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SEMIANNUAL MONITORING REPORTS
OPERABLE UNIT NO. 7 - SITES 1 AND 28

MARINE CORPS BASE
CAMP LEJEUNE, NORTH CAROLINA

CONTRACT TASK ORDER 0367

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LIST OF ACRONYMS

CLP	Contract Laboratory Program
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
DQOs	Data Quality Objective
gpm	gallons per minute
MCB	Marine Corps Base
MCL	Federal Maximum Contaminant Levels
NCWQS	North Carolina Water Quality Standards
NFESC	Naval Facilities Engineering Service Center
NTU	Nephelometric Turbidity Units
OU	Operable Unit
QA/QC	Quality Control and Quality Control
ROD	Record of Decision
TAL	target analyte list
TCL	target compound list
TOC	top-of-casing
USGS	U.S. Geological Survey
USEPA	United States Environmental Protection Agency
VOC	volatile organic compounds
mg/kg	milligrams per kilogram
µg/L	micrograms per liter

PREFACE

The semiannual monitoring reports that are presented herein describe the procedures, analytical findings, and subsequent recommendations of the monitoring program at Operable Unit (OU) No. 7 (Sites 1 and 28), Marine Corps Base (MCB) Camp Lejeune, North Carolina. Figure P-1 depicts the location of OU No 7. The monitoring reports have been prepared by Baker Environmental, Inc. and submitted to the Naval Facilities Engineering Command, Atlantic Division; MCB Camp Lejeune, Environmental Management Department; the United States Environmental Protection Agency - Region IV; and the North Carolina Department of Environment, Health and Natural Resources.

The monitoring program at OU No. 7 was implemented in response to the Record of Decision (ROD) document signed by MCB Camp Lejeune on May 16, 1994. The ROD for OU No. 7 stipulates that groundwater samples from 16 monitoring wells and surface water/sediment samples from 3 locations in the New River be collected semiannually and submitted for specified laboratory analyses. The ROD also indicates that documentation in support of the selected remedy, institutional controls with monitoring, be maintained for periodic regulatory review.

The principal objective of the monitoring program at OU No. 7 is to monitor the potential for human or ecological exposure due to off-site migration of contaminants. The semiannual monitoring reports document the findings and provide interested parties with information required to authorize future decisions regarding OU No. 7. The information presented in the reports will be used to either extend, modify, or discontinue the monitoring program as necessary.

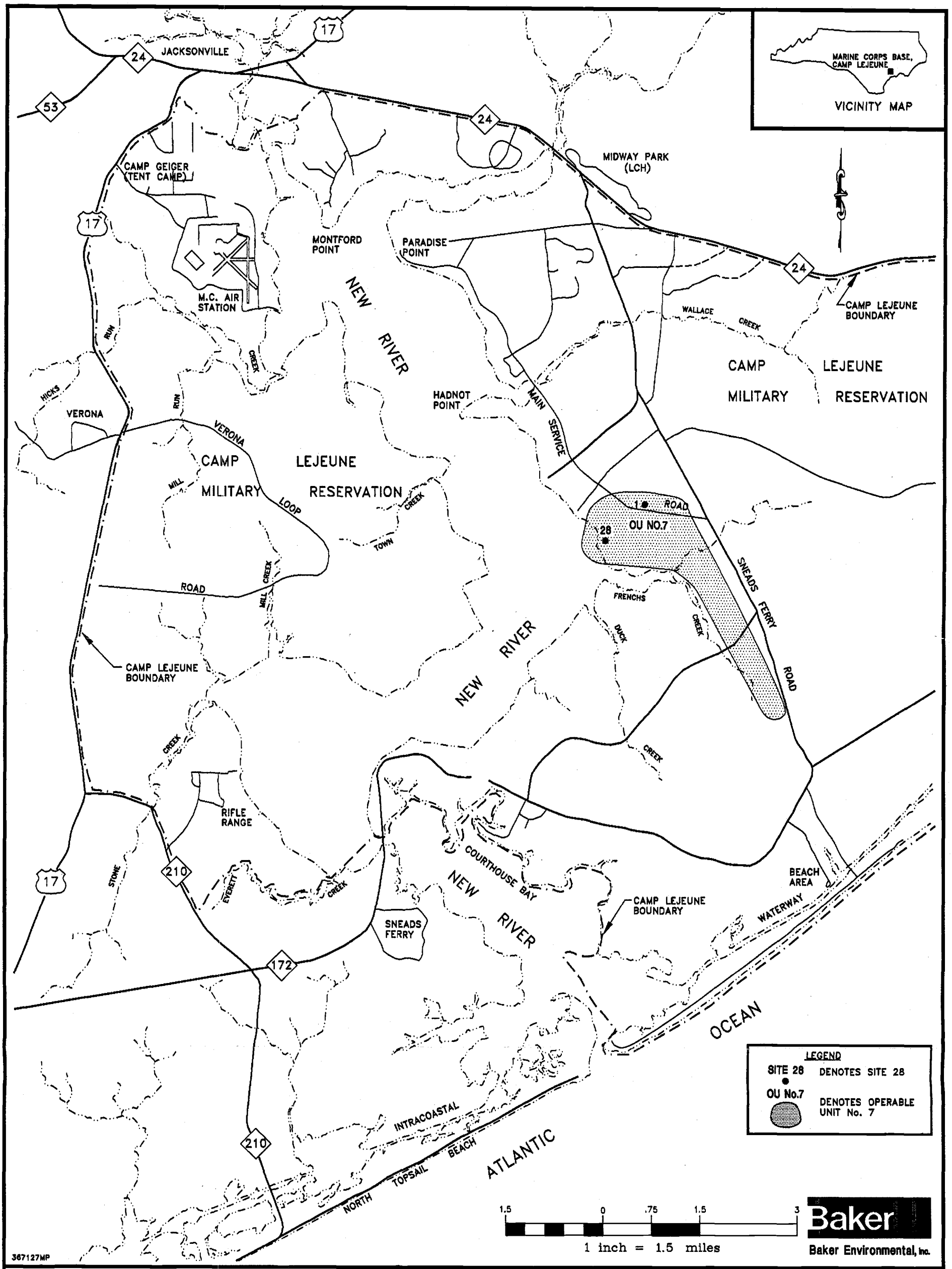

FIGURE P-1
LOCATION MAP
OPERABLE UNIT No. 7 - SITES 1 AND 28
MONITORING AND O&M SUPPORT, CTO - 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

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1.0 INTRODUCTION

The following semiannual monitoring report presents the sampling procedures and analytical results of the monitoring program at Operable Unit (OU) No. 7 (Sites 1 and 28), Marine Corps Base (MCB) Camp Lejeune, North Carolina. The report describes sampling activities completed at Sites 1 and 28 during the third quarter of 1996 and provides the findings of that effort. In addition, recommendations concerning the monitoring program are also presented within this report.

1.1 Report Organization

This semiannual monitoring report is comprised of four text sections. Section 1.0 describes the sampling program procedures and methodology. Section 1.0 also provides groundwater elevation data, groundwater flow direction, and various field observations. Analytical results and findings are presented in Section 2.0. A brief comparison of previous analytical findings versus the most recent findings is included within Section 2.0. Section 3.0 presents recommendations of the semiannual monitoring program at Sites 1 and 28. Finally, the references used during preparation of this report are included in Section 4.0. All tables, figures, and attachments are provided after the text portion of this report.

1.2 Semiannual Sampling Program

The sampling program at OU No. 7 commenced on July 22, 1996 and continued through July 31, 1996. The sampling program at Site 1 consisted of groundwater sample collection and analysis from seven shallow monitoring wells and one deep monitoring well. Although stipulated in the Record of Decision (Baker, 1995), a groundwater sample was not obtained from shallow monitoring well 1-GW18 at Site 1. Monitoring well 1-GW18 had been damaged and a sample could not be obtained. Figure 1-1 depicts groundwater sampling locations at Site 1. Groundwater samples from Site 28 were collected from five shallow monitoring wells and two deep monitoring wells. In addition to groundwater samples, one surface water and one sediment sample were collected from three distinct sample locations in the New River adjacent to Site 28. Figure 1-2 depicts the sampling locations at Site 28.

Prior to sampling, monitoring wells at both Sites 1 and 28 were redeveloped to remove fine-grained material from the well screens and to reestablish interconnection with the surrounding geologic formation. During redevelopment of the monitoring wells, a Waterra™ pump was used to rapidly raise and lower dedicated polyethylene tubing upon which a check valve and surge block were secured. The combined action of pumping and surging groundwater through the well screen was intended to dislodge and remove any fine grained material from the well screen and sand pack. Where conditions permitted, three to five well volumes were removed during redevelopment until the groundwater was essentially sediment-free. Measurements of pH, specific conductance, and temperature were recorded after each well volume was removed to confirm groundwater parameter stabilization. The groundwater measurements compiled during redevelopment activities are provided as Attachment A.

During the monitoring program, a low flow groundwater purge and sampling technique was employed. The sampling methodology was developed in response to conversations with the United States Environmental Protection Agency (USEPA) Region IV personnel in Athens, Georgia. A peristaltic pump, with the intake set two to four feet from the bottom, was used to purge each monitoring well. Dedicated sections of polyethylene and silicon pump-head tubing were used during

purge and sampling activities at each monitoring well. While purging groundwater, a flow rate of less than 0.25 gallons per minute was maintained. Environmental samples were obtained directly from the dedicated polyethylene tubing at the pump discharge.

A minimum of three well volumes were purged from each monitoring well prior to sampling. Measurements of pH, specific conductance, dissolved oxygen, temperature, and turbidity were recorded after each well volume was removed to ensure that groundwater characteristics had stabilized before sampling. These measurements were recorded in a field logbook. A summary of the groundwater field parameters at Sites 1 and 28 are provided in Tables 1-1 and 1-2, respectively. Prior to groundwater purging, water level and total depth measurements from each monitoring well were obtained. Water level, well depth, and well diameter measurements were used to calculate the volume of water in each well and the volume of water necessary to purge each well. Tables 1-3 and 1-4 provide summaries of monitoring well construction details for wells included in the monitoring program.

Groundwater samples were collected to assess whether contamination detected during previous investigative activities was present in the shallow aquifer or had migrated to the deeper, Castle Hayne, aquifer. Based upon previous monitoring results and decision documents, volatile organic compounds (VOCs) were identified as contaminants of concern at Site 1 and metals were identified at Site 28. As a result, groundwater samples collected at Site 1 were analyzed for target compound list (TCL) volatiles. Groundwater, surface water, and sediment samples collected at Site 28 were analyzed for target analyte list (TAL) metals. Aqueous samples were preserved at the time of collection with hydrochloric acid for volatile analyses and nitric acid for metal analyses. Tables 1-5 and 1-6 provide a summary of requested analyses and samples submitted during the semiannual monitoring program at Sites 1 and 28, respectively. As provided in Tables 1-5 and 1-6, environmental samples were analyzed using Contract Laboratory Program (CLP) methods and Level IV Data Quality Objectives (DQOs). DQO Level IV is equivalent to the Naval Facilities Engineering Service Center (NFESC) Level D, as specified in the "Sampling and Chemical Analysis Quality Assurance Requirements for the Navy Installation Restoration Programs" document. Table 1-7 provides the various Contract Required Quantitation Limits (CRQLs) for organic compounds, Contract Required Detection Limits (CRDLs) for inorganics, and comparative water quality standards.

In addition to groundwater samples, one surface water and one sediment sample were collected from three locations in the New River adjacent to Site 28. The surface water and sediment samples were collected to assess whether metals had migrated from an adjacent pistol firing range into the New River. Samples were obtained from the New River at regularly spaced intervals approximately 100 feet off the shore. The three surface water and sediment sampling locations are depicted in Figure 1-2. At each sampling station, surface water samples were collected by dipping laboratory prepared containers directly into the water. Sediment samples were collected below the water surface, from the river bed. A sediment corer, equipped with a disposable acetate sleeve, was manually pushed approximately six inches into the river bed. The sediment was then extruded from the disposable sampling tube and placed in appropriate laboratory containers. Each surface water and sediment sample was analyzed for TAL metals, as provided in Table 1-6.

Trip blanks were prepared prior to the sampling event, placed in sample storage containers, and kept with the investigative samples throughout the sampling event. The trip blanks were then packaged for shipment with the environmental samples and sent for analysis. Trip blanks were used to

determine if samples were cross-contaminated with volatile compounds during storage and transportation to the laboratory.

Sample information, including well number, sample identification, time and date of sample collection, samplers, analytical parameters, and required laboratory turnaround time, was recorded in a field logbook and on sample labels. Chain-of-custody documentation, provided in Attachment B, accompanied the samples to the laboratory. Chain-of-custody forms were then compared to the monitoring plan; this comparison was used to verify that appropriate laboratory analyses had been requested. Upon receipt of the laboratory analytical results, a further comparison was performed to verify that each sample was analyzed for the requested analyses. Sample tracking documentation is provided in Attachment C. The sample designation format used during the monitoring program at Sites 1 and 28 is provided in Attachment D.

1.3 Groundwater Elevation and Flow Direction

The following provides information concerning groundwater flow patterns at Sites 1 and 28. Static water level measurements were collected after all well sampling activities had been completed. Measurements were recorded from top-of-casing (TOC) reference points marked on each monitoring well. Groundwater measurements were recorded to the nearest 0.01-foot using an electric measuring tape. The elevation data were obtained by subtracting the measured depth to groundwater from the reference elevation. The groundwater elevation data are based upon water levels obtained during the sampling program. For ease of discussion, groundwater elevation and flow direction for the two sites are presented separately.

1.3.1 Site 1

Water level measurements were collected at Site 1 on July 30, 1996. Table 1-8 provides a summary of the measurements and Figure 1-3 depicts the static elevations and approximate flow direction of groundwater at Site 1. The groundwater flow regime throughout the northern portion of Site 1 is relatively consistent. As depicted in Figure 1-3, groundwater flow is generally west toward an unnamed tributary of Codgels Creek. The unnamed tributary discharges into Codgels Creek at Site 28, approximately 1,500 feet southwest of Site 1.

1.3.2 Site 28

Water level measurements at Site 28 were collected on July 30, 1996. Table 1-9 provides a summary of the measurements and Figure 1-4 depicts the static elevations and approximate flow direction of groundwater at Site 28. Groundwater flow within the surficial aquifer at Site 28 is influenced by both the New River and Codgels Creek. As depicted in Figure 1-4, groundwater flow within the central and eastern portions of the site is toward Cogdels Creek.

1.4 Field Observations

The following field observations were noted during the semiannual monitoring program at Sites 1 and 28. Recommendations regarding the field observations which follow are presented in Section 3.0.

As cited, a groundwater sample was not collected from shallow monitoring well 1-GW18 during the monitoring program. Monitoring well 1-GW18 is located within a fenced storage lot. This fenced

portion of Site 1 serves as a motor transport maintenance facility. Heavy equipment such as mobile cranes and forked vehicles are temporarily staged in this are while awaiting service. Presumably, one of the wheeled vehicles damaged the flush-mounted well while being moved. The steel protective lid was cracked, the concrete apron was dislodged, and the well riser had been sheared off. At the time of the investigation, sand and gravel from the staging area had nearly filled the well screen and riser to ground surface.

In general, monitoring wells that were installed during the 1994 Remedial Investigation at both Sites 1 and 28 are in good condition. Wells that were installed during the 1984 Confirmation Study, however, have begun to show signs of deterioration. Paint on the bollards and protective casings of wells 1,GW01, 1-GW02, 1-GW03, 28-GW02, and 28-GW04 has begun to peel and rust is present. The same monitoring wells are also missing interior protective caps. In addition, several of the locking padlocks no longer function properly. Both the usability and security of the wells included in the monitoring program should be addressed if they are going to remain groundwater sampling points in the future.

In addition to the need for above-ground maintenance, monitoring well 1-GW01 may also have begun to deteriorate below ground surface. Turbidity readings, obtained during sampling activities, suggest that soil material from the surrounding formation has begun to infiltrate the well screen and sand pack. Less than ideal sampling conditions may result when consistent readings of greater than 50 nephlometric turbidity units (NTUs) in groundwater are obtained. In general, it is preferable that groundwater samples be collected after turbidity readings stabilize at less than 10 NTUs. Elevated turbidity readings are particularly evident among groundwater samples submitted for metal analyses; naturally-occurring metals that adhere to soil particles are reflected in the groundwater results. Metal analyses, however, were not requested for groundwater samples obtained from Site 1.

2.0 ANALYTICAL RESULTS AND FINDINGS

The section which follows presents the analytical results and findings from sampling performed during the third quarter of 1996 as part of the monitoring program. This section also describes the primary concerns at Sites 1 and 28 and is not intended to address all analytical results. Groundwater samples from Site 1 were obtained from seven shallow monitoring wells and one deep monitoring well. The sampling program at Site 28 entailed the collection of groundwater samples from five shallow and two deep monitoring wells. In addition, one surface water and one sediment sample was obtained from three distinct locations in the New River adjacent to Site 28.

