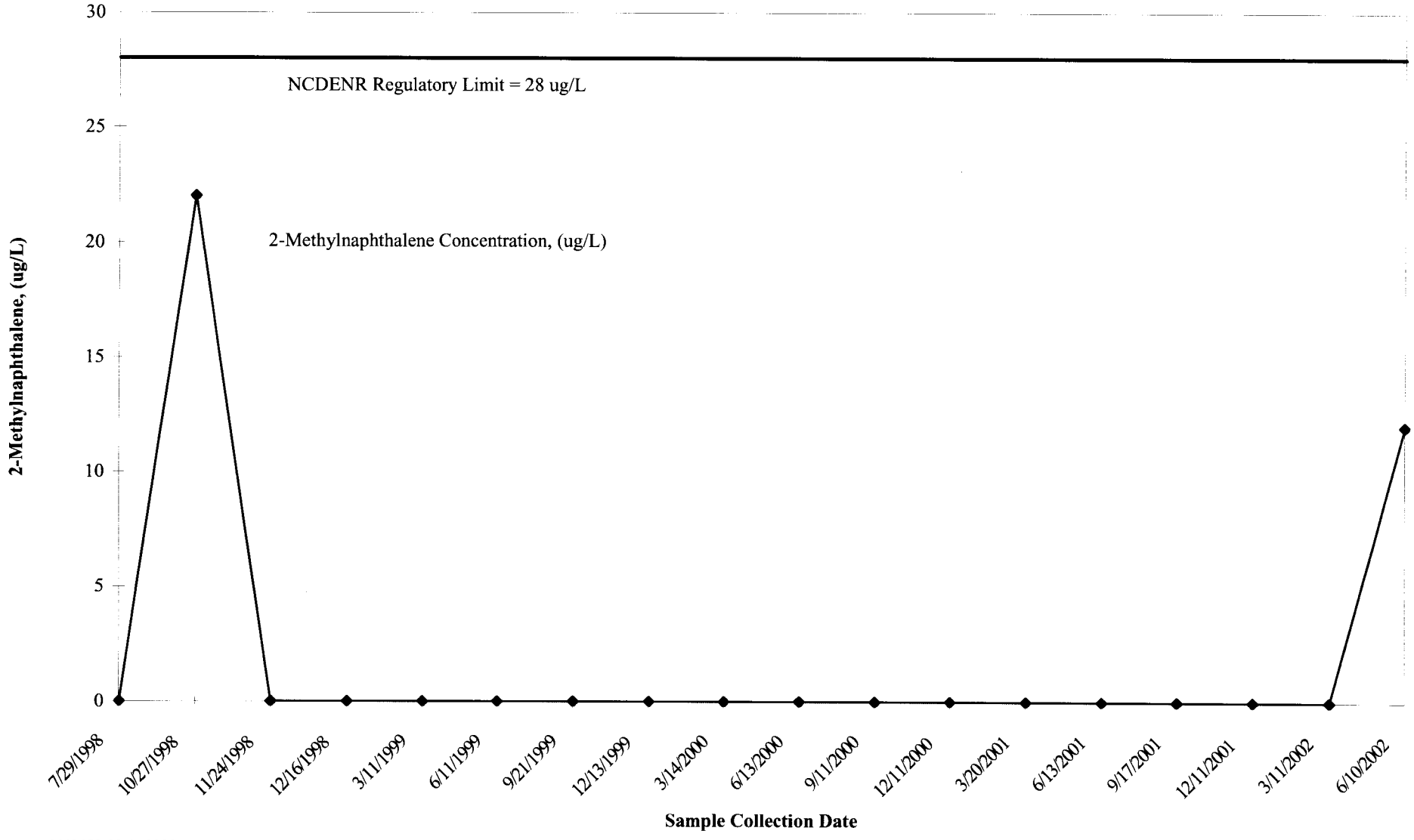

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FIGURE 3-34
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW09
Bis(2-ethylhexyl)phthlalate, ug/L

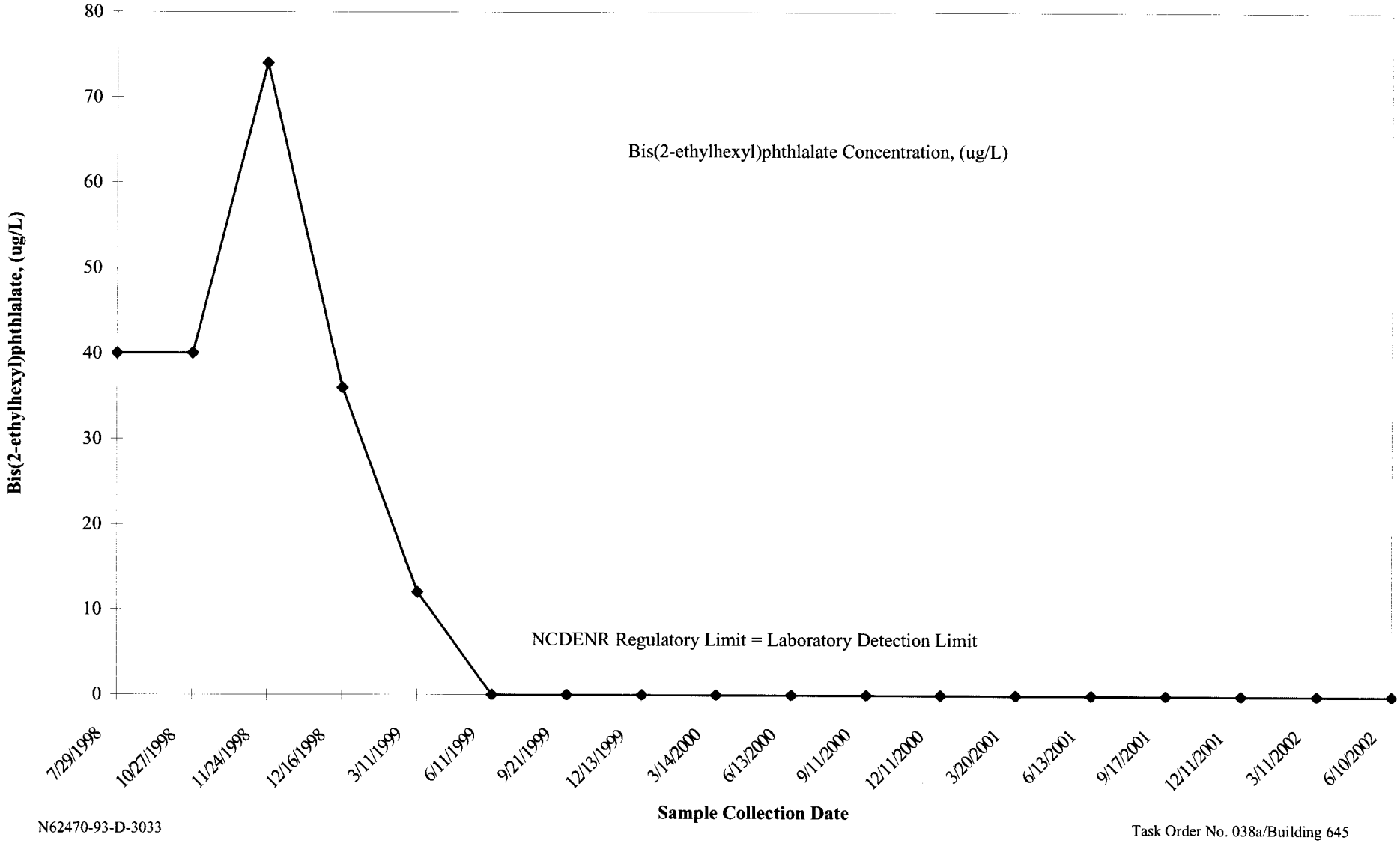

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FIGURE 3-35
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW10
Benzene, ug/L

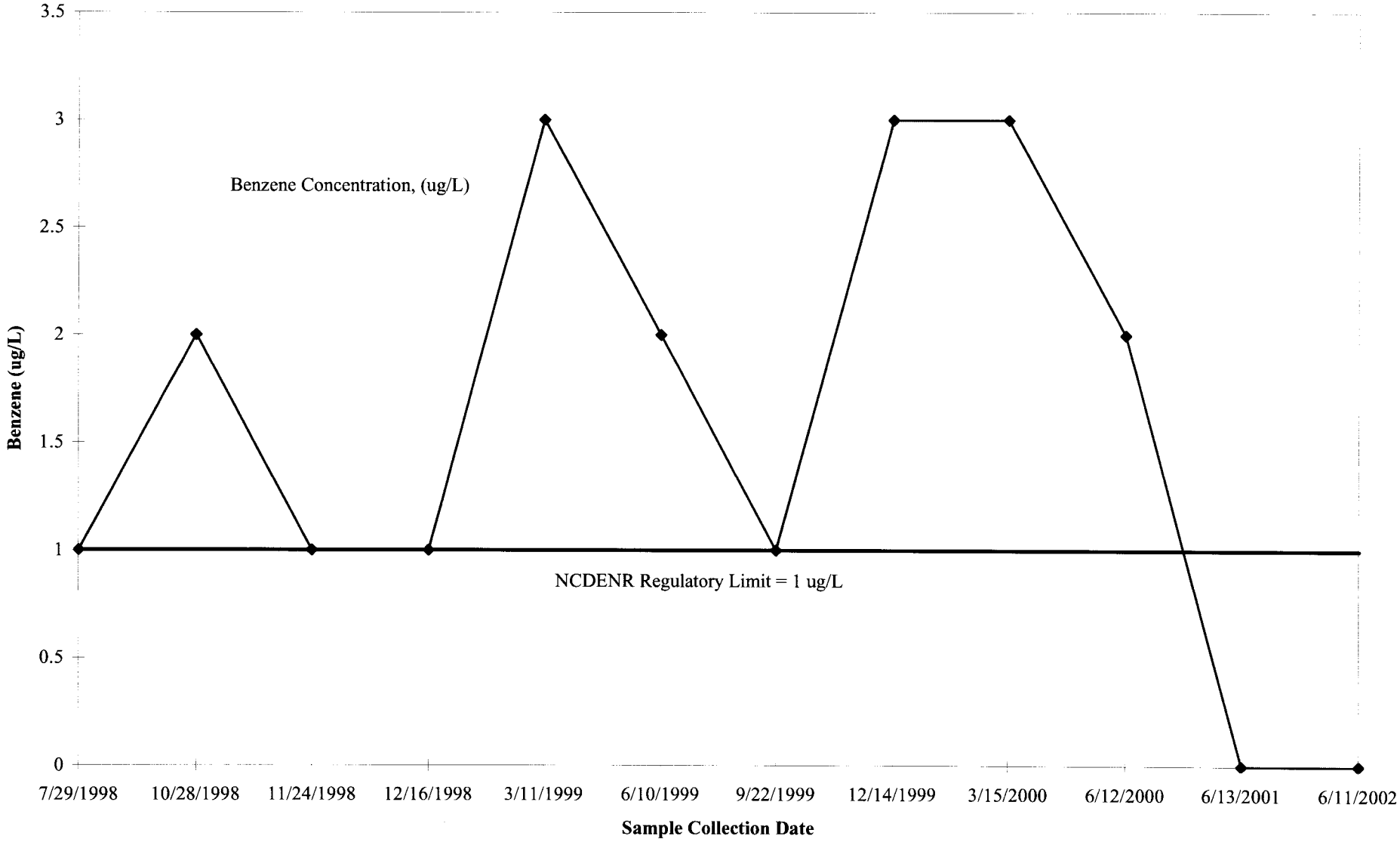

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FIGURE 3-36
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW12
Benzene, ug/L