As part of the continuing quality assurance and quality control (QA/QC) process, one trip blank was prepared for volatile organic analyses from Site 1. The trip blank was prepared prior to the sampling event and kept with the environmental samples during field collection, shipment, and laboratory analysis. As provided in Table 2-1, there were no detections of any organic compounds in the trip blank sample.

2.1 Site 1

The following presents analytical results and findings from the monitoring program conducted during the third quarter of 1996. Each groundwater sample collected at Site 1 was analyzed for TCL volatiles. A summary of groundwater analytical results is provided in Table 2-2. A positive detection summary of VOCs in groundwater at Site 1 is provided in Table 2-3.

Two VOCs were detected among the eight groundwater samples collected at Site 1. The VOC 1,2-dichloroethene (total) was detected at a concentration of 19 micrograms per liter (µg/L) in the sample obtained from shallow monitoring well 1-GW10. Xylenes (total) were detected in the groundwater sample obtained from shallow monitoring well 1-GW12 at an estimated concentration of 6 µg/L. The two VOC detections did not exceed the applicable North Carolina Water Quality Standards (NCWQS) or federal maximum contaminant levels (MCLs) for drinking water. Figure 2-1 depicts the locations and concentrations of both the 1,2-dichloroethene (total) and xylene (total) detections.

The two positive detections of VOCs were limited to shallow groundwater samples obtained from wells located near the northern boundary of the study area. As depicted in Figure 2-1, the two wells with positive VOC detections are located approximately 1,200 feet from one another. The lack of positive VOC detections in other wells, suggests that VOC contamination in groundwater is limited to the observed locations. In addition, the lack of positive VOC detections in the sample obtained from deep monitoring well 1-GW17DW suggests that volatile contaminants have not migrated from the surficial aquifer to the Castle Hayne Aquifer.

Positive detections of VOCs at Site 1 have been documented in the past. Table 2-4 provides a summary of VOC results from groundwater samples obtained during the past three years at Site 1. Previous sampling results have indicated VOCs in samples obtained from monitoring wells 1-GW10, 1-GW11, 1-GW12, and 1-GW17. Overall, the latest sampling results show a decrease in both the number of detected VOCs and their respective concentrations as compared to the previous data. The decrease may be a result of natural degradation of the organic compounds, natural fluctuations in groundwater levels, or migration of the contaminants.

2.2 Site 28

The following subsections present analytical results and findings from the monitoring program conducted during the third quarter of 1996 at Site 28. Groundwater quality was evaluated at Site 28 by sampling five shallow monitoring wells and two deep monitoring wells. In addition to groundwater samples, three surface water and three sediment samples were collected from the New River which borders Site 28. Each of the samples collected at Site 28 were analyzed for TAL metals. Analytical results from the groundwater, surface water, and sediment sampling are presented separately.

2.2.1 Groundwater Analytical Results

Metals were detected in each of the groundwater samples obtained at Site 28. Table 2-5 provides a summary of the groundwater analytical results. A positive detection summary of metals in groundwater samples is presented in Table 2-6. Figure 2-2 depicts the locations and groundwater sampling results of total metals that were detected at concentrations in excess of either NCWQS or MCL.

Aluminum, antimony, iron, and manganese were the only metals detected among the seven groundwater samples at concentrations in excess of either NCWQS or MCL. Aluminum exceeded the MCL of 50 µg/L in samples obtained from monitoring wells 28-GW02, 28-GW04, 28-GW07, 28-GW07DW, and 28-GW08 (refer to Figure 2-2). Antimony exceeded the MCL of 6 µg/L in samples obtained from monitoring wells 28-GW02 and 28-GW07. Iron exceeded the NCWQS and MCL of 300 µg/L with concentrations ranging from 364 µg/L in a sample obtained from deep monitoring well 28-GW01DW to 36,300 µg/L in a sample obtained from shallow monitoring well 28-GW07. Concentrations of manganese exceeded the NCWQS and MCL of 50 µg/L in samples obtained from monitoring wells 28-GW01, 28-GW01DW, 28-GW02, 28-GW04, 28-GW07, and 28-GW08.

Antimony, iron, and manganese were detected at their respective maximum concentrations in a sample obtained from shallow monitoring well 28-GW07, located within the suspected former burn dump area. Iron and manganese were detected at maximum concentrations of 36,300 and 860 µg/L, respectively. The iron and manganese detections exceeded the applicable NCWQS and MCL levels of 300 and 50 µg/L. Although the concentrations of both iron and manganese in groundwater samples often exceed established water quality standards, the levels are generally characteristic of natural site conditions. Soils found within the coastal plain of North Carolina are naturally rich in metals, particularly iron and manganese. The observed concentrations of iron and manganese in groundwater may be due more to geologic conditions (i.e., naturally occurring metals bound to unconsolidated soil particles) and sample acquisition methods than to mobile metal concentrations in the aquifer. The presence of metals in groundwater is often a reflection of solids or colloids in samples. The metals detected among groundwater samples obtained from Site 28 may also be indicative of buried metal material. Buried metal objects have been unearthed during previous investigations at Site 28, primarily west of Cogdels Creek (refer to Figure 1-2). Buried metal material in the presence of naturally-occurring acidic soils may provide another plausible explanation for the observed metal concentrations.

Aluminum and antimony were the only other total metals identified among groundwater samples at concentrations which exceeded applicable water quality standards. As depicted in Figure 2-2, five

of the monitoring wells at Site 28 had a positive detections of aluminum above the 50 µg/L MCL. Positive aluminum detections in groundwater samples ranged from 39.7 to 137 µg/L. Antimony was detected in two groundwater samples at concentrations exceeding the 6 µg/L MCL. Antimony was detected twice among the seven groundwater samples at concentrations of 14.7 and 19.2 µg/L. The combination of acidic soil in the presence of confirmed buried metal material may have contributed to elevated aluminum and antimony concentrations. Several hundred or even several thousand milligrams per liter of aluminum is not unusual for natural waters obtained from slightly acidic environs (USGS, 1992).

The observed concentrations of total metals in the groundwater at Site 28 are believed to be the result of natural site conditions and suspended solids within samples, possibly compound by known buried metal material. The slight acidity of natural soils, coupled with the natural occurrence of metals and the presence of buried metal material may have contributed to the observed concentrations of metals in groundwater at Site 28.

2.2.2 Surface Water Analytical Results

Three surface water samples were collected from the New River adjacent to Site 28 and submitted for total metal analyses. Metals were detected in each of the three surface water samples obtained from the New River. The locations of the surface water samples and concentrations of those metals which exceeded applicable screening criteria are depicted in Figure 2-3. Table 2-7 provides a summary of surface water analytical results. A positive detection summary of metals in the three surface water samples is presented in Table 2-8.

Laboratory analyses of the three surface water samples retained from the New River indicate that 16 of 23 total metals were positively detected. As indicated in Table 2-7, aluminum, beryllium, copper, and lead were the only metals identified at concentrations in excess of either state standards or federal criteria. Each sampling station had a positive detection of aluminum which exceeded the 50 µg/L federal criteria. Positive aluminum detections among the three surface water samples obtained from the New River were 690, 1,290, and 3,890 µg/L. Beryllium was detected at a concentration in excess of the 0.53 µg/L federal criterion in the surface water sample obtained from 28-SW01. As presented in Figure 2-1, sampling station 28-SW01 was located upgradient of both Site 28 and the pistol firing range. Copper was detected in each of the surface water samples at concentrations of 5.9, 8.9, and 28.4 µg/L which exceeded the 3.0 µg/L state standard. Lead was also detected in each of the samples collected from the New River. Positive detections of lead at each of the sampling stations exceeded the 1.32 µg/L federal criteria and two of the detections exceeded the 25 µg/L state standard. No other total metal concentrations in the three surface water samples exceeded either state standards or federal criteria.

2.2.3 Sediment Analytical Results

Three sediment samples were collected in conjunction with surface water samples also obtained from the New River adjacent to Site 28. Each of the three sediment samples were submitted for metal analyses. Laboratory analyses of three sediment samples obtained from the New River indicate that 13 of 23 metals were positively detected. As indicated in Table 2-9, copper was the only metal identified at concentrations in excess of applicable screening values. Concentrations of copper detected in samples 28-SD02 and 28-SD03 were 33.3 and 23.7 milligrams per kilogram (mg/kg), respectively. Both detections exceeded the copper screening value of 18.7 mg/kg.

Positive detections of lead among sediment samples obtained from the New River near the pistol firing range have been documented in the past. Previous sampling results have implied that the presence of lead , in the form of lead shot, in samples obtained from the New River is the result of training activities at the adjacent pistol firing range. The most recent analytical results indicate that lead was detected in each of the three sediment samples at concentrations less than 20 mg/kg. The screening value for lead in sediment is 30.2 mg/kg.

3.0 RECOMMENDATIONS

Based upon the observations and findings presented in Sections 1.0 and 2.0 of this semiannual monitoring report, the following recommendations for the monitoring program at OU No. 7 are provided. If non-significant changes are made to a component of the selected remedy described in the ROD (Baker, 1995), the changes must be recorded in a post-decision document file. If significant changes are made to a component of the selected remedy, the changes will need to be presented in an Explanation of Significant Differences document.

3.1 Abandon and Replace Monitoring Well

Field observations confirm that shallow monitoring well 1-GW18 has been damaged beyond repair. The steel protective lid was cracked, the concrete apron was dislodged, and the well riser had been sheared off. At the time of the investigation, sand and gravel from the surrounding area had nearly filled the well screen and riser to ground surface. As a result, it will no longer be possible to obtain groundwater samples from shallow monitoring well 1-GW18. Based upon this information, it is recommended that well 1-GW18 be abandoned according to accepted procedures and replaced with a similarly constructed monitoring well. The concrete apron of the new monitoring well will need to be reinforced or made significantly larger in order to withstand heavy equipment traffic. The location of the replacement well may also need to be adjusted to avoid future damage.

Wells not associated with the monitoring program at Sites 1 and 28 may also be abandoned, once the future need for supplemental data can be determined.

3.2 Maintain Well Security and Aesthetics

A number of monitoring wells at Sites 1 and 28 that were installed during the 1984 Confirmation Study have begun to show signs of deterioration. The bollards and protective casings of the wells have developed peeling paint and rust. In addition, a number of the padlocks used to secure the protective covers are either missing or no longer function properly. Both the usability and security of each monitoring well should be maintained if they are going to remain reliable groundwater sample collection points in the future. As suggested, the bollards and well casings should be painted with a weather and rust resistant paint. New padlocks that operate with a universal key should be installed on each of the monitoring wells at Sites 1 and 28.

4.0 REFERENCES

Baker Environmental, Inc. (Baker). December 1995. Record of Decision for Operable Unit No. 7 (Sites 1, 28 and 30). Final. Prepared for the Navy Atlantic Division Naval Facilities Engineering Command, Norfolk, Virginia.

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Environmental Science & Engineering (ES&E). 1990. Site Summary Report. Final. Prepared for the Department of the Navy Atlantic Division Naval Facilities Engineering Command, Norfolk, Virginia. ESE Project No. 49-02036.

U.S. Geological Survey (USGS). 1992. Study and Interpretation of the Chemical Characteristics of Natural Water. Third Edition. Prepared by John D. Hem for the U.S. Department of the Interior.

TABLES

TABLE 1-1

SUMMARY OF GROUNDWATER FIELD PARAMETERS
OPERABLE UNIT NO. 7 - SITE 1
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well Number/ Date of Measurement	Measuring Time	Well Volumes	Field Parameters				
			Dissolved Oxygen (mg/L)	Specific Conductance (µmhos/cm)	Temperature (°C)	pH (S.U.)	Turbidity (N.T.U.)
1-GW01	1158	0	1.25	430.9	21.2	6.65	72.4
	1210	1.0	1.25	399.0	20.5	6.73	>200
	1225	2.0	1.00	407.3	21.0	7.15	>200
	1245	3.0	1.50	419.9	22.9	7.27	106.5
	1355	4.0	2.00	411.2	22.0	7.29	55.6
1-GW02	1304	0	1.00	786	25.5	6.03	3.0
	1312	1.0	1.50	739	22.8	6.06	108.0
	1320	2.0	1.25	752	22.9	6.11	70.2
	1335	3.0	1.25	753	23.3	6.20	21.4
	1345	4.0	2.00	734	22.6	6.34	07.8
1-GW03	1410	0	3.50	163.8	23.3	5.33	122.9
	1418	1.0	3.25	154.4	24.0	5.24	58.0
	1423	2.0	3.00	152.0	22.1	5.17	17.2
	1438	3.0	3.25	149.4	22.7	5.22	07.3
1-GW10	0850	0	4.50	482	19.4	6.71	>200
	0903	1.0	1.50	464	18.6	6.51	35.3
	0910	2.0	1.50	462	18.4	6.84	21.7
	0918	3.0	1.75	461	18.4	6.85	17.1
	0930	4.0	1.00	478	18.6	6.90	16.2
1-GW11	1000	0	1.25	408.3	18.7	6.59	7200
	1008	1.0	1.75	402.8	19.5	6.64	46.2
	1018	2.0	1.25	403.5	19.5	6.68	19.9
	1026	3.0	1.00	404.9	19.6	6.70	14.6
	1036	4.0	1.50	405.6	19.6	6.72	13.7
1-GW12	1055	0	1.25	238.3	19.6	5.62	120.0
	1103	1.0	1.50	213.9	19.2	5.52	96.6
	1110	2.0	2.00	215.9	19.9	5.55	49.6
	1117	3.0	2.00	210.4	19.5	5.56	21.1
	1125	4.0	2.00	213.8	19.5	5.65	28.1
1-GW17	0858	0	2.25	566	23.0	6.87	>200
	0859	1.0	2.50	556	22.3	6.83	70.2
	0904	2.0	3.50	555	23.0	6.83	23.5
	0910	3.0	2.75	564	22.9	6.93	09.0

TABLE 1-1 (Continued)

SUMMARY OF GROUNDWATER FIELD PARAMETERS
OPERABLE UNIT NO. 7 - SITE 1
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well Number/ Date of Measurement	Measuring Time	Well Volumes	Field Parameters				
			Dissolved Oxygen (mg/L)	Specific Conductance (µmhos/cm)	Temperature (°C)	pH (S.U.)	Turbidity (N.T.U.)
1-GW17DW	0725	0	2.75	192.1	22.2	7.61	50.1
	0743	1.0	1.25	183.6	21.6	7.57	23.8
	0755	2.0	1.25	184.9	21.2	7.58	15.4
	0800	3.0	1.50	183.9	21.2	7.66	17.8
	0813	4.0	1.25	189.7	21.1	7.45	10.4
	0829	5.0	1.25	187.7	21.4	7.69	07.2

Notes:

N.T.U. = Nephelometric Turbidity Units
S.U. = Standard Units
µmhos/cm = micro ohms per centimeter
°C = Degrees Centigrade
mg/L = milligrams per liter

TABLE 1-2

SUMMARY OF GROUNDWATER FIELD PARAMETERS
OPERABLE UNIT NO. 7 - SITE 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well Number/ Date of Measurement	Measuring Time	Well Volumes	Field Parameters				
			Dissolved Oxygen (mg/L)	Specific Conductance (µmhos/cm)	Temperature (°C)	pH (S.U.)	Turbidity (N.T.U.)
28-GW01	0858	0	2.00	909	21.6	6.90	>200
	0905	1.0	2.50	928	23.4	6.79	17.5
	0910	1.5	2.50	1010	23.6	6.74	03.9
	0915	2.0	1.50	1009	24.2	6.72	01.5
	0920	2.5	1.50	1056	24.0	6.72	01.2
	0929	3.0	1.50	1059	24.3	6.72	01.0
	0932	4.0	1.50	1051	24.7	6.70	01.0
28-GW01DW	0812	0	2.00	4177	19.9	7.46	13.7
	0821	0.5	1.25	4179	20.0	7.46	07.6
	0835	1.0	1.25	4182	20.3	7.46	05.3
	0850	1.5	1.50	4163	20.6	7.43	07.5
	0905	2.0	1.50	4159	20.5	7.44	05.7
	0955	2.5	2.00	4200	20.9	7.65	05.2
	1021	3.0	2.00	4179	21.4	7.73	03.0
28-GW02	1400	0	1.25	917	24.8	8.87	38.2
	1410	1.0	1.25	851	23.3	8.37	26.2
	1418	2.0	1.25	848	23.3	8.25	11.0
	1432	3.0	1.25	853	23.4	8.05	08.8
28-GW04	1101	0	1.75	574	21.5	6.66	41.6
	1115	1.0	1.75	534	20.7	6.76	00.1
	1128	2.0	2.00	500	20.1	6.77	08.0
	1142	3.0	1.50	482	21.4	6.88	05.2
28-GW07	1450	0	1.50	1284	23.6	6.57	13.3
	1457	1.0	1.00	1390	26.8	6.41	10.8
	1505	2.0	1.00	1456	26.6	6.40	07.8
	1515	3.0	1.50	1499	26.5	6.43	07.8
	1525	4.0	1.00	1539	26.4	6.37	07.0
28-GW07DW	1525	0	3.00	132.5	21.5	9.00	59.1
	1545	1.0	2.25	129.9	20.6	9.02	40.5
	1600	2.0	2.25	168.7	20.7	8.58	36.4
	1620	3.0	1.50	168.0	20.4	8.98	26.3
	1635	4.0	1.25	170.1	20.2	9.09	20.0