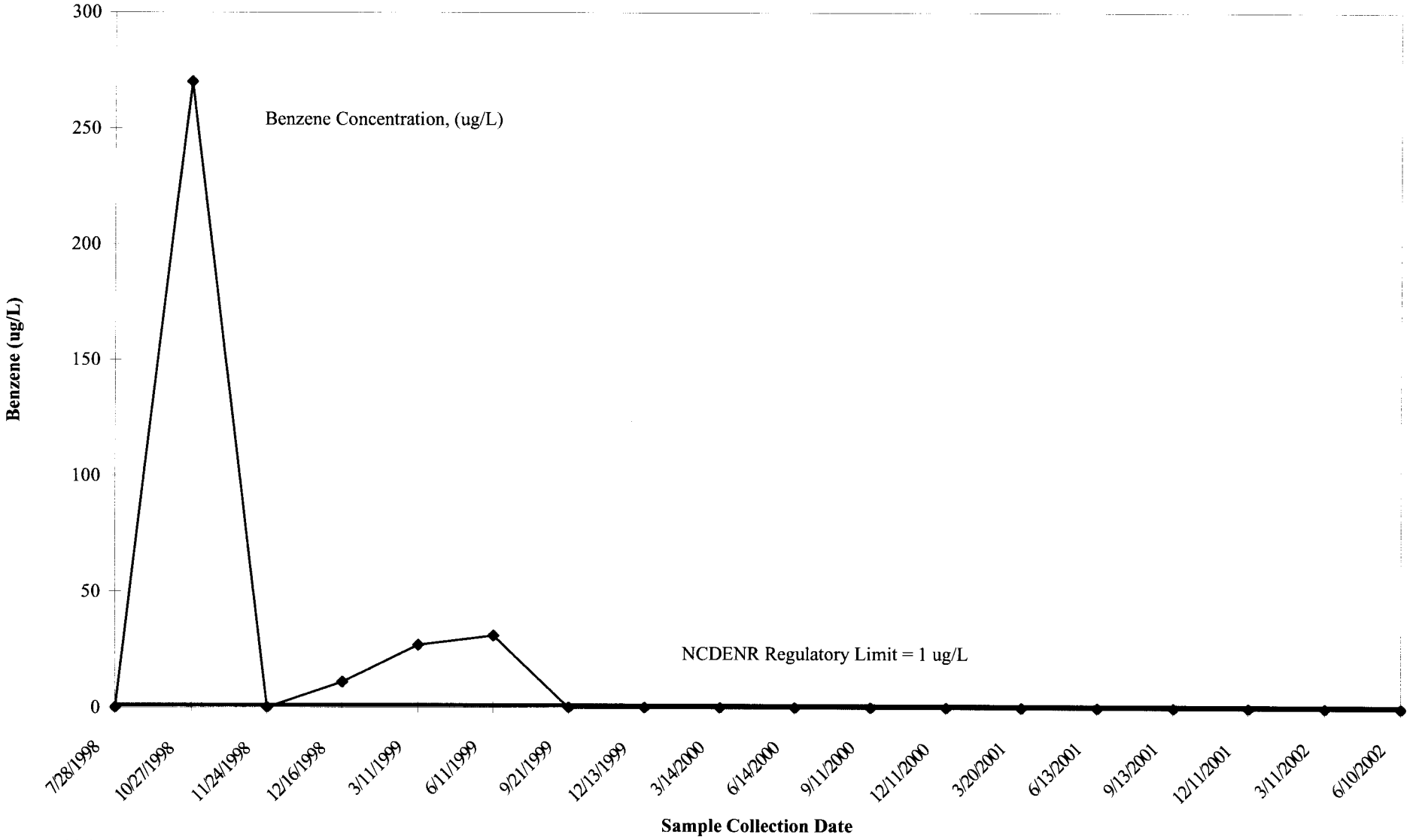

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FIGURE 3-37
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW12
Ethylbenzene, ug/L

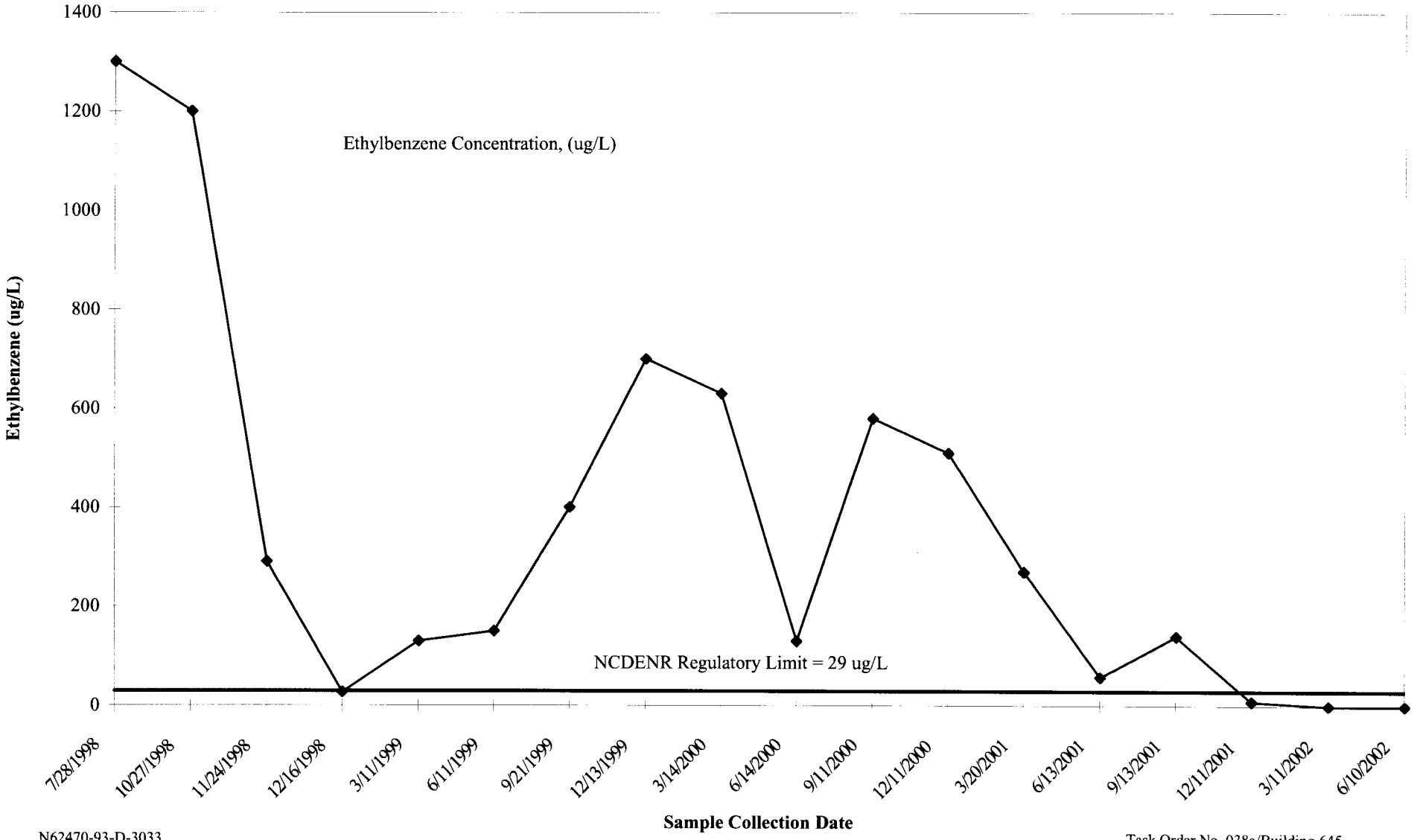

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FIGURE 3-38
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW12
Toluene, ug/L

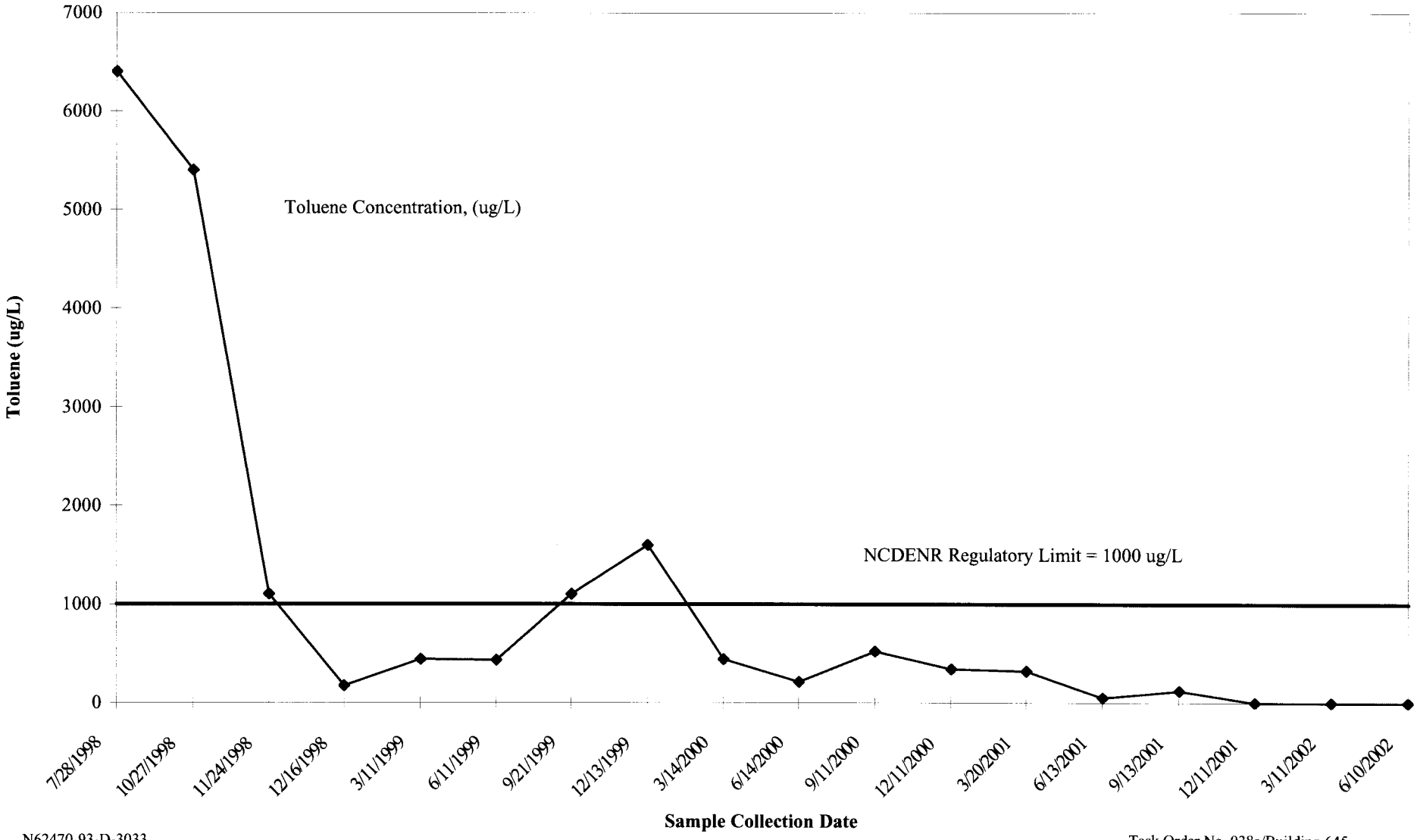

FIGURE 3-39
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW12
Total Xylenes, ug/L