TABLE 1-2 (Continued)

SUMMARY OF GROUNDWATER FIELD PARAMETERS
OPERABLE UNIT NO. 7 - SITE 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well Number/ Date of Measurement	Measuring Time	Well Volumes	Field Parameters				
			Dissolved Oxygen (mg/L)	Specific Conductance (µmhos/cm)	Temperature (°C)	pH (S.U.)	Turbidity (N.T.U.)
28-GW08	1545	0	2.00	1455	20.9	6.83	85.0
	1553	1.0	1.50	1101	19.9	7.12	71.6
	1602	2.0	1.50	1097	20.3	7.27	18.6
	1610	3.0	1.50	1080	20.3	7.36	09.1

Notes:

N.T.U. = Nephelometric Turbidity Units
S.U. = Standard Units
µmhos/cm = micro ohms per centimeter
°C = Degrees Centigrade
mg/L = milligrams per liter

TABLE 1-3

SUMMARY OF WELL CONSTRUCTION DETAILS
OPERABLE UNIT NO. 7 - SITE 1
MONITORING AND O&M SUPPORT, CTO-0367
MCB CAMP LEJEUNE, NORTH CAROLINA

Monitoring Well Number	Date Installed	Top of Casing Elevation (feet, msl)	Ground Surface Elevation (feet, msl)	Boring Depth (feet, msl)	Well Depth (feet, msl)	Screen Interval Depth (feet, bgs)	Depth to Bentonite (feet, bgs)	Depth to Sand Pack (feet, bgs)	Stick-Up (feet, ags)
1-GW01	1984	16.5	13.3	NA	24	NA	NA	NA	3.2
1-GW02	1984	17.95	15.7	NA	23	9.0 - 23.0	NA	NA	2.3
1-GW03	1984	21.78	19.7	NA	23	9.0 - 23.0	NA	NA	2.1
1-GW10	1994	18.07	15.3	24	24	9.1 - 23.4	5.0	7.0	2.8
1-GW11	1994	13.18	10.4	17	17	2.0 - 16.4	0.5	1.0	2.8
1-GW12	1994	16.33	13.8	17	17	3.1 - 17.3	0.5	2.0	2.5
1-GW17	1994	23.00	20.1	25	25	10 - 24.3	6.0	8.0	3.0
1-GW17DW	1994	21.91	19.1	122	122	105 - 120	92.0	97.0	2.8

Notes:

ags = above ground surface
msl = mean sea level
bgs = below ground surface
NA = Information not available

TABLE 1-4

SUMMARY OF WELL CONSTRUCTION DETAILS
OPERABLE UNIT NO. 7 - SITE 128
MONITORING AND O&M SUPPORT, CTO-0367
MCB CAMP LEJEUNE, NORTH CAROLINA

Monitoring Well Number	Date Installed	Top of Casing Elevation (feet, msl)	Ground Surface Elevation (feet, msl)	Boring Depth (feet, msl)	Well Depth (feet, msl)	Screen Interval Depth (feet, bgs)	Depth to Bentonite (feet, bgs)	Depth to Sand Pack (feet, bgs)	Stick-Up (feet, ags)
28-GW01	1994	7.34	4.8	17	17	2.5 - 16.2	0.0	1.5	2.5
28-GW01DW	1994	7.49	5.5	134	133	117 - 132	107.0	111.0	2.1
28-GW02	1984	5.96	4.8	NA	16.5	2.5 - 16.5	NA	NA	1.6
28-GW04	1984	8.17	4.4	NA	29.02	NA	NA	NA	3.8
28-GW07	1994	6.62	3.8	18	18	2.5 - 17.5	0.0	0.5	2.8
28-GW07DW	1994	6.03	3.6	132	131	114 - 129	104.0	109.0	2.4
28-GW08	1994	14.16	11.6	24	24	7.9 - 22.7	4.0.0	6.0	2.6

Notes:

ags = above ground surface
msl = mean sea level
bgs = below ground surface
NA = Information not available

TABLE 1-5

SAMPLING SUMMARY - JULY 1996
OPERABLE UNIT NO. 7 - SITE 1
MONITORING AND O&M PROGRAM SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Location	Media	TCL Volatiles[1]	Laboratory Sample Identification
1-GW01	Groundwater	X	01-GW01-96C
1-GW02	Groundwater	X	01-GW02-96C
1-GW03	Groundwater	X	01-GW03-96C
1-GW10	Groundwater	X	01-GW10-96C
1-GW11	Groundwater	X	01-GW11-96C
1-GW12	Groundwater	X	01-GW12-96C
1-GW17	Groundwater	X	01-GW17-96C
1-GW17DW	Groundwater	X	01-GW17DW-96C
1-GW18[2]	Groundwater	--	--

Notes:

(1) Target Compound List Volatiles by U.S. Environmental Protection Agency, Contract Laboratory Program, Statement of Work, Document Number OLM01.8.
(2) Monitoring well damaged. No samples collected.

X = Requested analysis

TABLE 1-6

SAMPLING SUMMARY - JULY 1996
OPERABLE UNIT NO. 7 - SITE 28
MONITORING AND O&M PROGRAM SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Location	Media	TAL Metals[1]	Laboratory Sample Identification
28-GW01	Groundwater	X	28-GW01-96C
28-GW01DW	Groundwater	X	28-GW01DW-96C
28-GW02	Groundwater	X	28-GW02-96C
28-GW04	Groundwater	X	28-GW04-96C
28-GW07	Groundwater	X	28-GW07-96C
28-GW07DW	Groundwater	X	28-GW07DW-96C
28-GW08	Groundwater	X	28-GW08-96C
28-SW01	Surface Water	X	28-SW01-96C
28-SW02	Surface Water	X	28-SW02-96C
28-SW03	Surface Water	X	28-SW03-96C
28-SD01	Sediment	X	28-SD01-96C
28-SD02	Sediment	X	28-SD02-96C
28-SD03	Sediment	X	28-SD03-96C

Notes:

(1) Target Analyte List Metals by U.S. Environmental Protection Agency, Contract Laboratory Protocol, Statement of Work, Document Number ILM03.0.

X = Requested analysis

TABLE 1-7

CONTRACT REQUIRED DETECTION LIMITS
OPERABLE UNIT NO. 7 - SITES 1 AND 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Parameter	Analytical Method	CRQL (µg/L)	NCWQS (µg/L)	MCL (µg/L)
Volatile Organics:				
Chloromethane	OLM01.8	10	NA	NA
Vinyl Chloride	OLM01.8	10(1)	0.015	2
Bromomethane	OLM01.8	10	NA	NA
Chloroethane	OLM01.8	10(1)	NA	NA
1,1-dichloroethene	OLM01.8	10	7	7
Acetone	OLM01.8	10	700	NA
Carbon Disulfide	OLM01.8	10	700	NA
Methylene Chloride	OLM01.8	10(1)	5	5
1,2-dichloroethene (Total)	OLM01.8	10	70	70
1,1-dichloroethane	OLM01.8	10	700	NA
2-butanone	OLM01.8	10	NA	NA
Chloroform	OLM01.8	10(1)	0.19	100
1,1,1-trichloroethane	OLM01.8	10	200	200
Carbon Tetrachloride	OLM01.8	10(1)	0.3	5
Benzene	OLM01.8	10(1)	1	5
1,2-dichloroethane	OLM01.8	10(1)	0.38	5
Trichloroethene	OLM01.8	10(1)	NA	5
1,2-dichloropropane	OLM01.8	10(1)	0.56	5
Bromodichloromethane	OLM01.8	10(1)	0.6	100
Cis-1,3-dichloropropene	OLM01.8	10	NA	NA
4-methyl-2-pentanone	OLM01.8	10	NA	NA
Toluene	OLM01.8	10	1000	1000
Trans-1,3-dichloropropene	OLM01.8	10(1)	0.2	NA
1,1,2-trichloroethane	OLM01.8	10(1)	NA	5
Tetrachloroethene	OLM01.8	10(1)	0.7	5
2-hexanone	OLM01.8	10	NA	NA
Dibromochloromethane	OLM01.8	10	NA	NA
Chlorobenzene	OLM01.8	10	50	100
Ethylbenzene	OLM01.8	10	29	700
Xylene, Total	OLM01.8	10	530	10000
Styrene	OLM01.8	10	100	100
Bromoform	OLM01.8	10(1)	0.19	100
1,1,2,2-tetrachloroethane	OLM01.8	10	NA	NA

TABLE 1-7 (Continued)

CONTRACT REQUIRED DETECTION LIMITS
OPERABLE UNIT NO. 7 - SITES 1 AND 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Parameter	Analytical Method	CRDL (µg/L)	NCWQS (µg/L)	MCL (µg/L)
Metals:				
Aluminum	ILM0.30	100	NA	NA
Antimony	ILM0.30	60[1]	6	NA
Arsenic	ILM0.30	10	50	50
Barium	ILM0.30	200	2000	2000
Beryllium	ILM0.30	5[1]	4	NA
Cadmium	ILM0.30	5	5	5
Calcium	ILM0.30	5000	NA	NA
Chromium	ILM0.30	10	100	50
Cobalt	ILM0.30	50	NA	NA
Copper	ILM0.30	25	1300	1000
Iron	ILM0.30	100	NA	300
Lead	ILM0.30	3	15	15
Magnesium	ILM0.30	5000	NA	NA
Manganese	ILM0.30	15	NA	50
Mercury	ILM0.30	0.2	2	1.1
Nickel	ILM0.30	40	100	100
Potassium	ILM0.30	5000	NA	NA
Selenium	ILM0.30	5	50	50
Silver	ILM0.30	10	NA	18
Sodium	ILM0.30	5000	NA	NA
Thallium	ILM0.30	10[1]	2	NA
Vanadium	ILM0.30	50	NA	NA
Zinc	ILM0.30	20	NA	2100

Notes:

[1] Contract Required Detection Limit greater than North Carolina Water Quality Standard or Federal Maximum Contaminant Level

CRDL = Contract Required Detection Limit
CRQL = Contract Required Quantitation Limit
MCL = Federal Maximum Contaminant Level. Maximum permissible level of a contaminant in water which is delivered to any user of a public water system. (U.S. Environmental Protection Agency - Drinking Water Regulations and Health Advisories.)
NA = standard not available
NCWQS = North Carolina Water Quality Standards. Values Applicable to Groundwater (North Carolina Administrative Code, Title 15A, Subchapter 2L).
µg/L = micrograms per liter or parts per billion

TABLE 1-8

SUMMARY OF WATER LEVEL MEASUREMENTS
OPERABLE UNIT NO. 7 - SITE 1
MONITORING AND O&M PROGRAM SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well ID	Reference Elevation [1]	SWL (Date 7-30-96)	SWE (Date 7-30-96)
1-GW01	16.50	7.46	9.04
1-GW02	17.95	9.52	8.43
1-GW03	21.78	13.41	8.37
1-GW10	18.07	11.06	7.01
1-GW11	13.18	4.90	8.28
1-GW12	16.33	6.68	9.65
1-GW17	23.00	14.25	8.75
1-GW17DW	21.91	13.24	8.67

Notes:

[1] Top of well casing expressed in feet above mean sea level
SWL = Static water level taken from top of well casing
SWE = Static water elevation expressed in feet above mean sea level

TABLE 1-9

SUMMARY WATER LEVEL MEASUREMENTS
OPERABLE UNIT NO. 7 - SITE 28
MONITORING AND O&M PROGRAM SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Well ID	Reference Elevation [1]	SWL (Date 7-30-96)	SWE (Date 7-30-96)
28-GW01	7.34	4.98	2.36
28-GW01DW	7.49	5.78	1.71
28-GW02	5.96	3.72	2.24
28-GW03	5.90	2.76	3.14
28-GW04	8.17	4.85	3.32
28-GW06	19.98	17.55	2.43
28-GW07	6.62	3.38	3.24
28-GW07DW	6.03	3.32	2.71
28-GW08	13.27	11.49	1.78

Notes:

[1] Top of well casing expressed in feet above mean sea level
SWL = Static water level taken from top of well casing
SWE = Static water elevation expressed in feet above mean sea level

TABLE 2-1
TRIP BLANK ANALYTICAL RESULTS
OPERABLE UNIT NO. 7 - SITES 1 AND 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	01-TB01-96C
DATE SAMPLED	07/31/96
UNITS	UG/L
VOLATILES	
CHLOROMETHANE	10 U
BROMOMETHANE	10 U
VINYL CHLORIDE	10 U
CHLOROETHANE	10 U
METHYLENE CHLORIDE	10 U
ACETONE	10 U
CARBON DISULFIDE	10 U
1,1-DICHLOROETHENE	10 U
1,1-DICHLOROETHANE	10 U
1,2-DICHLOROETHENE (TOTAL)	10 U
CHLOROFORM	10 U
1,2-DICHLOROETHANE	10 U
2-BUTANONE	10 U
1,1,1-TRICHLOROETHANE	10 U
CARBON TETRACHLORIDE	10 U
BROMODICHLOROMETHANE	10 U
1,2-DICHLOROPROPANE	10 U
CIS-1,3-DICHLOROPROPENE	10 U
TRICHLOROETHENE	10 U
DIBROMOCHLOROMETHANE	10 U
1,1,2-TRICHLOROETHANE	10 U
BENZENE	10 U
TRANS-1,3-DICHLOROPROPENE	10 U
BROMOFORM	10 U
4-METHYL-2-PENTANONE	10 U
2-HEXANONE	10 U
TETRACHLOROETHENE	10 U
1,1,2,2-TETRACHLOROETHANE	10 U
TOLUENE	10 U
CHLOROBENZENE	10 U
ETHYLBENZENE	10 U
STYRENE	10 U
XYLENE (TOTAL)	10 U

U = Not detected
ug/L = Micrograms per liter

TABLE 2-2

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
OPERABLE UNIT No. 7 - SITE 1
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Fraction	Detected Contaminants or Analytes	Comparison Criteria		Concentration Range		Location of Maximum Detection	Detection Frequency	Detections Above		Qualitative Assessment of Positive Detections
		NCWQS	MCL	Min.	Max.			NCWQS	MCL	
Volatile Organics	Xylenes (total)	530	10000	6J	6J	01-GW12	1/8	0/8	0/8	Does Not Exceed Standards
	1,2-Dichloroethene (total)	70	70	19	19	01-GW10	1/8	0/8	0/8	Does Not Exceed Standards

Notes:

- Concentrations presented in micrograms per liter (µg/L) or parts per billion.

NCWQS - North Carolina Water Quality Standards (North Carolina Administrative Code, Title 15A, Subchapter 2L).

MCL - Federal Maximum Contaminant Level. Maximum permissible level of a contaminant in water which is delivered to any user of a public water system (U.S. Environmental Protection Agency - Drinking Water Regulations and Health Advisories).

TABLE 2-3
POSITIVE DETECTIONS IN GROUNDWATER
OPERABLE UNIT NO. 7 - SITE 1
MONITORING AND O & M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	01-GW01-96C	01-GW02-96C	01-GW03-96C	01-GW10-96C	01-GW11-96C	01-GW12-96C	01-GW17-96C	01-GW17DW-96C
DATE SAMPLED	07/28/96	07/30/96	07/30/96	07/28/96	07/28/96	07/28/96	07/31/96	07/31/96
VOLATILES (ug/L)								
1,2-DICHLOROETHENE (TOTAL)	10 U	10 U	10 U	19	10 U	10 U	10 U	10 U
XYLENE (TOTAL)	10 U	10 U	10 U	10 U	10 U	6 J	10 U	10 U

U = not detected
ug/L = micrograms per liter

TABLE 2-4

SUMMARY OF VOLATILE COMPOUNDS IN GROUNDWATER
MAY 1994 - JULY 1996
OPERABLE UNIT NO. 7 - SITE 1
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Monitoring Well/ Volatile Compound	May, 1994[1]	December, 1994[2]	August, 1995[3]	July, 1996[3]
1-GW01	ND	ND	ND	ND
1-GW02	ND	ND	ND	ND
1-GW03	ND	ND	ND	ND
1-GW10				
Vinyl Chloride	2	4	ND	ND
1,2-Dichloroethene(Total)	10	21	23	19
1,1-Dichloroethene (Total)	ND	2	ND	ND
Trichloroethene	4	8	4	ND
1-GW11				
Trichloroethene	1	ND	ND	ND
1-GW12				
Toluene	ND	ND	4	ND
Ethylbenzene	ND	ND	4	ND
Xylenes	3	9	150	6J
1-GW17				
1,2-Dichloroethene (Total)	1	ND	ND	ND
Trichloroethene	27	18	ND	ND
1-GW17DW	ND	ND	ND	ND
1-GW18	Not Sampled	Not Sampled	ND	Not Sampled

Notes:

(1) Samples collected using a Teflon bailer
(2) Samples collected using an environmental submersible pump
(3) Samples collected using a peristaltic pump

ND = Not detected

Concentrations expressed in micrograms per liter (µg/L) or parts per billion.