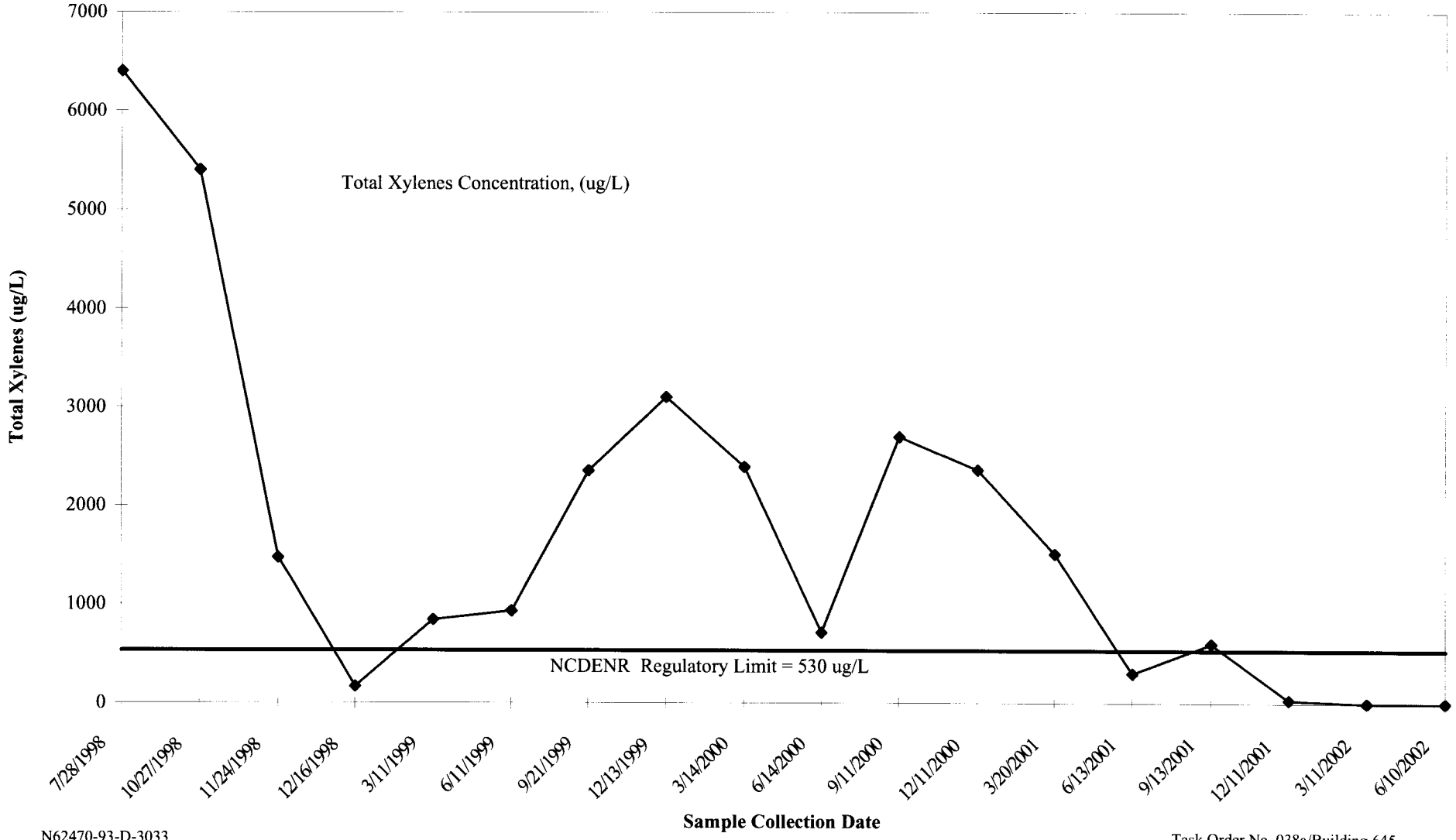

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FIGURE 3-40
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW12
Total VOCs, ug/L

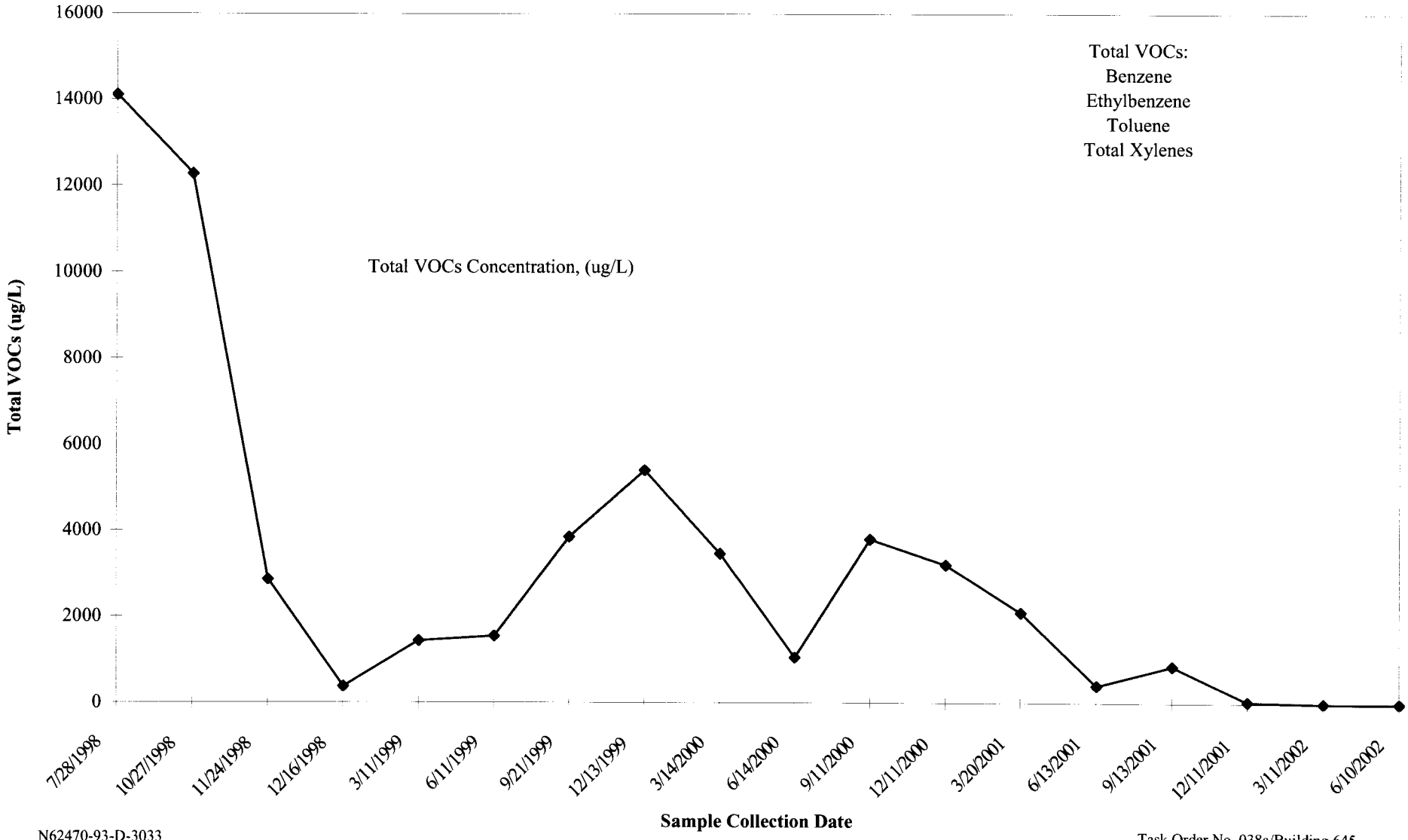

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FIGURE 3-41
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW12
Naphthalene, ug/L

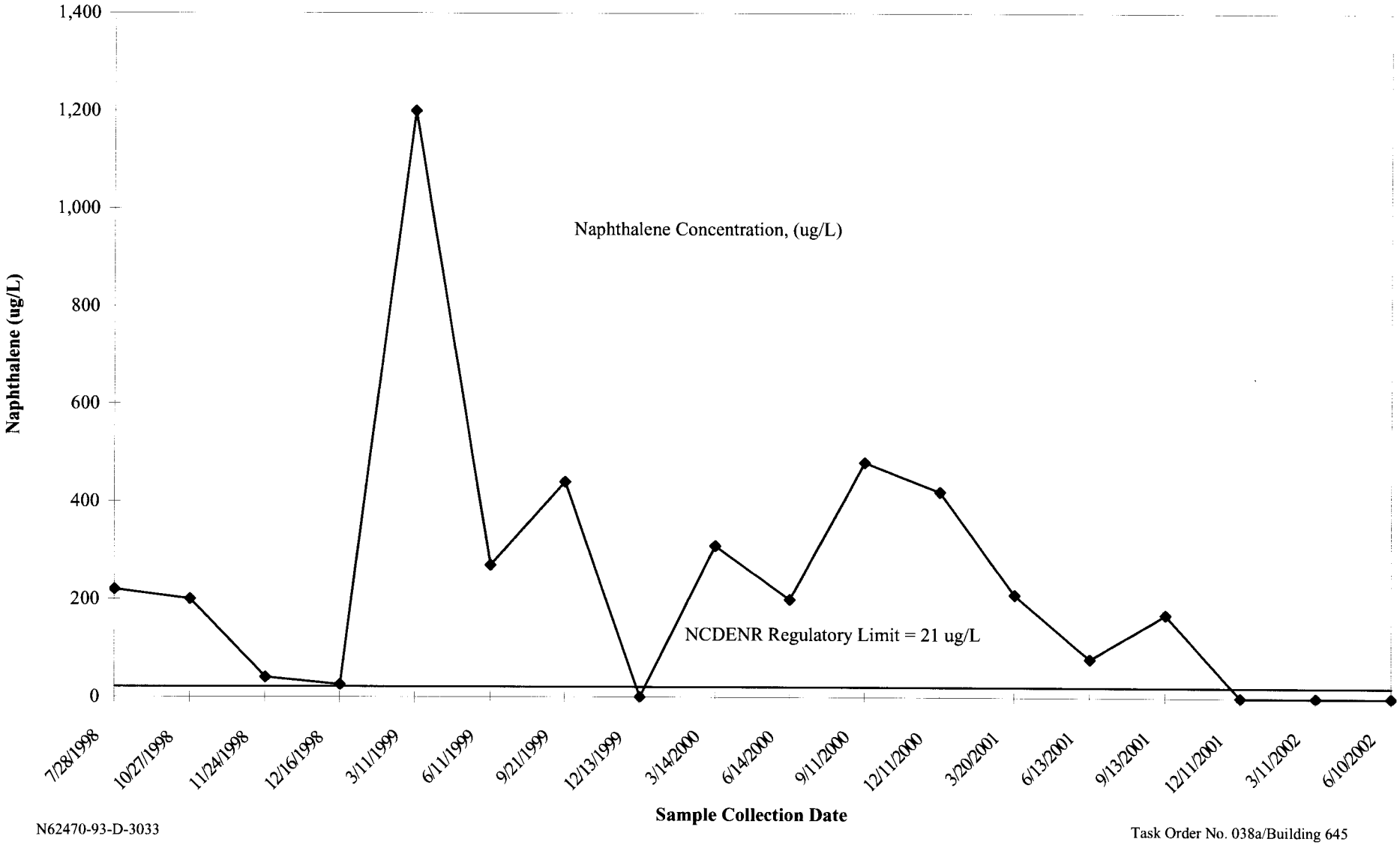

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FIGURE 3-42
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW12
1-Methylnaphthalene, ug/L

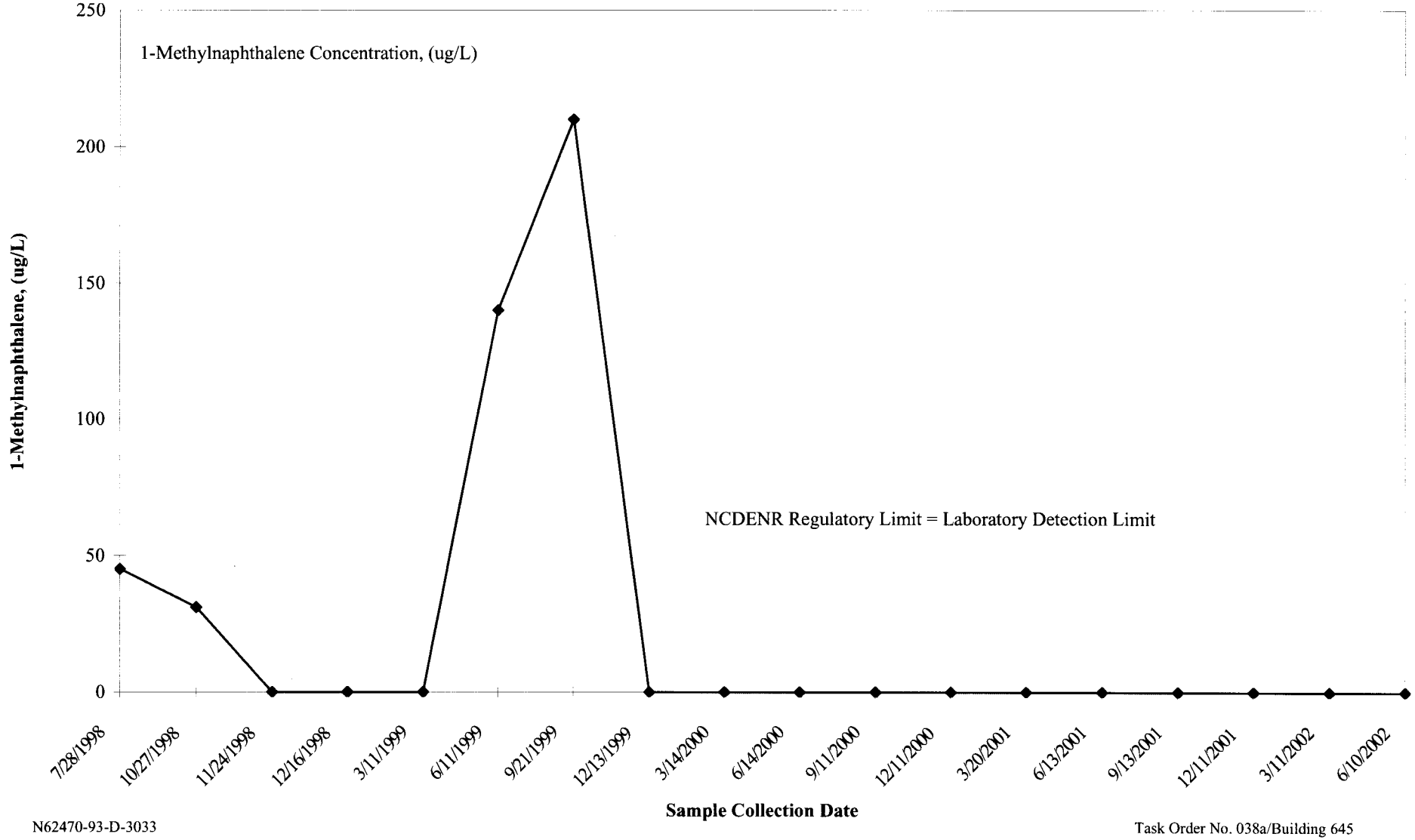

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FIGURE 3-43
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW12
2-Methylnaphthalene, ug/L

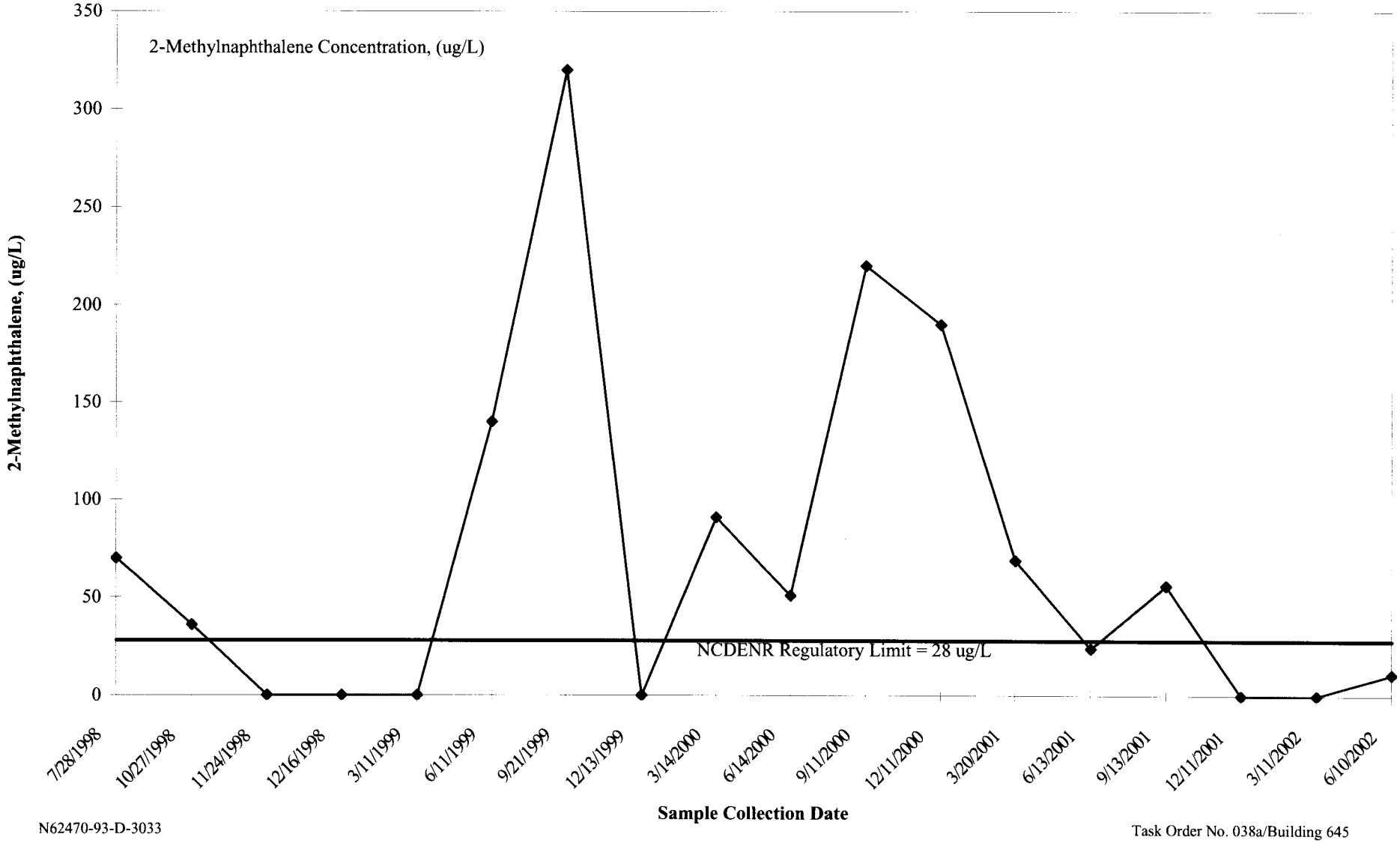

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FIGURE 3-44
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW12
Bis(2-ethylhexyl)phthlalate, ug/L