TABLE 2-5

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS
OPERABLE UNIT No. 7 - SITE 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Fraction	Detected Contaminants or Analytes	Comparison Criteria		Concentration Range		Location of Maximum Detection	Detection Frequency	Detections Above		Qualitative Assessment of Positive Detections
		NCWQS	MCL	Min.	Max.			NCWQS	MCL	
Total Metals	Aluminum	NE	50	31.7	137	28-GW02	6/7	NA	5/7	5 Exceed MCL, Scattered Throughout
	Antimony	NE	6	14.7	19.2	28-GW07	2/7	NA	2/7	2 Exceed MCL, Former Burn Dump Area
	Arsenic	50	50	2.3	5.0	28-GW07	2/7	0/7	0/7	Niether Exceed Standards
	Barium	2000	2000	12.6	715	28-GW08	7/7	0/7	0/7	None Exceed Standards
	Copper	1,000	1,300	2.5	16.6	28-GW07	6/7	0/7	0/7	None Exceed Standards
	Iron	300	300	66.5	36300	28-GW07	7/7	5/7	5/7	5 Exceed MCL and NCWQS
	Lead	15	15	4.9	12.4	28-GW07	4/7	0/7	0/7	None Exceed Standards
	Manganese	50	50	67	860	28-GW07	6/7	6/7	6/7	6 Exceed MCL and NCWQS
	Vanadium	NE	NE	2.9	3.7	28-GW07	2/7	NA	NA	Former Burn Dump Area
	Zinc	2100	NE	2.5	24.2	28-GW07	5/7	0/7	NA	None Exceed NCWQS

Notes:

- Concentrations presented in micrograms per liter (µg/L) or parts per billion.

NA - Not applicable

NE - Not Established

NCWQS - North Carolina Water Quality Standards (North Carolina Administrative Code, Title 15A, Subchapter 2L).

MCL - Federal Maximum Contaminant Level. Maximum permissible level of a contaminant in water which is delivered to any user of a public water system (U.S. Environmental Protection Agency - Drinking Water Regulations and Health Advisories).

TABLE 2-6
POSITIVE DETECTIONS IN GROUNDWATER
OPERABLE UNIT NO. 7 - SITE 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	28-GW01-96C	28-GW01DW-96C	28-GW02-96C	28-GW04-96C	28-GW07-96C	28-GW07DW-96C	28-GW08-96C
DATE SAMPLED	07/26/96	07/29/96	07/26/96	07/29/96	07/26/96	07/28/96	07/26/96
TOTAL METALS (ug/L)							
ALUMINUM, TOTAL	21.9 U	31.7	137	121	56.1	72	109
ANTIMONY, TOTAL	14.4 U	14.4 U	14.7	14.4 U	19.2	14.4 U	14.4 U
ARSENIC, TOTAL	1.4 U	1.4 U	1.4 U	1.4 U	5	1.4 U	2.3
BARIUM, TOTAL	223	19.7	710	29.7	315	12.6	715
CALCIUM, TOTAL	174000	103000	52000	70800	225000	34100	49400
COPPER, TOTAL	4	3.2	2 U	2.5	16.6	6	3.5
IRON, TOTAL	1840	364	4320	171	36300	66.5	3910
LEAD, TOTAL	4.9	1.2 U	4.9	1.2 U	12.4	1.2 U	9.8
MAGNESIUM, TOTAL	14300	20500	23700	3600	24200	378	32300
MANGANESE, TOTAL	250	109	174	67	860	1.6 U	212
POTASSIUM, TOTAL	15800	19400	48200	1330	10100	1920	68800
SODIUM, TOTAL	44900	822000	78100	31600	64800	6390	130000
VANADIUM, TOTAL	2.5 U	2.5 U	2.5 U	2.9	3.7	2.5 U	2.5 U
ZINC, TOTAL	17.1	2.3 U	14.3	2.3 U	24.2	2.5	22

U = not detected
ug/L = micrograms per liter

TABLE 2-7

SUMMARY OF SURFACE WATER ANALYTICAL RESULTS
OPERABLE UNIT No. 7 - SITE 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Fraction	Detected Contaminants or Analytes	Comparison Criteria		Concentration Range		Location of Maximum Detection	Detection Frequency	Detections Above		Qualitative Assessment of Positive Detections
		NCWQS	Region IV	Min.	Max.			NCWQS	Region IV	
Total Metals	Aluminum	NE	50	690	3890	28-SW03	3/3	NA	3/3	All Exceed Region IV Screening Values
	Arsenic	50	190	1.7	4	28-SW03	3/3	0/3	0/3	None Exceed Screening Values
	Barium	NE	NE	21.8	35	28-SW03	3/3	NA	NA	Each with Positive Detection
	Beryllium	NE	0.53	0.74	0.74	28-SW01	1/3	NA	1/3	Downgradiet of Pistol Range
	Chromium	20	11	5.3	8.2	28-SW03	2/3	0/3	0/3	None Exceed Screening Values
	Copper	3	6.54	5.9	28.4	28-SW03	3/3	3/3	2/3	All Exceed NCWQS
	Iron	NE	NE	963	5090	28-SW03	3/3	NA	NA	Each With Positive Detections
	Lead	25	1.32	14.7	60	28-SW03	3/3	2/3	3/3	All Exceed Region IV Screening Values
	Manganese	NE	NE	49	97.1	28-SW03	3/3	NA	NA	Each With Positive Detections
	Selenium	71	5	1.8	1.8	28-SW01	1/3	0/3	0/3	None Exceed Screening Values
	Vanadium	NE	NE	2.7	10	28-SW03	3/3	NA	NA	Each With Positive Detections
	Zinc	86	58.91	6.8	35.8	28-SW03	2/3	0/3	0/3	None Exceed Screening Values

Notes:

- Concentrations presented in micrograms per liter (µg/L) or parts per billion.

NA - Not applicable

NCWQS - North Carolina Water Quality Standards (North Carolina Administrative Code, Title 15A, Subchapter 2B).

NE - Not Established

Region IV - U.S. Environmental Protection Agency, Region IV - Surface Water Screening Values.

TABLE 2-8
POSITIVE DETECTIONS IN SURFACE WATER
OPERABLE UNIT NO. 7 - SITE 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	28-SW01-96C	28-SW02-96C	28-SW03-96C
DATE SAMPLED	07/27/96	07/27/96	07/27/96
TOTAL METALS (ug/L)			
ALUMINUM, TOTAL	1290	690	3890
ARSENIC, TOTAL	1.7	1.9	4
BARIUM, TOTAL	22.1	21.8	35
BERYLLIUM, TOTAL	0.74	0.7 U	0.7 U
CALCIUM, TOTAL	85000	70500	75600
CHROMIUM, TOTAL	5.3	3.3 U	8.2
COPPER, TOTAL	8.9	5.9	28.4
IRON, TOTAL	1260	963	5090
LEAD, TOTAL	37.8	14.7	60
MAGNESIUM, TOTAL	215000	155000	147000
MANGANESE, TOTAL	49	52.3	97.1
POTASSIUM, TOTAL	74700	53800	51500
SELENIUM, TOTAL	1.8	1.8 U	1.8 U
SODIUM, TOTAL	1880	1350	1270
VANADIUM, TOTAL	5.5	2.7	10
ZINC, TOTAL	6.8	2.3 U	35.8

U = not detected
ug/L = micrograms per liter

TABLE 2-9

SUMMARY OF SEDIMENT ANALYTICAL RESULTS
OPERABLE UNIT No. 7 - SITE 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB, CAMP LEJEUNE, NORTH CAROLINA

Fraction	Detected Contaminants or Analytes	Comparison Criteria	Comparison Criteria		Location of Maximum Detection	Detection Frequency	Detections Above Comparison Criteria	Qualitative Assessment of Positive Detections
			Min.	Max.				
Metals	Aluminum	NE	698	1520	28-SD03	3/3	NA	All With Positive Detections
	Arsenic	7.24	0.8	0.8	28-SD03	1/3	0/3	Did Not Exceed Screening Value
	Barium	NE	3.3	5.9	28-SD01	3/3	NA	All With Positive Detections
	Chromium	52.3	2.2	3	28-SD03	2/3	0/3	None Exceed Screening Value
	Copper	18.70	3.2	33.3	28-SD02	3/3	2/3	2 Exceed Screening Value
	Iron	NE	450	1950	28-SD03	3/3	NA	All With Positive Detections
	Lead	30.2	6	19.4	28-SD03	3/3	0/3	None Exceed Screening Value
	Manganese	NE	2.4	10.4	28-SD03	3/3	NA	All With Positive Detections
	Vanadium	NE	1.5	3.5	28-SD03	3/3	NA	All With Positive Detections
	Zinc	124	3.2	25	28-SD01	3/3	0/3	None Exceed Screening Value

Notes:

- Concentrations presented in milligrams per kilogram (mg/kg) or parts per million.

NA - Not applicable

NE - Not Established

Comparison Criteria - U.S. Environmental Protection Agency, Region IV - Adoption of Risk-Based Values for Aquatic Life from The National Oceanic and Atmospheric Administration (NOAA).

TABLE 2-10
POSITIVE DETECTIONS IN SEDIMENT
OPERABLE UNIT NO. 7 - SITE 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB CAMP LEJEUNE, NORTH CAROLINA

SAMPLE ID	28-SD01-96C	28-SD02-96C	28-SD03-96C
DATE SAMPLED	07/27/96	07/27/96	07/27/96
TOTAL METALS (mg/kg)			
ALUMINUM, TOTAL	987	698	1520
ARSENIC, TOTAL	0.35 U	0.25 U	0.8
BARIUM, TOTAL	5.9	3.3	4.1
CALCIUM, TOTAL	10800	126	9830
CHROMIUM, TOTAL	2.2	0.72 U	3
COPPER, TOTAL	3.2	33.3	23.7
IRON, TOTAL	1080	450	1950
LEAD, TOTAL	6	12.4	19.4
MAGNESIUM, TOTAL	184	194	429
MANGANESE, TOTAL	4.6	2.4	10.4
SODIUM, TOTAL	57.8	623	839
VANADIUM, TOTAL	3.1	1.5	3.5
ZINC, TOTAL	25	3.2	20

U = not detected
mg/kg = milligrams per kilogram

FIGURES

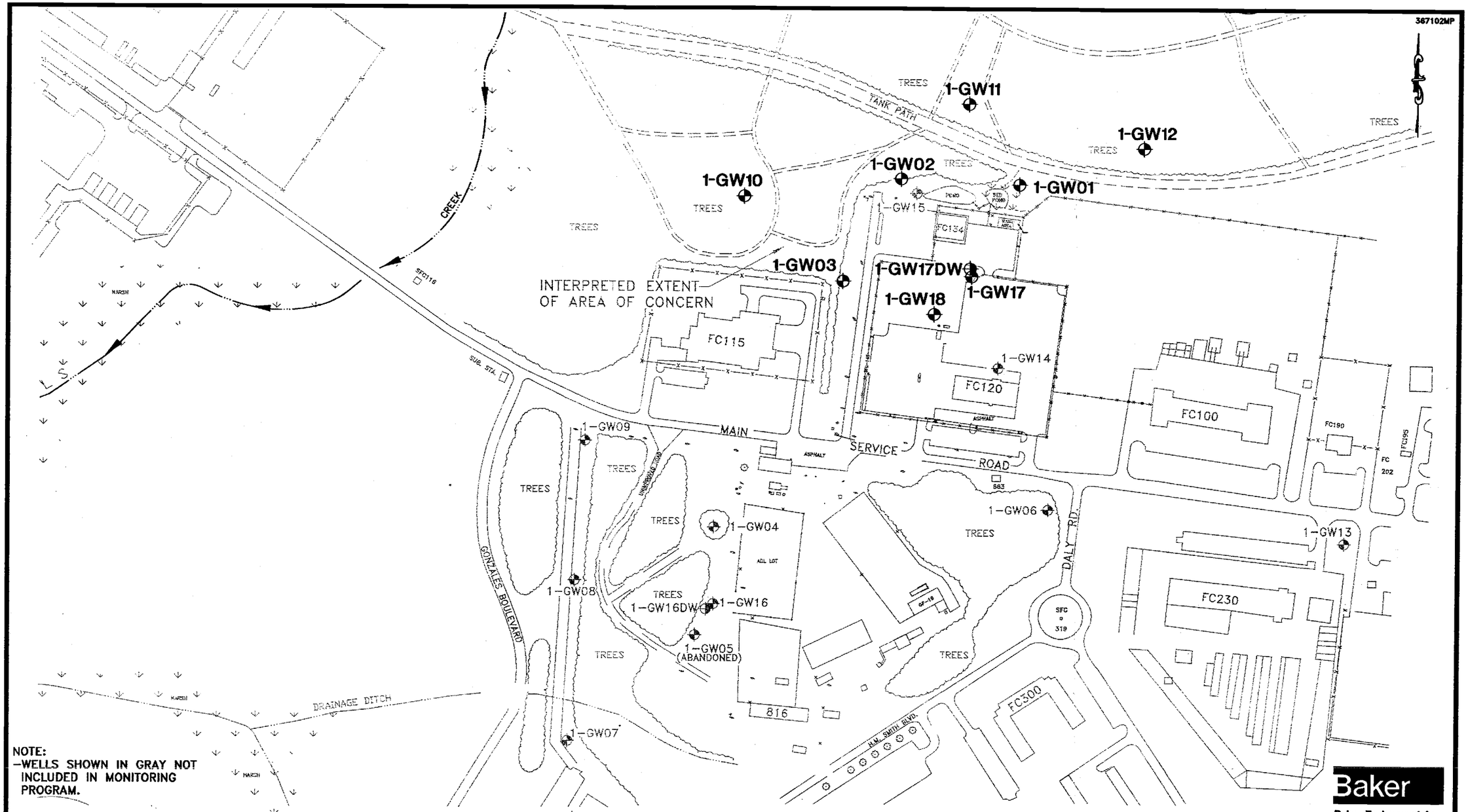
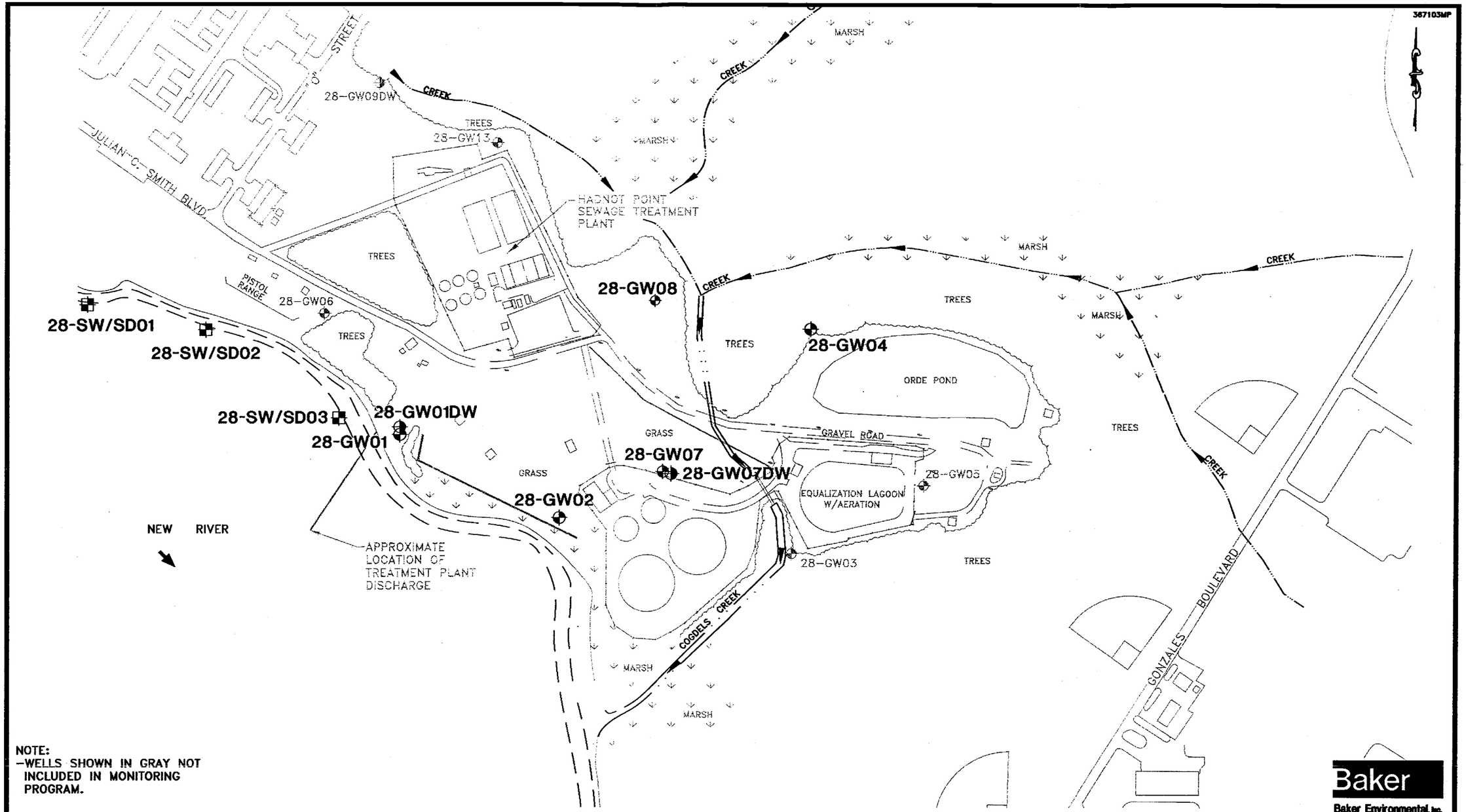


FIGURE 1-1
SAMPLING LOCATION MAP
OPERABLE UNIT NO. 7 - SITE 1
MONITORING AND O&M SUPPORT, CTO - 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

01749JJ B1Z



NOTE:
-WELLS SHOWN IN GRAY NOT INCLUDED IN MONITORING PROGRAM.