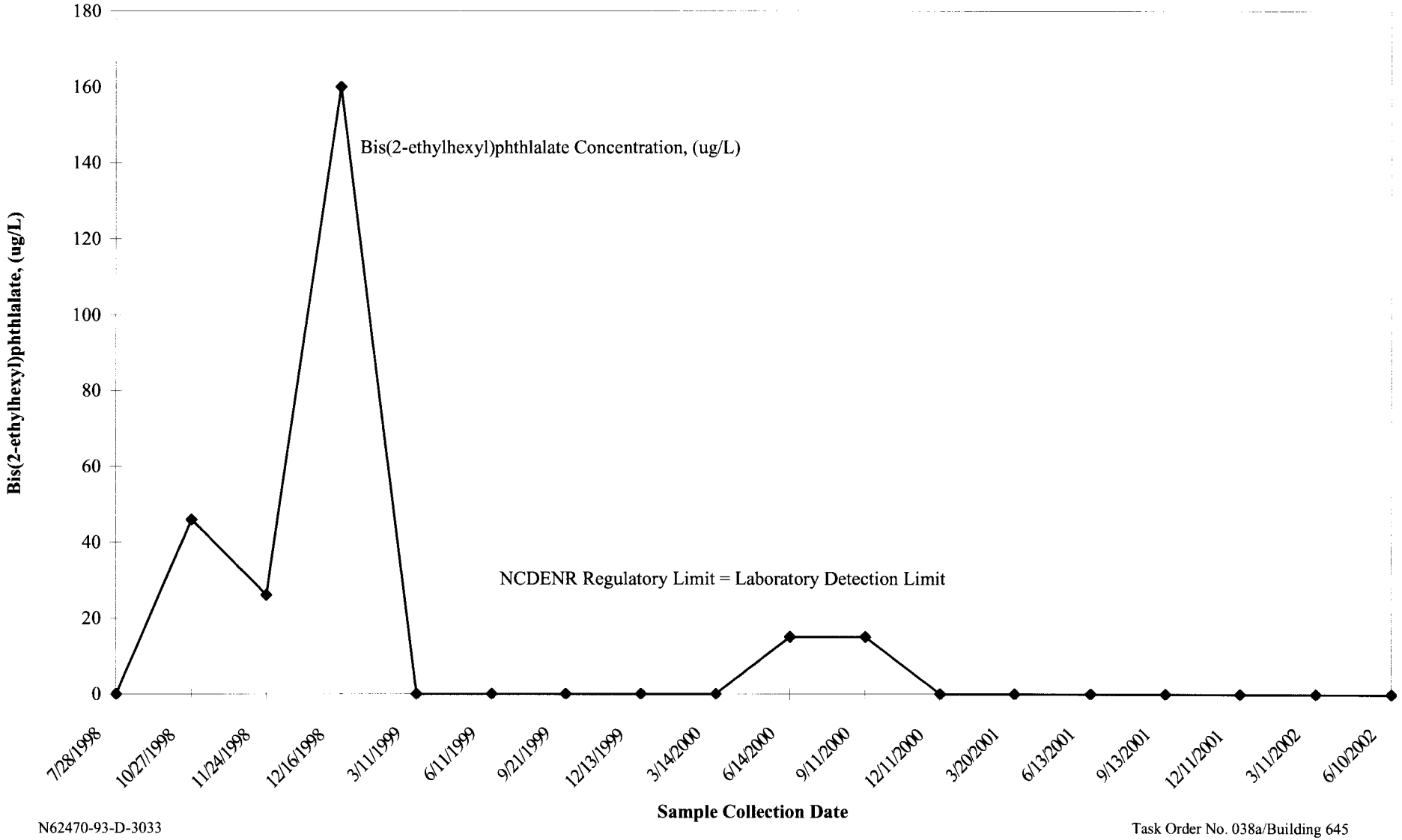

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FIGURE 3-45
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW12
2,4-Dimethylphenol, ug/L

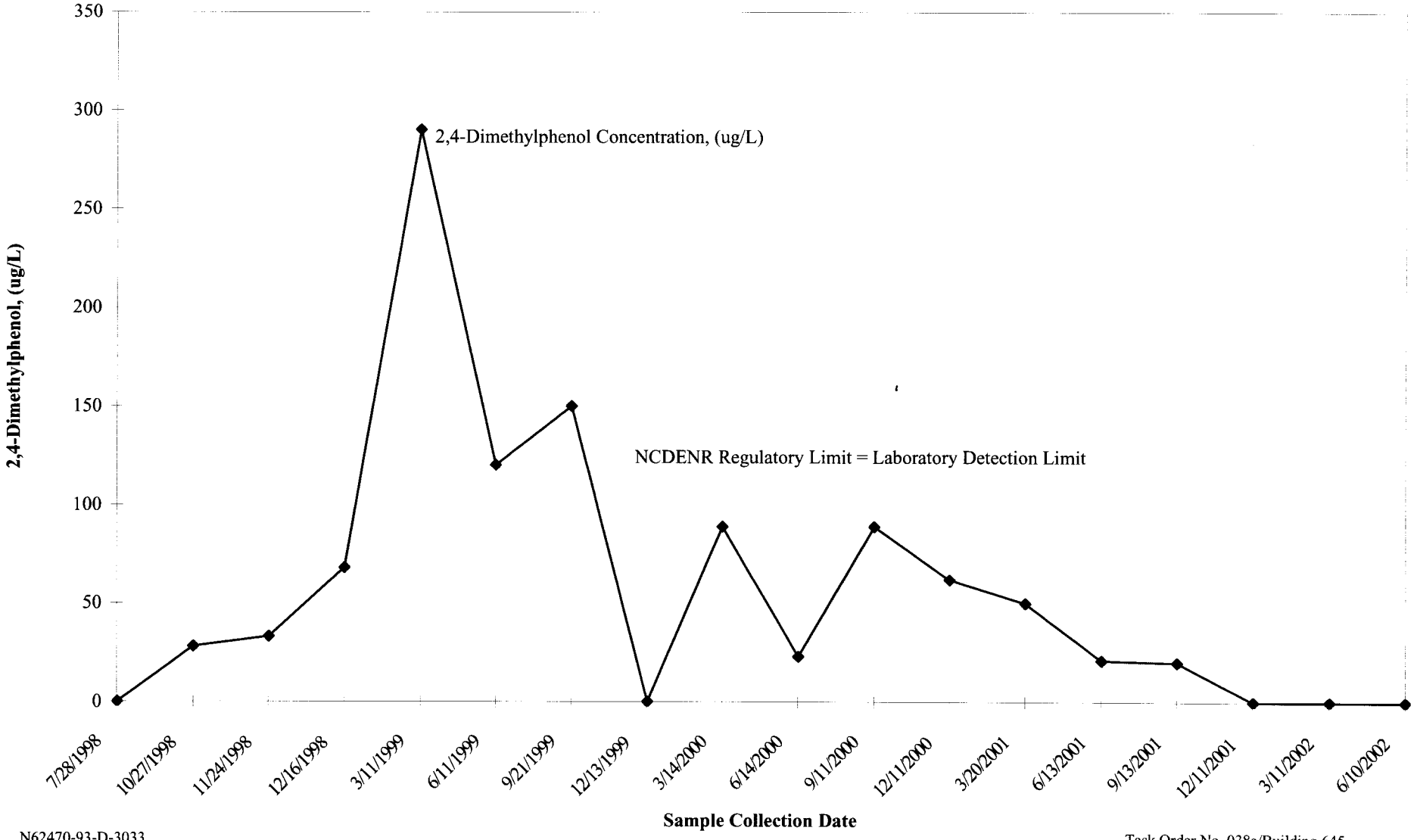

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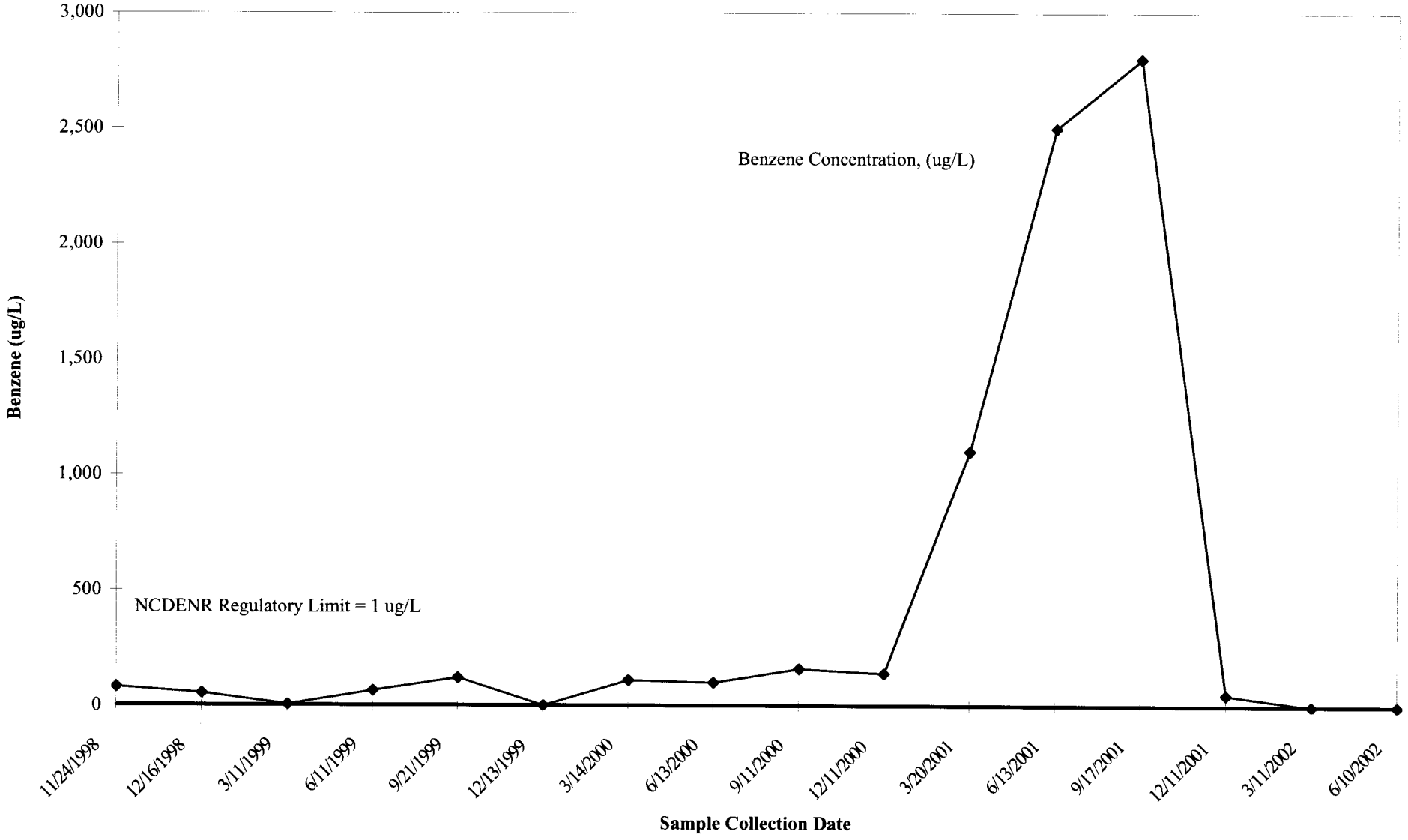
FIGURE 3-46
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW15
Benzene, ug/L



Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW15
Toluene, ug/L

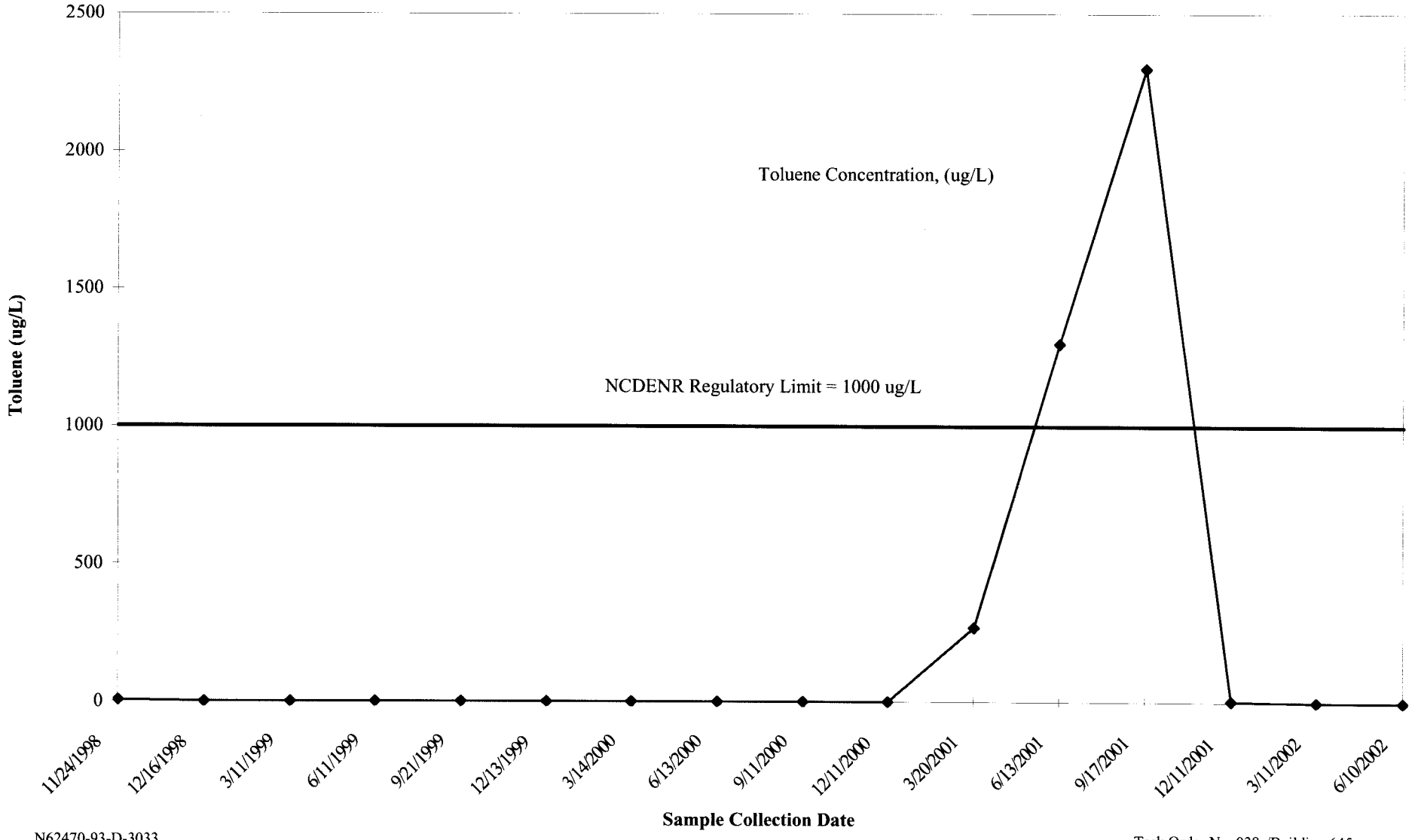


FIGURE 3-47
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW15
Total VOCs, ug/L

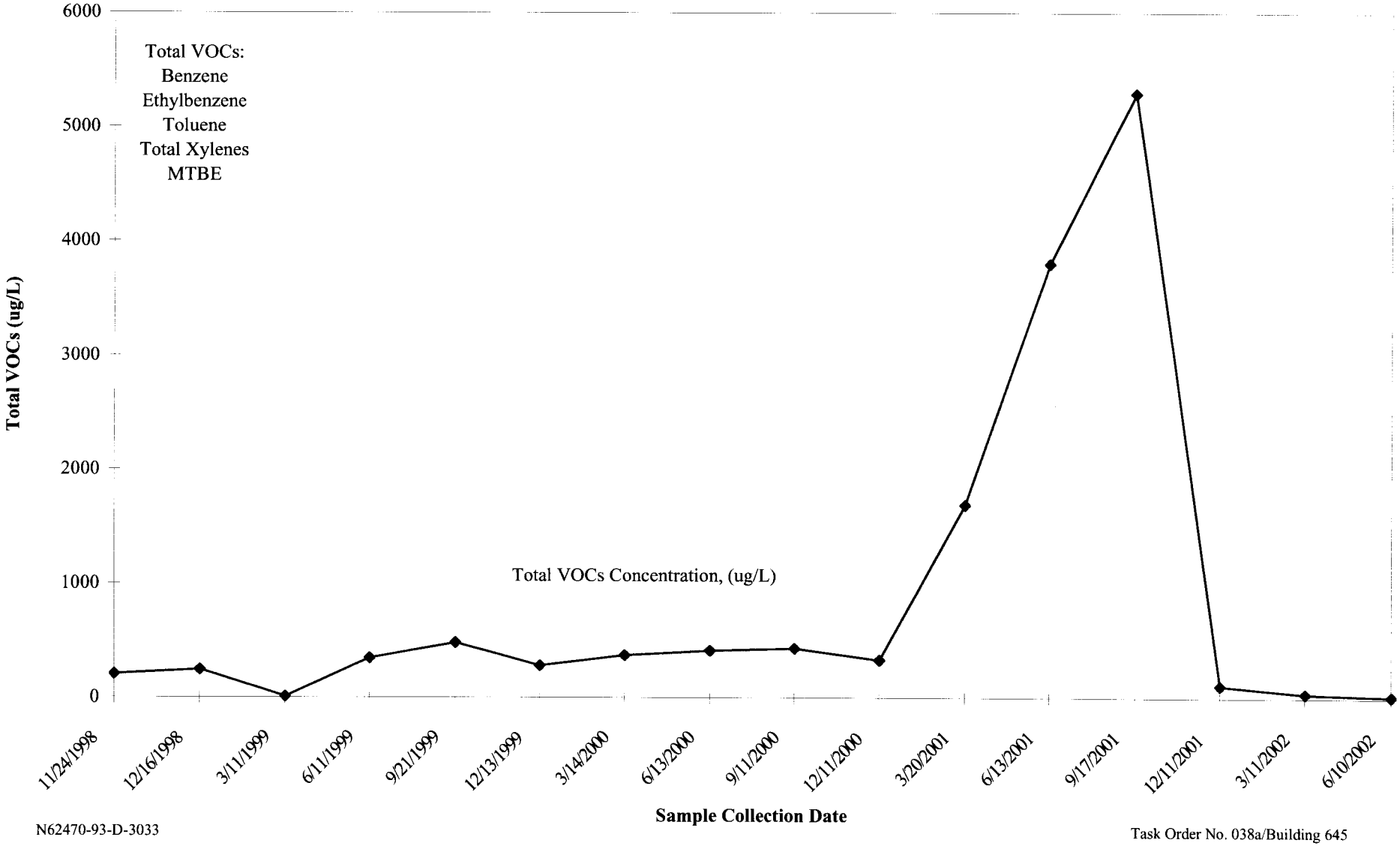


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FIGURE 3-48
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW15
Methyl-tert-butyl ether (MTBE), ug/L

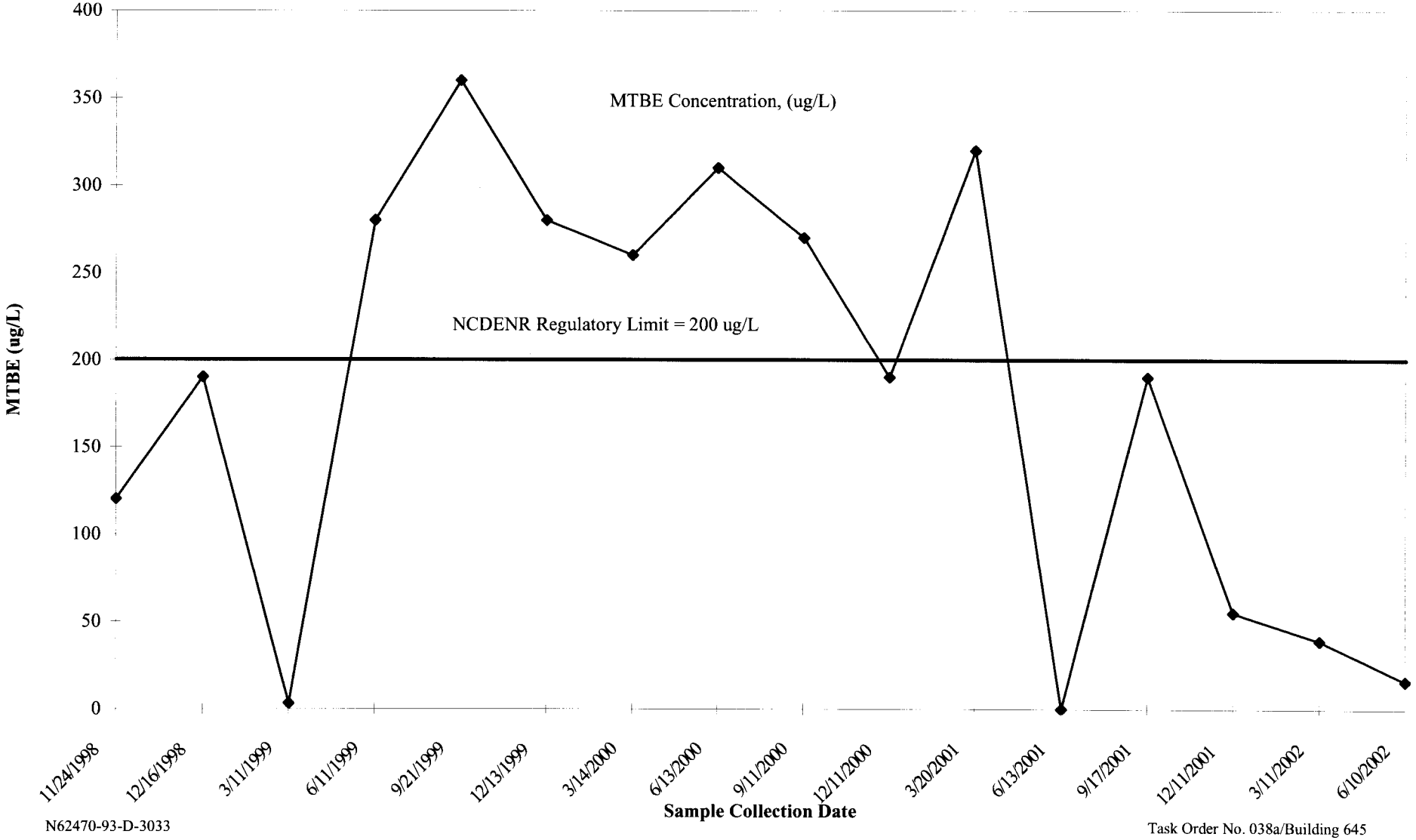

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FIGURE 3-49
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW15
Bis(2-ethylhexyl)phthlalate, ug/L