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LEGEND

28-GW01 SHALLOW MONITORING WELL

28-GW01DW DEEP MONITORING WELL

28-SW/SD01 SURFACE WATER AND SEDIMENT SAMPLE LOCATION

APPROXIMATE SURFACE WATER FLOW DIRECTION

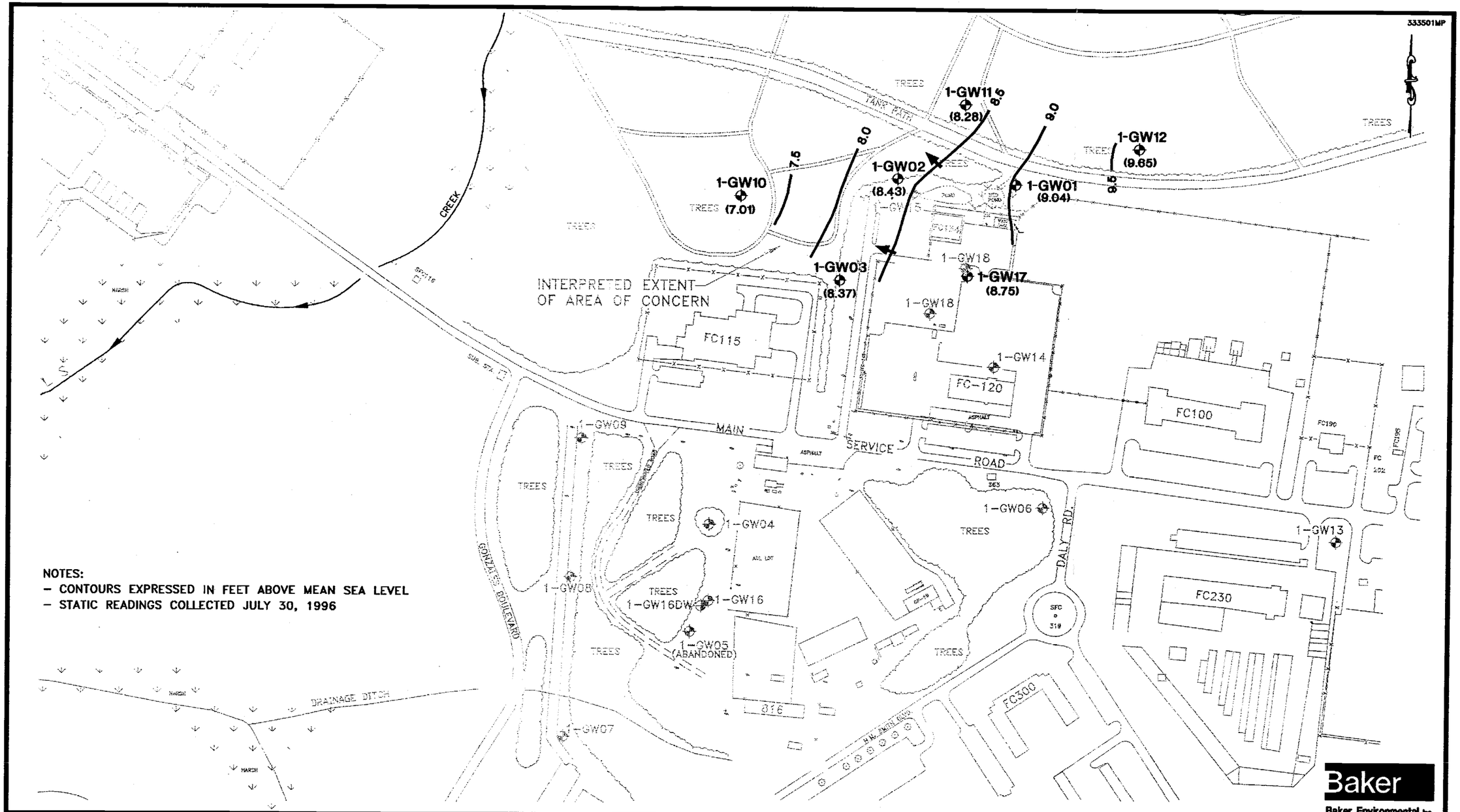
SOURCE: LANTDIV, FEBRUARY 1992 AND W.K. DICKSON, JUNE 1994

300 0 150 300 600

1 inch = 300 ft.

FIGURE 1-2
SAMPLING LOCATION MAP
OPERABLE UNIT NO. 7 - SITE 28
MONITORING AND O&M SUPPORT, CTO - 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA



NOTES:
- CONTOURS EXPRESSED IN FEET ABOVE MEAN SEA LEVEL
- STATIC READINGS COLLECTED JULY 30, 1996

LEGEND

- 1-GW07 — SHALLOW MONITORING WELL
- 1-GW16DW — DEEP MONITORING WELL
- (7.01) — GROUNDWATER ELEVATION
- —9.0— GROUNDWATER ELEVATION CONTOUR
- → APPROXIMATE DIRECTION OF GROUNDWATER FLOW
- → APPROXIMATE DIRECTION OF SURFACE WATER FLOW

SOURCE: LANTDIV, FEBRUARY 1992 AND W.K. DICKSON & ASSOC., JUNE 1994

300 0 150 300 600

1 inch = 300 ft.

Baker

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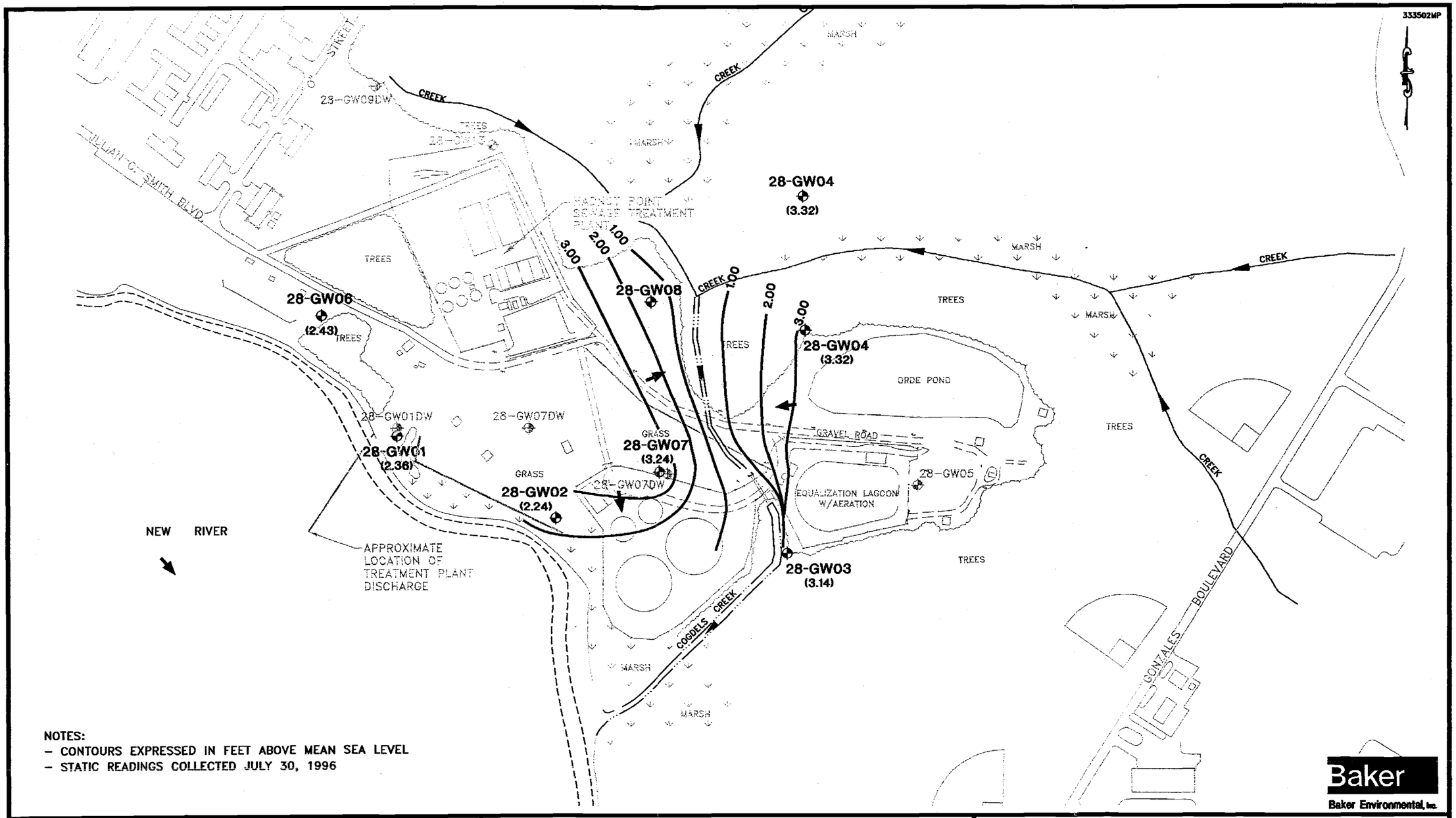
FIGURE 1-3
SHALLOW GROUNDWATER CONTOUR MAP
OPERABLE UNIT NO. 7 – SITE 1
MONITORING AND O&M SUPPORT, CTO – 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

333502MP



NOTES:
- CONTOURS EXPRESSED IN FEET ABOVE MEAN SEA LEVEL
- STATIC READINGS COLLECTED JULY 30, 1996

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LEGEND

28-GW01	SHALLOW MONITORING WELL
28-GW01DW	DEEP MONITORING WELL
(1.78)	GROUNDWATER ELEVATION
3.00	GROUNDWATER ELEVATION CONTOUR
→	APPROXIMATE DIRECTION OF GROUNDWATER FLOW
→	APPROXIMATE DIRECTION OF SURFACE WATER FLOW

SOURCE: LANTDIV, FEBRUARY 1992 AND W.K. DICKSON, JUNE 1994

300 0 150 300 600

1 inch = 300 ft.

FIGURE 1-4
SHALLOW GROUNDWATER CONTOUR MAP
OPERABLE UNIT NO. 7 – SITE 28
MONITORING AND O&M SUPPORT, CTO – 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

36712BMP

SAMPLE ID	01-GW10-96C
SAMPLE DATE	7/28/96
1,2-DICHLOROETHENE (TOTAL)	19

SAMPLE ID	01-GW12-96C
SAMPLE DATE	7/28/96
XYLENE (TOTAL)	6 J

1-GW10
1-GW11
1-GW12
1-GW02
1-GW01
1-GW03
1-GW17DW
1-GW17
1-GW18
1-GW14
1-GW09
1-GW04
1-GW06
1-GW13
1-GW08
1-GW16DW
1-GW16
1-GW05 (ABANDONED)
1-GW07

INTERPRETED EXTENT OF AREA OF CONCERN

CREEK
MARSH
SFC116
SFC 274
TREES
POND
SFC POND
FC134
FC115
FC120
ASPHALT
MAIN SERVICE ROAD
FC100
FC190
FC 202
FC195
UNIMPROVED ROAD
GONZALES BOULEVARD
ABL LOT
GP-1P
SFC 319
FC230
FC300
515
663
DALY RD.
H.M. SMITH BLVD.
DRAINAGE DITCH

FEDERAL MAXIMUM CONTAMINANT LEVELS (MCLs) AND NORTH CAROLINA WATER QUALITY STANDARDS (NCWQS)

Organic Contaminants	NCWQS	MCL
1,2-Dichloroethene (Total)	70	
Xylene (Total)	530	10000

NOTE:
- CONCENTRATIONS PRESENTED IN MICROGRAMS PER LITER OR PARTS PER BILLION.
- WELLS SHOWN WITHOUT CONCENTRATIONS INDICATE NONDETECTABLE LEVELS.

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LEGEND

1-GW07 SHALLOW MONITORING WELL

1-GW16DW DEEP MONITORING WELL

APPROXIMATE SURFACE WATER FLOW DIRECTION

SOURCE: LANTDIV, FEBRUARY 1992 AND W.K. DICKSON & ASSOC., JUNE 1994

300 0 150 300 600

1 inch = 300 ft.

FIGURE 2-1
VOLATILE ORGANIC COMPOUNDS IN GROUNDWATER
OPERABLE UNIT NO. 7 - SITE 1
MONITORING AND O&M SUPPORT, CTO - 0367

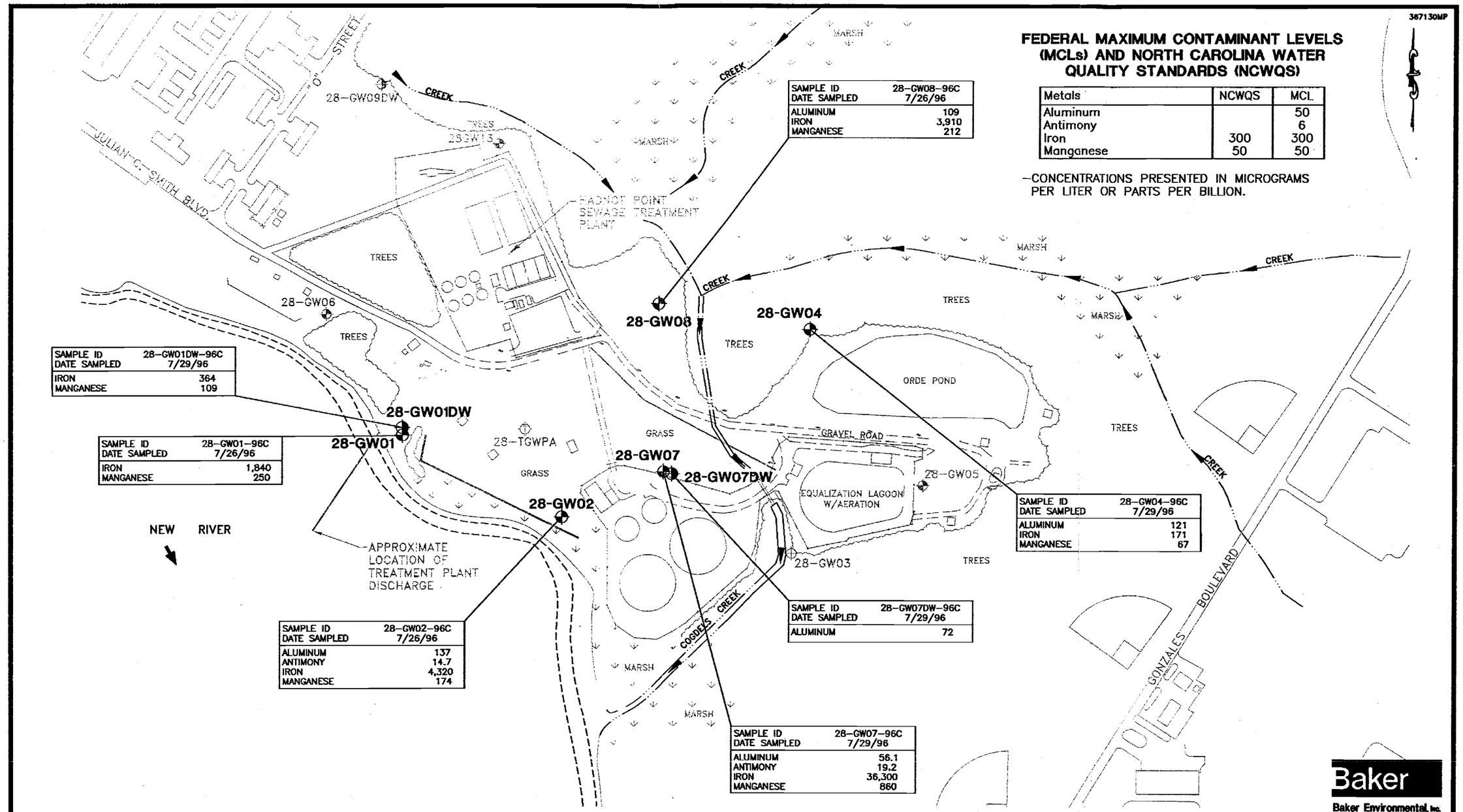
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

367130MP

FEDERAL MAXIMUM CONTAMINANT LEVELS (MCLs) AND NORTH CAROLINA WATER QUALITY STANDARDS (NCWQS)

Metals	NCWQS	MCL
Aluminum		50
Antimony		6
Iron	300	300
Manganese	50	50

–CONCENTRATIONS PRESENTED IN MICROGRAMS PER LITER OR PARTS PER BILLION.



SAMPLE ID	28–GW08–96C
DATE SAMPLED	7/26/96
ALUMINUM	109
IRON	3,910
MANGANESE	212

SAMPLE ID	28–GW01DW–96C
DATE SAMPLED	7/29/96
IRON	364
MANGANESE	109

SAMPLE ID	28–GW01–96C
DATE SAMPLED	7/26/96
IRON	1,840
MANGANESE	250

SAMPLE ID	28–GW04–96C
DATE SAMPLED	7/29/96
ALUMINUM	121
IRON	171
MANGANESE	67

SAMPLE ID	28–GW02–96C
DATE SAMPLED	7/26/96
ALUMINUM	137
ANTIMONY	14.7
IRON	4,320
MANGANESE	174

SAMPLE ID	28–GW07DW–96C
DATE SAMPLED	7/29/96
ALUMINUM	72

SAMPLE ID	28–GW07–96C
DATE SAMPLED	7/29/96
ALUMINUM	56.1
ANTIMONY	19.2
IRON	36,300
MANGANESE	860

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LEGEND

28–GW01 SHALLOW MONITORING WELL

28–GW01DW DEEP MONITORING WELL

SOURCE: LANTDIV, FEBRUARY 1992 AND W.K. DICKSON, JUNE 1994

300 0 150 300 600

1 inch = 300 ft.

FIGURE 2–2
METALS IN GROUNDWATER
ABOVE SCREENING STANDARDS
OPERABLE UNIT NO. 7 – SITE 28
MONITORING AND O&M SUPPORT, CTO – 0367

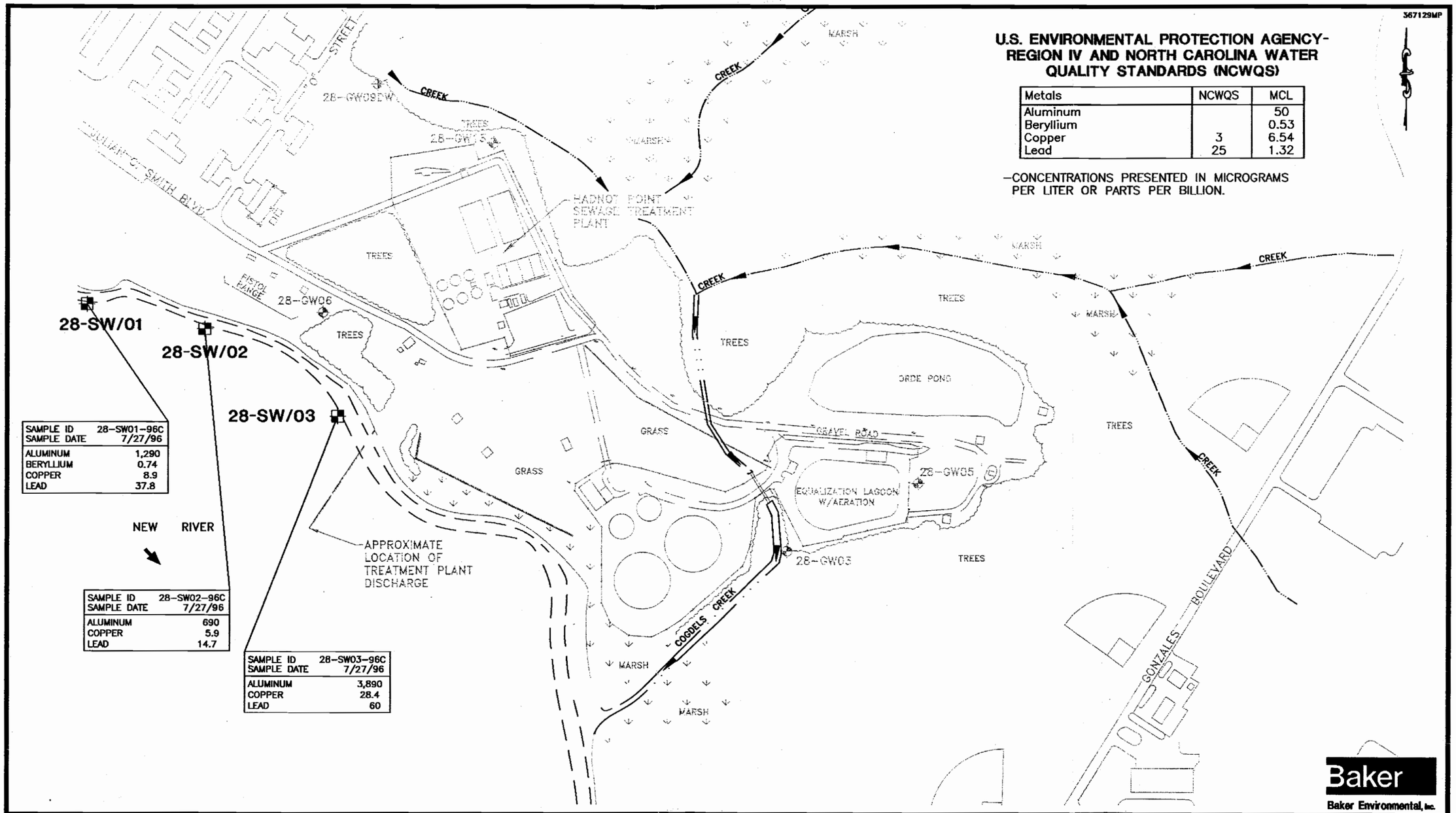
MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

367129MP

U.S. ENVIRONMENTAL PROTECTION AGENCY-REGION IV AND NORTH CAROLINA WATER QUALITY STANDARDS (NCWQS)

Metals	NCWQS	MCL
Aluminum		50
Beryllium		0.53
Copper	3	6.54
Lead	25	1.32

–CONCENTRATIONS PRESENTED IN MICROGRAMS PER LITER OR PARTS PER BILLION.



LEGEND

28-SW/01 — SURFACE WATER AND SEDIMENT SAMPLE LOCATION

APPROXIMATE SURFACE WATER FLOW DIRECTION

SOURCE: LANTDIV, FEBRUARY 1992 AND W.K. DICKSON, JUNE 1994

300 0 150 300 600

1 inch = 300 ft.

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FIGURE 2-3
METALS IN SURFACE WATER ABOVE COMPARISON CRITERIA
OPERABLE UNIT NO. 7 – SITE 28
MONITORING AND O&M SUPPORT, CTO – 0367

MARINE CORPS BASE, CAMP LEJEUNE
NORTH CAROLINA

ATTACHMENTS

ATTACHMENT A
WELL DEVELOPMENT RECORDS

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FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 01-GW01

DATE: 7-27-96 SITE: 1

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START: 1448

TIME FINISH: 1533

INITIAL WATER LEVEL (FT): 7.92'

TOTAL WELL DEPTH (TD): 24.25'

WELL DIAMETER (INCHES): 2"

CALCULATED WELL VOLUME: 1.8 gal. (1)

BOREHOLE DIAMETER (INCHES): –

BOREHOLE VOLUME: –

AMOUNT OF WATER ADDED DURING DRILLING: NA

DEVELOPMENT METHOD: Check valve with Surge Block

PUMP TYPE: Waterra™

TOTAL TIME (A): 50 min.

AVERAGE FLOW (GPM)(B): .2 gal./min.

TOTAL ESTIMATED WITHDRAWAL AxB=: 10.8 gallons

(HNU)/OVA READING: 0 PPM BG: 0 PPM

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
1453	0	6.67	24.4	503	23.7	Very turbid / Brownish-orange
1458	1.8	6.67	21.1	487	21.8	very turbid / Brownish-Orange (slight sheen)
1503	3.6	6.65	21.8	483	21.5	Very turbid / Brownish-Orange
1511	5.4	6.85	21.0	451.7	20.8	Very turbid / Brownish-Orange
1515	7.2	6.97	20.4	435	21.2	Very turbid / Brownish-Orange
1530	9.0	7.04	21.2	419.5	20.9	Slightly clearer
1533	10.8	6.89	20.3	418.5	20.7	Slightly clearer

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

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FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 01-GW02

DATE: 7-27-96 SITE: 1

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START	1450
TIME FINISH	1511
INITIAL WATER LEVEL (FT)	9.50'
TOTAL WELL DEPTH (TD)	23.0'
WELL DIAMETER (INCHES)	2"
CALCULATED WELL VOLUME	2.2 gal. (1)
BOREHOLE DIAMETER (INCHES)	–
BOREHOLE VOLUME	–
AMOUNT OF WATER ADDED DURING DRILLING	NA
DEVELOPMENT METHOD	Check valve with Surge Block
PUMP TYPE	Waterra™
TOTAL TIME (A)	1 hr. 11 min.
AVERAGE FLOW (GPM)(B)	.18 gal./min.
TOTAL ESTIMATED WITHDRAWAL AxB=	13.2 gallons
(HNU/OVA READING	0ppm BG=0ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
1453	0	6.69	26.6	710	23.9	Deep Rusty Red
1456	2.2	6.81	23.6	630	22.0	Brown
1459	4.4	6.84	23.1	619	20.6	Medium Brown
1504	6.6	6.87	23.7	370	21.8	Slightly Lighter Brown
1506	8.8	6.85	23.2	543	22.7	Medium to Light Brown
1508	11.0	6.87	23.9	532	21.3	Medium to Light Brown
1511	13.2	6.90	24.3	533	20.7	Medium to Light Brown

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

Baker
Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 01-GW03

DATE: 7-27-96 SITE: 1

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START	1342
TIME FINISH	1433
INITIAL WATER LEVEL (FT)	13.5'
TOTAL WELL DEPTH (TD)	23.0'
WELL DIAMETER (INCHES)	2"
CALCULATED WELL VOLUME	1.6 gal. (1)
BOREHOLE DIAMETER (INCHES)	–
BOREHOLE VOLUME	–
AMOUNT OF WATER ADDED DURING DRILLING	NA
DEVELOPMENT METHOD	Check valve with Surge Block
PUMP TYPE	Waterra™
TOTAL TIME (A)	51 min.
AVERAGE FLOW (GPM)(B)	.1 gal./min.
TOTAL ESTIMATED WITHDRAWAL AxB=	9.6 gallons
(HNU)/OVA READING	0 ppm BG: 0 ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
1350	0	5.26	24.4	190	27.6	Heavy Sediment / Brown
1402	1.6	5.00	24.4	161.5	23.7	Heavy Sediment / Brown
1410	3.2	4.87	23.2	155.3	22.7	Heavy Sediment / Brown
1418	4.8	5.14	23.8	162.2	23.2	Slightly less Sediment / Brown
1422	6.4	5.15	23.0	160.1	22.8	Slightly less Sediment / Brown
1428	8.0	5.20	23.1	155.3	22.4	Slightly less Sediment / Brown
1433	9.6	5.21	24.1	152.2	21.8	Very little Sediment / Light Brown

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

Baker
Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 01-GW10

DATE: 7-27-96 SITE: 1

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START	1400
TIME FINISH	1430
INITIAL WATER LEVEL (FT)	11.65'
TOTAL WELL DEPTH (TD)	24.0'
WELL DIAMETER (INCHES)	2"
CALCULATED WELL VOLUME	2.1 gal. (1)
BOREHOLE DIAMETER (INCHES)	—
BOREHOLE VOLUME	—
AMOUNT OF WATER ADDED DURING DRILLING	NA
DEVELOPMENT METHOD	Check valve with Surge Block
PUMP TYPE	Waterra™
TOTAL TIME (A)	30 min.
AVERAGE FLOW (GPM)(B)	≈.5 gal./min.
TOTAL ESTIMATED WITHDRAWAL AxB=	14.7 gallons
(HNU)/OVA READING	0ppm BG=0 ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
1405	2.1	6.85	20.4	489	18.7	Dark Brown/ Orange
1411	4.2	6.68	21.1	480	18.5	Dark Brown/ Orange
1414	6.3	6.73	19.7	477	18.6	Dark Brown/ orange
1418	8.4	6.70	18.8	485	18.6	Dark Brown/ Orange
1422	10.5	6.74	19.0	483	18.6	Dark Brown/ orange (slightly lighter)
1425	12.6	6.69	20.0	484	18.8	Dark Brown/ orange (slightly lighter)
1430	14.7	6.77	18.2	484	18.5	Dark Brown/ orange (slightly lighter)

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 01-GW11

DATE: 7-27-96 SITE: 1

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START	1315
TIME FINISH	1343
INITIAL WATER LEVEL (FT)	5.50'
TOTAL WELL DEPTH (TD)	17.0'
WELL DIAMETER (INCHES)	2"
CALCULATED WELL VOLUME	2.0 gal. (1)
BOREHOLE DIAMETER (INCHES)	–
BOREHOLE VOLUME	–
AMOUNT OF WATER ADDED DURING DRILLING	NA
DEVELOPMENT METHOD	Check valve with Surge Block
PUMP TYPE	Waterra™
TOTAL TIME (A)	28 min.
AVERAGE FLOW (GPM)(B)	.4 gal./min.
TOTAL ESTIMATED WITHDRAWAL AxB=	12.0 gallons
(HNU)/OVA READING	0ppm BG=0ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
1320	0	6.55	21.9	399	20.8	very turbid / Brownish-orange
1323	2.0	6.58	20.0	398	19.1	Very turbid / Brownish-orange
1328	4.0	6.65	19.1	395	18.9	Very turbid / Brownish-orange
1331	6.0	6.66	20.9	401.5	18.9	Very turbid / Brownish-orange
1335	8.0	6.73	19.5	401.3	18.8	Very turbid / Brownish-orange
1340	10.0	6.73	19.8	399.5	18.5	Very turbid / Brownish-orange
1343	12.0	6.74	20.3	405.6	18.6	Very turbid / Brownish-orange

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

Baker
Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 01-GW12

DATE: 7-27-96 SITE: 1

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START: 1220

TIME FINISH: 1245

INITIAL WATER LEVEL (FT): 7.24'

TOTAL WELL DEPTH (TD): 17.0'

WELL DIAMETER (INCHES): 2"

CALCULATED WELL VOLUME: 1.6 gal. (1)

BOREHOLE DIAMETER (INCHES): -

BOREHOLE VOLUME: -

AMOUNT OF WATER ADDED DURING DRILLING: NA

DEVELOPMENT METHOD: Check valve with Surge Block

PUMP TYPE: Waterra™

TOTAL TIME (A): 25 min.

AVERAGE FLOW (GPM)(B): .38 gal./min.