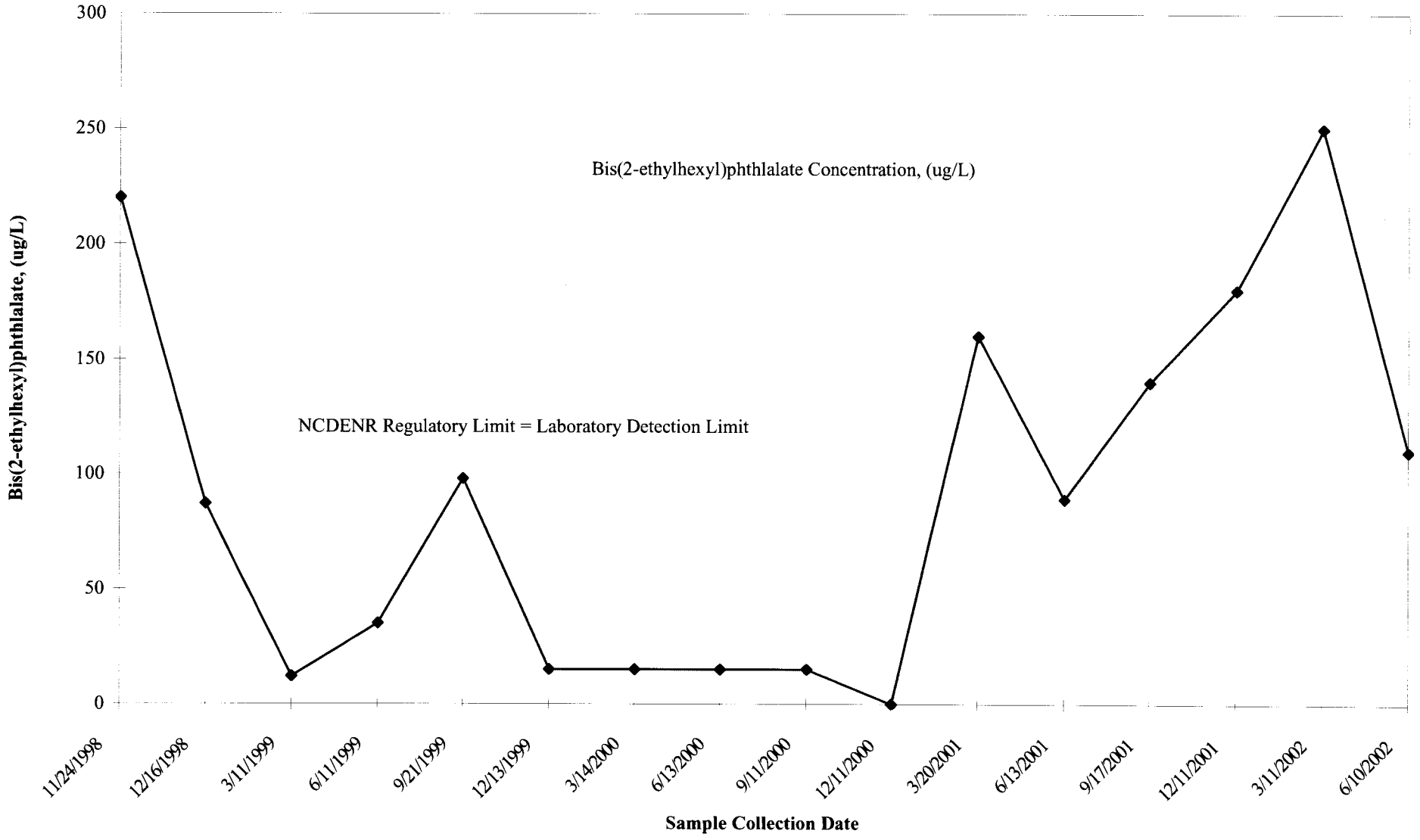
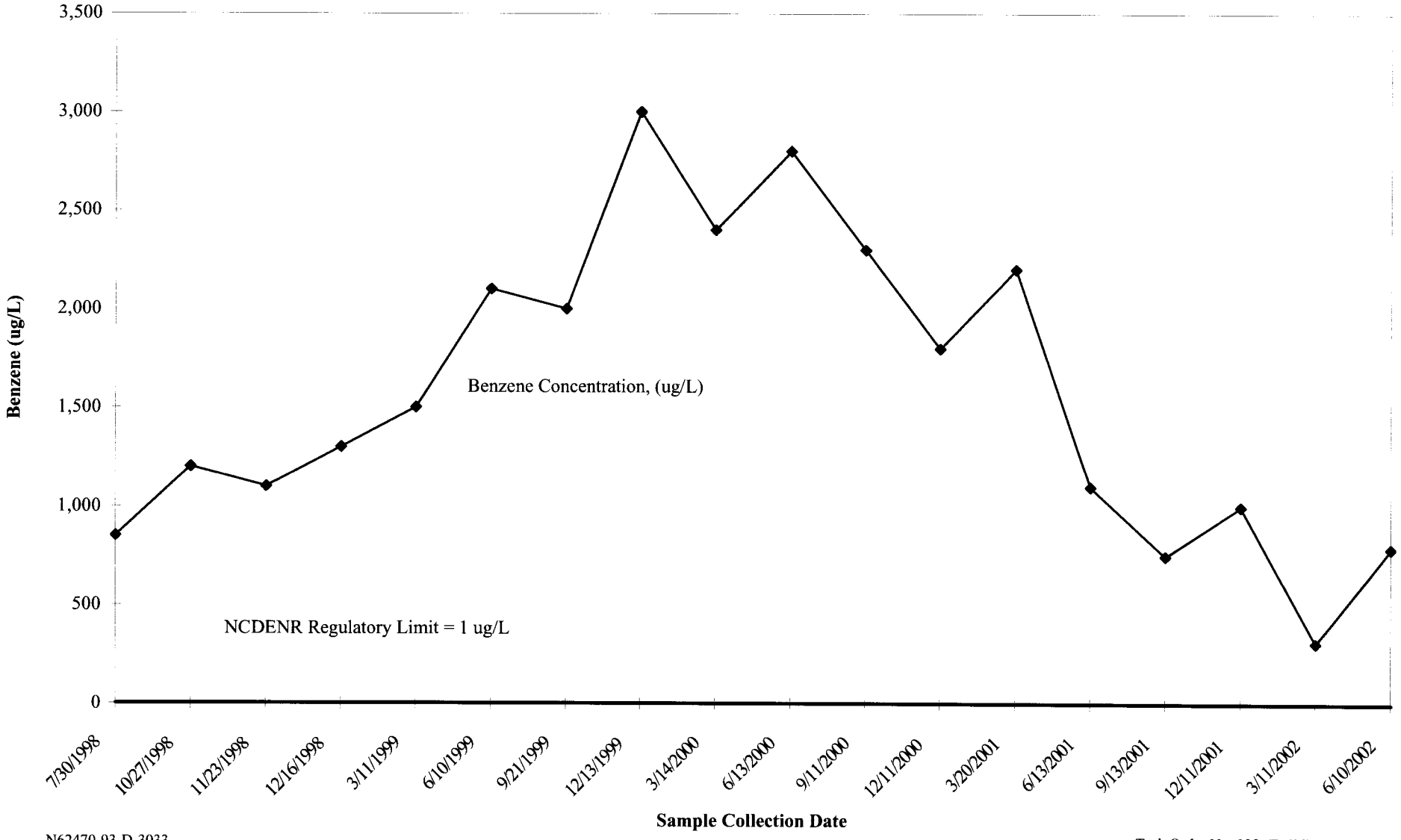


FIGURE 3-50
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW18
Benzene, ug/L



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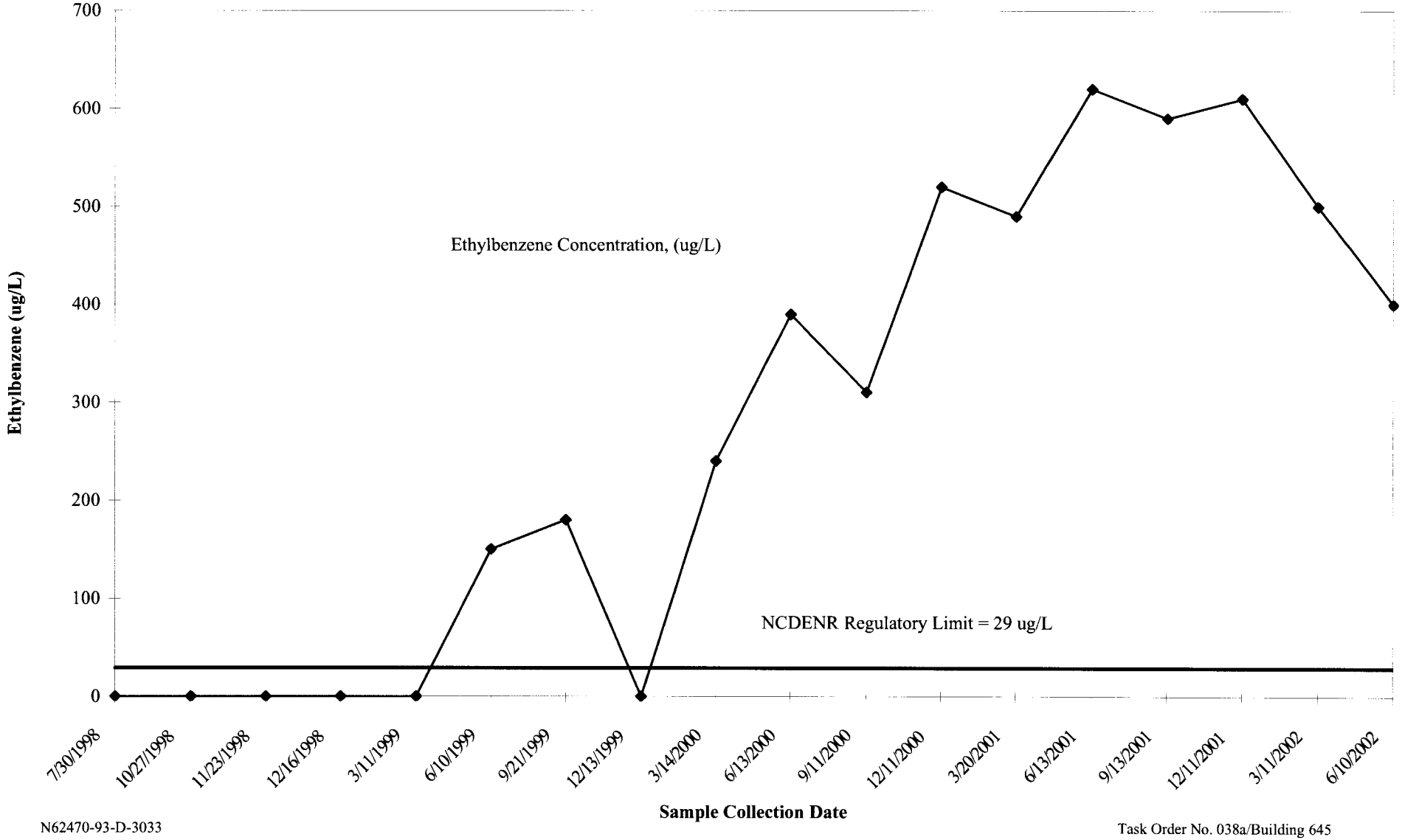
Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW18
Ethylbenzene, ug/L



Groundwater Monitoring Well Samples
Building 645
Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW18
Total Xylenes, ug/L