TOTAL ESTIMATED WITHDRAWAL AxB=: 9.6 gallons

(HNU)/OVA READING: 0ppm BG=0ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
1225	0	7.50	20.8	218	20.8	High turbidity / medium Brown
1230	1.6	7.04	19.9	205	19.3	High turbidity / medium Brown
1233	3.2	6.95	20.8	203.7	19.1	High turbidity / medium Brown
1236	4.8	6.89	20.5	206.1	19.1	High turbidity / medium Brown
1238	6.4	6.86	20.6	207.9	19.0	High turbidity / medium Brown
1243	8.0	6.82	20.7	209.8	19.6	High turbidity / medium Brown
1245	9.6	6.78	20.7	210.6	19.3	High turbidity / medium Brown

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 01-GW17

DATE: 7-30-96 SITE: 1

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START	DEVELOPMENT DATA						
1015	TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
TIME FINISH 1032	1017	0	6.69	25.1	545	23.0	Bright Rusty Red
INITIAL WATER LEVEL (FT) 14.25	1019	1.8	6.69	24.3	535	22.0	Bright Rusty Red
TOTAL WELL DEPTH (TD) 25.00'	1021	3.6	6.70	23.9	539	22.0	Bright Rusty Red
WELL DIAMETER (INCHES) 2"	1023	5.4	6.71	24.2	538	21.6	Bright Rusty Red (high turbidity)
CALCULATED WELL VOLUME 1.8 gal. (1)	1025	7.2	6.69	23.6	546	22.1	Bright Rusty Red
BOREHOLE DIAMETER (INCHES) —	1028	9.0	6.67	24.5	547	21.8	Bright Rusty Red
BOREHOLE VOLUME —	1032	10.8	6.65	23.8	554	21.7	Bright Rusty Red
AMOUNT OF WATER ADDED DURING DRILLING NA							
DEVELOPMENT METHOD Check valve with Surge Block							
PUMP TYPE Waterra™							
TOTAL TIME (A) 17 min.							
AVERAGE FLOW (GPM)(B) .63 gal./min.							
TOTAL ESTIMATED WITHDRAWAL AxB= 10.8 gallons							
HNU/OVA READING 0ppm BG=0ppm							

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

Baker
Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 01-GW17DW

DATE: 7-30-96 SITE: 1

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START	0810
TIME FINISH	1005
INITIAL WATER LEVEL (FT)	13.24'
TOTAL WELL DEPTH (TD)	122.0'
WELL DIAMETER (INCHES)	2"
CALCULATED WELL VOLUME	18.0 gal. (1)
BOREHOLE DIAMETER (INCHES)	-
BOREHOLE VOLUME	-
AMOUNT OF WATER ADDED DURING DRILLING	NA
DEVELOPMENT METHOD	Check valve with Surge Block
PUMP TYPE	Waterra™
TOTAL TIME (A)	1 hr. 55 min.
AVERAGE FLOW (GPM)(B)	.46 gal./min.
TOTAL ESTIMATED WITHDRAWAL AxB=	54.0 gallons
(HNU)/OVA READING	0 ppm BG=0 ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
0816	0	8.32	21.7	179.5	21.2	Clear
0837	9.0	8.04	21.6	189.9	21.1	Clear
0900	18.0	8.07	22.2	190.0	21.0	Clear
0915	27.0	8.19	20.6	189.8	21.0	Clear
0932	36.0	8.03	22.1	187.3	21.0	Clear
0949	45.0	8.09	21.3	188.7	21.5	Clear
1005	54.0	8.14	22.9	188.3	23.0	Clear

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 28-GW01

DATE: 7-22-96 SITE: 28

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START	1640
TIME FINISH	1707
INITIAL WATER LEVEL (FT)	5.06'
TOTAL WELL DEPTH (TD)	17.0'
WELL DIAMETER (INCHES)	2"
CALCULATED WELL VOLUME	2.0 gal. (1)
BOREHOLE DIAMETER (INCHES)	–
BOREHOLE VOLUME	–
AMOUNT OF WATER ADDED DURING DRILLING	NA
DEVELOPMENT METHOD	Check valve with Surge Block
PUMP TYPE	Waterra™
TOTAL TIME (A)	27 min
AVERAGE FLOW (GPM)(B)	.37 gal./min.
TOTAL ESTIMATED WITHDRAWAL AxB=	10.0 gallons
(HNU)/OVA READING	0ppm BG=0ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
1645	2.0	7.52	24.1	882	22.9	turbid / medium Brown
1653	4.0	7.51	22.8	747	23.0	turbid / medium Brown
1655	6.0	7.49	23.6	756	22.3	turbid / medium Brown
1700	8.0	7.53	23.1	750	22.1	turbid / medium Brown
1707	10.0	7.64	22.1	753	24.3	Less turbid / Tan

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 28-GW01DW

DATE: 7-22-96 SITE: 28

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START	1530
TIME FINISH	1622
INITIAL WATER LEVEL (FT)	6.06'
TOTAL WELL DEPTH (TD)	133.0'
WELL DIAMETER (INCHES)	2"
CALCULATED WELL VOLUME	22.0 gal. (1)
BOREHOLE DIAMETER (INCHES)	-
BOREHOLE VOLUME	-
AMOUNT OF WATER ADDED DURING DRILLING	NA
DEVELOPMENT METHOD	Check valve with Surge Block
PUMP TYPE	Waterra™
TOTAL TIME (A)	52 min.
AVERAGE FLOW (GPM)(B)	.7 gal./min.
TOTAL ESTIMATED WITHDRAWAL AxB=	66.0 gallons
(HNU)/OVA READING	0ppm BG=0ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
1530	0	7.24	22.0	4745	20.9	clear
1537	11.0	7.72	21.5	4674	21.4	clear
1542	22.0	7.80	21.6	4798	21.4	clear
1552	33.0	7.60	24.3	4728	21.4	clear
1602	44.0	7.71	22.6	4740	21.1	clear
1622	66.0	7.75	23.3	4720	21.3	clear

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

Baker
Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 28-GW02

DATE: 7-25-96 SITE: 28

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START: 1427

TIME FINISH: 1446

INITIAL WATER LEVEL (FT): 3.98'

TOTAL WELL DEPTH (TD): 21.74'

WELL DIAMETER (INCHES): 2"

CALCULATED WELL VOLUME: 3.0 gal. (1)

BOREHOLE DIAMETER (INCHES): –

BOREHOLE VOLUME: –

AMOUNT OF WATER ADDED DURING DRILLING: NA

DEVELOPMENT METHOD: Check valve with Surge Block

PUMP TYPE: Waterra™

TOTAL TIME (A): 19 min

AVERAGE FLOW (GPM)(B): .63 gal./min.

TOTAL ESTIMATED WITHDRAWAL AxB=: 12.0 gallons

(HNU)/OVA READING: 0 ppm BG=0 ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
1430	0	7.06	24.6	874	25.0	turbid/Black
1433	3.0	7.26	23.3	864	23.3	turbid/Black
1438	6.0	7.13	24.2	866	22.5	turbid/Black
1443	9.0	7.09	23.8	879	22.4	minor clearing/medium Black
1446	12.0	7.08	23.0	880	22.9	medium Black/Brown

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

Baker
Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 28-GW04

DATE: 7-25-96 SITE: 28

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START	1528
TIME FINISH	1551
INITIAL WATER LEVEL (FT)	5.15'
TOTAL WELL DEPTH (TD)	29.0'
WELL DIAMETER (INCHES)	2"
CALCULATED WELL VOLUME	4.0 gal. (1)
BOREHOLE DIAMETER (INCHES)	-
BOREHOLE VOLUME	-
AMOUNT OF WATER ADDED DURING DRILLING	NA
DEVELOPMENT METHOD	Check valve with Surge Block
PUMP TYPE	Waterra™
TOTAL TIME (A)	23 min
AVERAGE FLOW (GPM)(B)	.86 gal./min.
TOTAL ESTIMATED WITHDRAWAL AxB=	20.0 gallons
(HNU)/OVA READING	0 ppm BG=0 ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
1530	0	6.79	20.8	533	20.6	"muddy" high turbid / Tan, Brown
1535	4.0	6.75	20.5	441.4	19.8	slightly clearer / Tan
1540	8.0	6.75	20.4	439	20.4	Tan
1544	12.0	6.71	20.4	426.2	19.8	Tan
1547	16.0	6.74	21.0	420.3	19.4	lighter Tan
1551	20.0	6.71	20.5	419.1	19.7	"very little" turbid / light Tan

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

Baker
Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 28-GW07

DATE: 7-24-96 SITE: 28

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START: 1608

TIME FINISH: 1659

INITIAL WATER LEVEL (FT): 2.85'

TOTAL WELL DEPTH (TD): 18.0'

WELL DIAMETER (INCHES): 2"

CALCULATED WELL VOLUME: 2.5 gal. (1)

BOREHOLE DIAMETER (INCHES): -

BOREHOLE VOLUME: -

AMOUNT OF WATER ADDED DURING DRILLING: NA

DEVELOPMENT METHOD: Check valve with Surge Block

PUMP TYPE: Waterra™

TOTAL TIME (A): 49 min.

AVERAGE FLOW (GPM)(B): .25 gal./min.

TOTAL ESTIMATED WITHDRAWAL AxB=: 12.5 gallons

HNU/OVA READING: 0ppm BG = 0ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
1610	0	6.89	22.7	1334	22.8	very turbid/Black
1620	2.5	6.66	24.5	1373	23.4	very turbid/Black
1625	3.75	6.62	24.1	1487	23.7	slightly less turbid/Black
1628	5.0	6.66	23.6	1594	23.5	turbid/Black
1634	6.25	6.65	23.8	1673	23.7	slightly less turbid/Black
1638	7.50	6.67	23.6	1677	23.5	turbid/Black
1643	8.75	6.79	24.0	1705	23.4	slightly less turbid/very dark Brown
1648	10.0	6.80	23.7	1731	23.8	turbid/dark Brown to Black
1656	11.25	6.89	24.6	1736	23.7	very turbid/dark Brown
1659	12.5	6.92	23.9	1734	23.5	turbid/dark Brown to Black

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

Baker
Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 28-GW07DW

DATE: 7-27-96 SITE: 28

GEOLOGIST/ENGINEER: KATua/RWKrivan

	DEVELOPMENT DATA						
TIME START: 0800	TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
TIME FINISH: 0935	0805	0	8.55	22.5	140.9	21.5	Clear
INITIAL WATER LEVEL (FT): 3.74'	0820	11.0	9.76	20.8	173.0	20.0	Slightly cloudy
TOTAL WELL DEPTH (TD): 131.0'	0835	22.0	9.39	20.4	177.2	20.0	Slightly cloudy
WELL DIAMETER (INCHES): 2"	0846	33.0	9.24	20.4	182.9	20.5	Slightly cloudy
CALCULATED WELL VOLUME: 22.0 gal. (1)	0905	44.0	9.09	21.1	192.4	20.5	Slightly cloudy
BOREHOLE DIAMETER (INCHES): -	0925	55.0	8.95	23.3	199.5	20.4	very slight cloudyness
BOREHOLE VOLUME: -	0935	66.0	8.91	22.0	201.8	20.3	very slight cloudyness
AMOUNT OF WATER ADDED DURING DRILLING: NA							
DEVELOPMENT METHOD: Check valve with Surge Block							
PUMP TYPE: Waterra™							
TOTAL TIME (A): 1 hr. 35 min.							
AVERAGE FLOW (GPM)(B): ≈.7 gal./min.							
TOTAL ESTIMATED WITHDRAWAL AxB=: 66.0 gallons							
(HNU)/OVA READING: 0ppm BG=0ppm							

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

Baker

Baker Environmental, Inc.

FIELD WELL DEVELOPMENT RECORD

PROJECT: Monitoring and O&M Program Support, MCB Camp Lejeune, North Carolina

CTO NO.: 367 WELL NO.: 28-GW08

DATE: _____ SITE: 28

GEOLOGIST/ENGINEER: KATua/RWKrivan

TIME START	1238
TIME FINISH	1259
INITIAL WATER LEVEL (FT)	12.37'
TOTAL WELL DEPTH (TD)	24.0'
WELL DIAMETER (INCHES)	2"
CALCULATED WELL VOLUME	2.0 gal. (1)
BOREHOLE DIAMETER (INCHES)	–
BOREHOLE VOLUME	–
AMOUNT OF WATER ADDED DURING DRILLING	NA
DEVELOPMENT METHOD	Check valve with Surge Block
PUMP TYPE	Waterra™
TOTAL TIME (A)	21 min
AVERAGE FLOW (GPM)(B)	.6 gal./min.
TOTAL ESTIMATED WITHDRAWAL AxB=	14.0 gallons
(HNU)/OVA READING	0ppm BG=0ppm

DEVELOPMENT DATA

TIME	CUMULATIVE VOLUME (gallons)	pH	TEMP (°C)	SPECIFIC COND. (µmhos/cm)	TEMP (°C)	COLOR
1240	0	6.65	22.6	1840	20.2	very turbid/Black
1242	2.0	6.85	20.3	1523	22.1	very turbid/Black
1244	4.0	6.89	20.2	1405	19.7	very turbid/Black
1247	6.0	6.93	20.2	1308	19.1	very turbid/Black
1250	8.0	6.91	20.7	1257	19.3	very turbid/Black
1254	10.0	7.04	19.9	1240	19.7	very turbid/Black
1256	12.0	7.02	20.2	1209	19.3	"organic material"/dark Brown
1259	14.0	6.83	20.4	1213	19.6	"organic material"/dark Brown

Satisfied criteria for well development. No elevated HNu readings occurred during well development. All readings are shown prior to stabilization of water quality parameters (pH, specific conductance and temperature). All readings are recorded in the field log book.

ATTACHMENT B
CHAIN-OF-CUSTODY DOCUMENTATION

Baker Environmental, Inc.
Airport Office Park, Bldg. 3
420 Rouser Road
Coraopolis, PA 15108
412-269-6000
412-269-6097 (fax)

CHAIN-OF-CUSTODY RECORD

Lab and BOA #:
Delivery Order #
Project Number: 6270-333
Project Name: LTM
Field Team: Kreuch/Tua
SEND RESULTS TO: Treboll Cook

Sample Number	Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM (2)	Analytical Methods: CLP VOA	Analytical Methods: TAL Metals	Type of Container(s) (3)	Number of Container(s)	General Comments: Sample ID - Remarks
Notes										
Duplicate	7/24/96	0940		GW		2	1	V	1	28-GW01-96C
Trip	7/24/96	1440		GW		2	1	V	1	28-GW02-96C
↓	7/24/96	1530		GW		2	1	V	1	28-GW03-96C
	7/24/96	1625		GW		2	1	V	1	28-GW08-96C
Blank	7/24/96	1705				2		V		28-TB01-96C

COC# OU701-96C

Relinquished By: [signature] Date: 7/24/96 Time: 1715
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Sample Stored at 4 Degrees C: Yes ☑ No ☐
Chain-of-custody seal on cooler: Yes ☑ Number: No ☐
Analysis turnaround: Priority ☐ hrs. Regular ☑
See Work Order ☐
See Analysis Request Form ☐
Sample Disposal Return to Baker ☐ Lab Disposal ☑
Archive until: (date)

NOTES:
(1) A - Air; GW - Groundwater; L - Leachate; S - Spring; SS - Surface Soil; SB - SubSurface Soil; SW - Surface Water; W - Waste; WP - Wipe; WW - Wastewater
(2) GB - Grab; COM - Composite
(3) P - Plastic; G - Glass

White - Return with analytical results; Yellow - Laboratory Copy; Pink - Field Copy

Courier Name: FED EX
Courier Pickup Number: 1369199955
File Name:

7-03-1996 7:21AM FROM BAKER ENVIR. 910 451 1725 P.1

Baker

Baker Environmental, Inc.
Airport Office Park, Bldg. 3
420 Rouser Road
Coraopolis, PA 15108
412-269-6000
412-269-6097 (fax)

CHAIN-OF-CUSTODY RECORD

Lab and BOA #:
Delivery Order #: 6024
Project Number: 70-333
Project Name: LTM
Field Team: Kevin Tua
SEND RESULTS TO: Trebilcock

Notes / Sample Number	Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM (2)	Number of Container(s)											Analytical Methods											General Comments / Sample ID Remarks
						Type of Container(s) (3)											624 VOA	TAL Metals	TAL Metals										
								G	G	P																		
Routine	10/7/96	1155		SW		2		1																				28-SW01-96C
Trip	10/7/96	1615		SW		2		1																				28-SW02-96C
	10/7/96	1635		SW		2		1																				28-SW03-96C
	10/7/96	1155		SED	SED	1	1																					28-SD01-96C
	10/7/96	1145		SED	SED	1	1																					28-SD02-96C
	10/7/96	1135		SED	SED	1	1																					28-SD03-96C
	10/8/96	0940		GW		2		1																				01-GW10-96C
	10/8/96	1050		GW		2		1																				01-GW11-96C
	10/8/96	1145		GW		2		1																				01-GW12-96C
	10/8/96	1430		GW		2		1																				01-GW01-96C