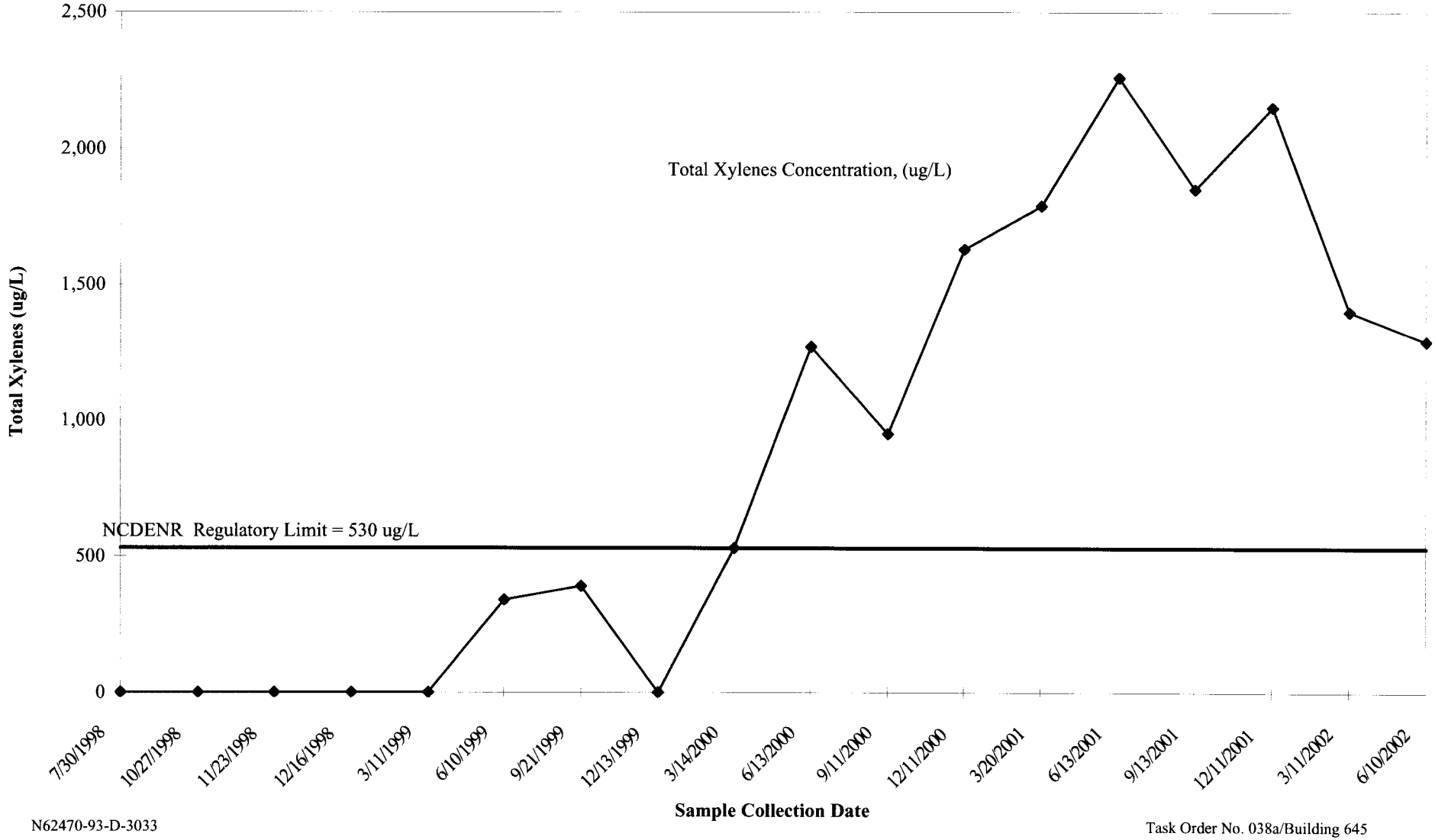


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FIGURE 3-51
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW18
Toluene, ug/L

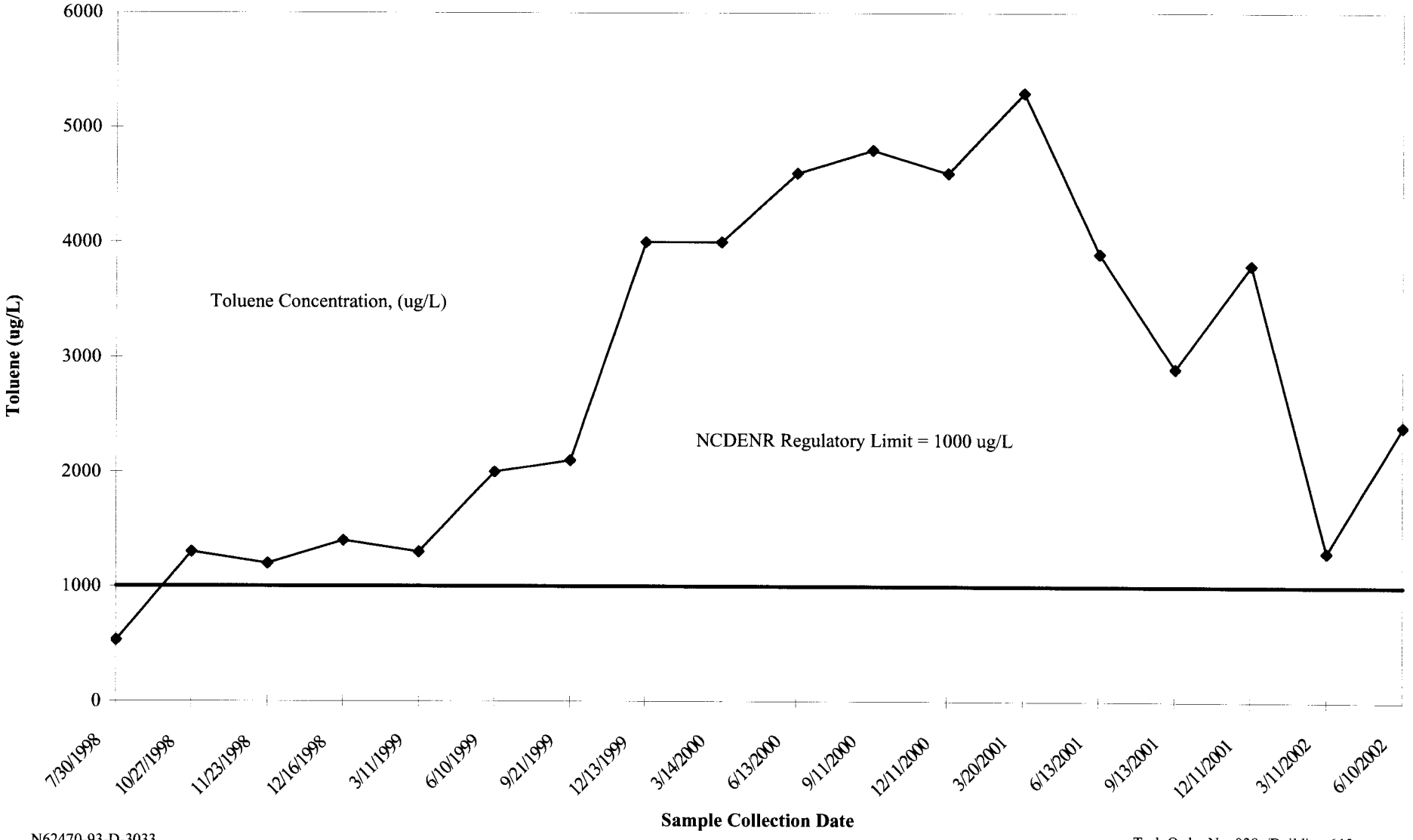

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FIGURE 3-52
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW18
Total VOCs, ug/L

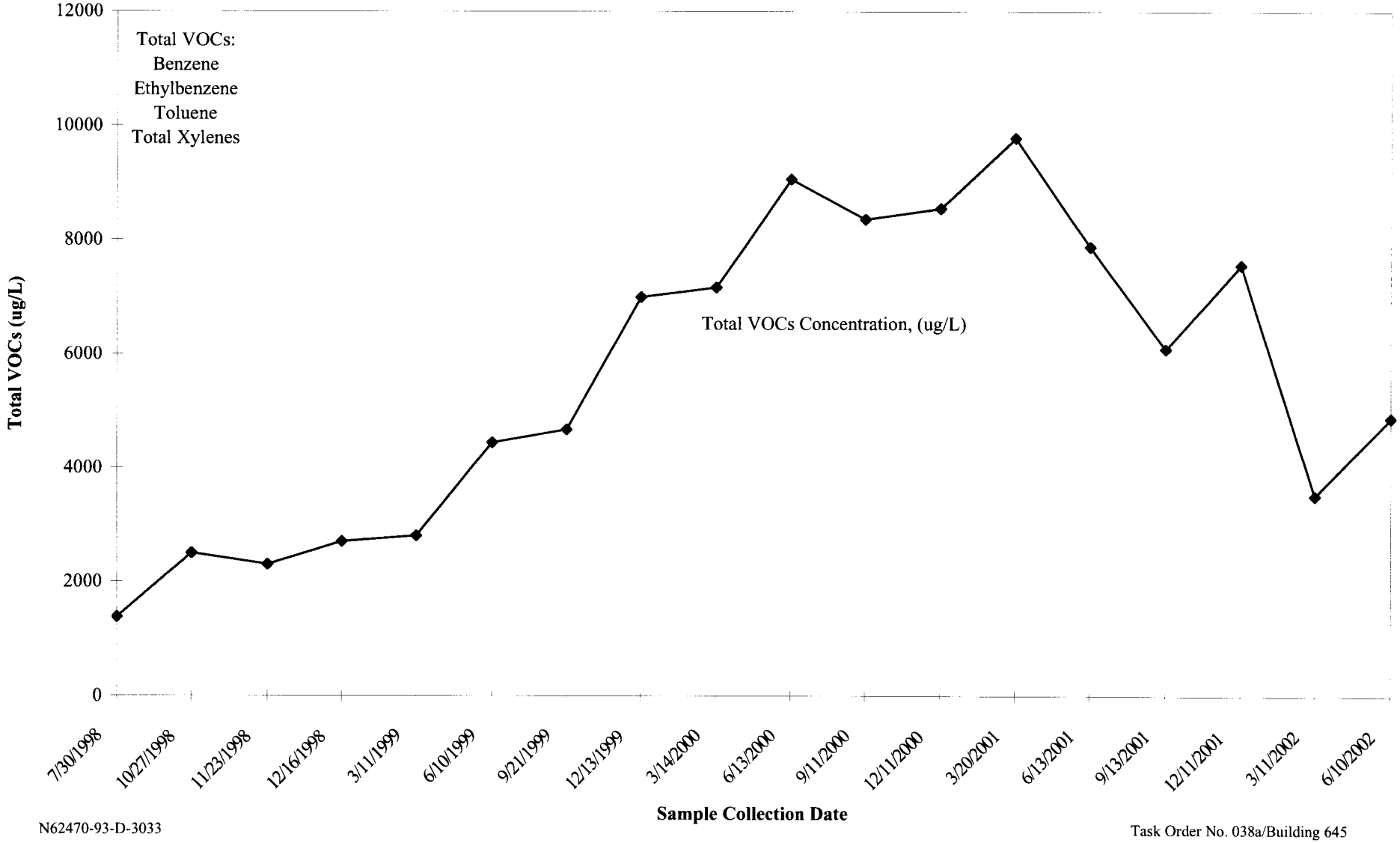

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FIGURE 3-53
Groundwater Monitoring Well Samples
Building 645, Camp Lejeune, North Carolina
Monitoring Well ID: UST645-MW18
Bis(2-ethylhexyl)phthlalate, ug/L