Relinquished By: [signature] Date: 10/9/96 Time: 1510
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Sample Stored at 4 Degrees C: Yes ☒ No ☐
Chain-of-custody seal on cooler: Yes ☒ Number: ____ No ☐
Analysis turnaround: Priority ☐ ____ hrs. Regular ☒
See Work Order ☐
See Analysis Request Form ☐
Sample Disposal: Return to Baker ☐ Lab Disposal ☒ Archive until: ____ (date)

NOTES:
(1) A - Air; GW - Groundwater; L - Leachate; S - Spring; SS - Surface Soil; SB - SubSurface Soil; SW - Surface Water; W - Waste; WP - Wipe; WW - Wastewater
(2) GB - Grab; COM - Composite
(3) P - Plastic; G - Glass

White - Return with analytical results; Yellow - Laboratory Copy; Pink - Field Copy

Courier Name: Fed Ex
Courier Pickup Number: 6-9799933
File Name:

CHAIN-OF-CUSTODY RECORD

Pg. 2 of 2

Baker

Baker Environmental, Inc.
Airport Office Park, Bldg. 3
420 Rouser Road
Coraopolis, PA 15108
412-269-6000
412-269-6097 (fax)

Lab and BOA #:
Delivery Order #:
Project Number: 62470-323
Project Name: LTM
Field Team: Krivan/Tus
SEND RESULTS TO: Trehilcock

Notes Sample Number	Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM (2)	Analytical Methods: 8260 VOA	Analytical Methods: TAL Metals	Type of Container(s) (3): G	Type of Container(s) (3): P	Number of Container(s)	Sample ID Remarks
Eastend	7/29/96	1630		GW		2	1				28-GW01DW-96C
Twin	7/29/96	1145		GW		2	1				28-GW04-96C
Blank	7/29/96	1615				2					28-TB02-96C
Pontiac	7/29/96	1700		GW		2	1				28-GW07DW-96C

General Comments: COC # 00702-96C

Relinquished By: _____ Date: 7/29/96 Time: 1710
Received By: _____ Date: _____ Time: _____
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐ _____

Relinquished By: _____ Date: _____ Time: _____
Received By: _____ Date: _____ Time: _____
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐ _____

Relinquished By: _____ Date: _____ Time: _____
Received By: _____ Date: _____ Time: _____
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐ _____

Sample Stored at 4 Degrees C: Yes ☒ No ☐
Chain-of-custody seal on cooler: Yes ☒ Number: _____ No ☐
Analysis turnaround: Priority ☐ _____ hrs. Regular ☒
See Work Order ☐
See Analysis Request Form ☐

Sample Disposal: Return to Baker ☐ Lab Disposal ☒
Archive until: _____ (date)

NOTES:
(1) A - Air; GW - Groundwater; L - Leachate; S - Spring; SS - Surface Soil; SB - SubSurface Soil; SW - Surface Water; W - Waste; WP - Wipe; WW - Wastewater
(2) GB - Grab; COM - Composite
(3) P - Plastic; G - Glass

White - Return with analytical results; Yellow - Laboratory Copy; Pink - Field Copy

Courier Name: Fed Ex
Courier Pickup Number: 7869799933
File Name:

FROM BAKER ENVIR. 310 431 1123 08/ 1996 4:44PM P.4

Baker Environmental, Inc.
Airport Office Park, Bldg. 3
420 Rouser Road
Coraopolis, PA 15108
412-269-6000
412-269-6097 (fax)

CHAIN-OF-CUSTODY RECORD

Lab and BOA #:
Delivery Order #
Project Number: 62470-333
Project Name: LTM
Field Team: Brivan / Tim
SEND RESULTS TO: Kosalcock

Sample Number (Notes)	Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM (2)	Type of Container(s) (3) G	Type of Container(s) (3) P	Number of Container(s)	Analytical Methods	General Comments / Remarks
Routine	7/30/96	1400		GW		2	1		CLP VOA / TAL Metals	01-GW02-96C
Turn	7/30/96	1450		GW		2	1			01-GW03-96C
↓	7/31/96	0830		GW		2	1			01-GW17DW-96C
↓	7/31/96	0920		GW		2	1			01-GW17-96C
BLANK	7/31/96	1215				2				01-TB01-96C

COC # 04703-96C

Sample Id.

Relinquished By: Donald Vawter Date: 7/31/96 Time: 1300
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Relinquished By: Date: Time:
Received By: Date: Time:
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐

Sample Stored at 4 Degrees C: Yes ☒ No ☐
Chain-of-custody seal on cooler: Yes ☒ Number: No ☐
Analysis turnaround: Priority ☐ hrs. Regular ☒
See Work Order ☐
See Analysis Request Form ☐

Sample Disposal Return to Baker ☐ Lab Disposal ☐
Archive until: (date)

NOTES:
(1) A - Air; GW - Groundwater; L - Leachate; S - Spring; SS - Surface Soil; SB - SubSurface Soil; SW - Surface Water; W - Waste; WP - Wipe; WW - Wastewater
(2) GB - Grab; COM - Composite
(3) P - Plastic; G - Glass

White - Return with analytical results; Yellow - Laboratory Copy; Pink - Field Copy

Courier Name: Fed. Ex
Courier Pickup Number: 1369799922
File Name:

ATTACHMENT C
SAMPLE TRACKING FORM

Sample Tracking and Chain-of-Custody Documentation - Sites 1 and 28
Monitoring and O&M Program Support, CTO-367
MCB, Camp Lejeune, North Carolina

MATRIX	DATE SHIPPED	SAMPLE ID	Analysis Requested		Analysis Requested		DATE RECEIVED	TURNAROUND TIME	RFW NO.	COMMENTS
			CLP Volatiles (SOW OLM01.8)	TAL Metals (SOW ILM03.0)	CLP Volatiles (SOW OLM01.8)	TAL Metals (SOW ILM03.0)				
Groundwater		**COC# OU701-96C**								
	7/26/96	28-GW01-96C	X	X	X	X	8/26/96	30	9607G438	
	7/26/96	28-GW02-96C	X	X	X	X	8/26/96	30	9607G438	
	7/26/96	28-GW07-96C	X	X	X	X	8/26/96	30	9607G438	
	7/26/96	28-GW08-96C	X	X	X	X	8/26/96	30	9607G438	
	7/26/96	28-TB01-96C	X		X		8/26/96	30	9607G438	
		COC# OU702-96C								
	7/29/96	01-GW10-96C	X	X	X	X	9/3/96	34	9607G458	
	7/29/96	01-GW11-96C	X	X	X	X	9/3/96	34	9607G458	
	7/29/96	01-GW12-96C	X	X	X	X	9/3/96	34	9607G458	
	7/29/96	01-GW01-96C	X	X	X	X	9/3/96	34	9607G458	
		COC# OU703-96C								
	7/31/96	01-GW02-96C	X	X	X	X	9/4/96	34	9608G547	
	7/31/96	01-GW03-96C	X	X	X	X	9/4/96	34	9608G547	
	7/31/96	01-GW17DW-96C	X	X	X	X	9/4/96	34	9608G547	
	7/31/96	01-GW17-96C	X	X	X	X	9/4/96	34	9608G547	
	7/31/96	01-TB01-96C	X		X		9/4/96	34	9608G547	
Groundwater		**COC# OU702-96C**								
Surface Water	7/29/96	28-SW01-96C	X	X	X	X	9/3/96	34	9607G458	
Sediment	7/29/96	28-SW02-96C	X	X	X	X	9/3/96	34	9607G458	
	7/29/96	28-SW03-96C	X	X	X	X	9/3/96	34	9607G458	
	7/29/96	28-SD01-96C	X	X	X	X	9/3/96	34	9607G458	
	7/29/96	28-SD02-96C	X	X	X	X	9/3/96	34	9607G458	
	7/29/96	28-SD03-96C	X	X	X	X	9/3/96	34	9607G458	
	7/29/96	28-GW01DW-96C	X	X	X	X	9/3/96	34	9607G458	
	7/29/96	28-GW04-96C	X	X	X	X	9/3/96	34	9607G458	
	7/29/96	28-TB02-96C	X		X		9/3/96	34	9607G458	
	7/29/96	28-GW07DW-96C	X	X	X	X	9/3/96	34	9607G458	
TOTAL ANALYSES			24	21	24	21				

ATTACHMENT D
SAMPLE DESIGNATIONS

SAMPLE DESIGNATIONS

In order to accurately identify and differentiate samples collected during the monitoring program, all samples were designated with a unique identification number. The unique sample number identifies the site, the sample media, the sampling station's number, and the quarter in which the sample was collected. The sample designation format is as follows:

Site Number - Sample Station Identifier - Year and Quarter

An explanation of each identifier is provided below:

Site Number	The investigation was conducted at Sites 1 and 28.
Sample Station Identifier	Each monitoring well has been assigned a unique identification number. The identification number may include the qualifiers "DW" which denotes a deep monitoring well, "IW" which denotes an intermediate monitoring well, and "GW" which denotes groundwater.
Year	The investigation was conducted during 1996.
Quarter	The investigation was conducted during the third quarter. The four quarters of year are identified by the first four letters of the alphabet (i.e., A, B, C and D).

Under this sample designation format the sample number 28-GW07DW-96C refers to:

28-GW07DW-96C	Site 28
28-GW07DW-96C	Groundwater sample
28-GW07DW-96C	Monitoring well No.7
28-GW07DW-96C	Deep monitoring well
28-GW07DW-96C	Year 1996.
28-GW07DW-96C	The third quarter (i.e., July through September)

ATTACHMENT E
MONITORING PROGRAM ANALYTICAL RESULTS

SYMBOL KEY

NA	=	Not Analyzed
MG/L	=	Milligrams Per Liter or Parts Per Million
MG/KG	=	Milligrams Per Kilogram or Parts Per Million
U	=	Not Detected
UG/L	=	Micrograms Per Liter or Parts Per Billion

GROUNDWATER ANALYTICAL RESULTS
JULY 1996
OPERABLE UNIT NO. 7 - SITE 1
MONITORING AND O&M SUPPORT, CTO-0367
MCB CAMP LEJEUNE, NORTH CAROLINA
VOLATILE ORGANICS

SAMPLE ID	01-GW01-96C	01-GW02-96C	01-GW03-96C	01-GW10-96C	01-GW11-96C	01-GW12-96C	01-GW17-96C	01-GW17DW-96C
DATE SAMPLED	07/28/96	07/30/96	07/30/96	07/28/96	07/28/96	07/28/96	07/31/96	07/31/96
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
VOLATILES								
CHLOROMETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BROMOMETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
VINYL CHLORIDE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
METHYLENE CHLORIDE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ACETONE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CARBON DISULFIDE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-DICHLOROETHENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1-DICHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROETHENE (TOTAL)	10 U	10 U	10 U	19	10 U	10 U	10 U	10 U
CHLOROFORM	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-BUTANONE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,1-TRICHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CARBON TETRACHLORIDE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BROMODICHLOROMETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,2-DICHLOROPROPANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CIS-1,3-DICHLOROPROPENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
TRICHLOROETHENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
DIBROMOCHLOROMETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2-TRICHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
TRANS-1,3-DICHLOROPROPENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
BROMOFORM	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
2-HEXANONE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
TETRACHLOROETHENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
1,1,2,2-TETRACHLOROETHANE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
TOLUENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
CHLOROBENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
ETHYLBENZENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
STYRENE	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
XYLENE (TOTAL)	10 U	10 U	10 U	10 U	10 U	6 J	10 U	10 U

GROUNDWATER ANALYTICAL RESULTS
JULY 1996
OPERABLE UNIT NO. 7 - SITE 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB CAMP LEJEUNE, NORTH CAROLINA
TOTAL METALS

SAMPLE ID	28-GW01-96C	28-GW01DW-96C	28-GW02-96C	28-GW04-96C	28-GW07-96C	28-GW07DW-96C	28-GW08-96C
DATE SAMPLED	07/26/96	07/29/96	07/26/96	07/29/96	07/26/96	07/28/96	07/26/96
UNITS	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
TOTAL METALS							
ALUMINUM, TOTAL	21.9 U	31.7	137	121	56.1	72	109
ANTIMONY, TOTAL	14.4 U	14.4 U	14.7	14.4 U	19.2	14.4 U	14.4 U
ARSENIC, TOTAL	1.4 U	1.4 U	1.4 U	1.4 U	5	1.4 U	2.3
BARIUM, TOTAL	223	19.7	710	29.7	315	12.6	715
BERYLLIUM, TOTAL	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
CADMIUM, TOTAL	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U	2.6 U
CALCIUM, TOTAL	174000	103000	52000	70800	225000	34100	49400
CHROMIUM, TOTAL	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U	3.3 U
COBALT, TOTAL	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U
COPPER, TOTAL	4	3.2	2 U	2.5	16.6	6	3.5
IRON, TOTAL	1840	364	4320	171	36300	66.5	3910
LEAD, TOTAL	4.9	1.2 U	4.9	1.2 U	12.4	1.2 U	9.8
MAGNESIUM, TOTAL	14300	20500	23700	3600	24200	378	32300
MANGANESE, TOTAL	250	109	174	67	860	1.6 U	212
MERCURY, TOTAL	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U	0.1 U
NICKEL, TOTAL	8.7 U	8.7 U	8.7 U	8.7 U	8.7 U	8.7 U	8.7 U
POTASSIUM, TOTAL	15800	19400	48200	1330	10100	1920	68800
SELENIUM, TOTAL	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U
SILVER, TOTAL	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U	3.1 U
SODIUM, TOTAL	44900	822000	78100	31600	64800	6390	130000
THALLIUM, TOTAL	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
VANADIUM, TOTAL	2.5 U	2.5 U	2.5 U	2.9	3.7	2.5 U	2.5 U
ZINC, TOTAL	17.1	2.3 U	14.3	2.3 U	24.2	2.5	22

SURFACE WATER ANALYTICAL RESULTS
JULY 1996
OPERABLE UNIT NO. 7 - SITE 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB CAMP LEJEUNE, NORTH CAROLINA
TOTAL METALS

SAMPLE ID	28-SW01-96C	28-SW02-96C	28-SW03-96C
DATE SAMPLED	07/27/96	07/27/96	07/27/96
UNITS	UG/L	UG/L	UG/L
TOTAL METALS			
ALUMINUM, TOTAL	1290	690	3890
ANTIMONY, TOTAL	14.4 U	14.4 U	14.4 U
ARSENIC, TOTAL	1.7	1.9	4
BARIUM, TOTAL	22.1	21.8	35
BERYLLIUM, TOTAL	0.74	0.7 U	0.7 U
CADMIUM, TOTAL	2.6 U	2.6 U	2.6 U
CALCIUM, TOTAL	85000	70500	75600
CHROMIUM, TOTAL	5.3	3.3 U	8.2
COBALT, TOTAL	3.6 U	3.6 U	3.6 U
COPPER, TOTAL	8.9	5.9	28.4
IRON, TOTAL	1260	963	5090
LEAD, TOTAL	37.8	14.7	60
MAGNESIUM, TOTAL	215000	155000	147000
MANGANESE, TOTAL	49	52.3	97.1
MERCURY, TOTAL	0.1 U	0.1 U	0.1 U
NICKEL, TOTAL	8.7 U	8.7 U	8.7 U
POTASSIUM, TOTAL	74700	53800	51500
SELENIUM, TOTAL	1.8	1.8 U	1.8 U
SILVER, TOTAL	3.1 U	3.1 U	3.1 U
SODIUM, TOTAL	1880	1350	1270
THALLIUM, TOTAL	1.5 U	1.5 U	1.5 U
VANADIUM, TOTAL	5.5	2.7	10
ZINC, TOTAL	6.8	2.3 U	35.8

SEDIMENT ANALYTICAL RESULTS
JULY 1996
OPERABLE UNIT NO. 7 - SITE 28
MONITORING AND O&M SUPPORT, CTO-0367
MCB CAMP LEJEUNE, NORTH CAROLINA
TOTAL METALS

SAMPLE ID	28-SD01-96C	28-SD02-96C	28-SD03-96C
DATE SAMPLED	07/27/96	07/27/96	07/27/96
UNITS	MG/KG	MG/KG	MG/KG
TOTAL METALS			
ALUMINUM, TOTAL	987	698	1520
ANTIMONY, TOTAL	3.1 U	3.2 U	3 U
ARSENIC, TOTAL	0.35 U	0.25 U	0.8
BARIUM, TOTAL	5.9	3.3	4.1
BERYLLIUM, TOTAL	0.15 U	0.15 U	0.15 U
CADMIUM, TOTAL	0.56 U	0.57 U	0.55 U
CALCIUM, TOTAL	10800	126	9830
CHROMIUM, TOTAL	2.2	0.72 U	3
COBALT, TOTAL	0.77 U	0.79 U	0.75 U
COPPER, TOTAL	3.2	33.3	23.7
IRON, TOTAL	1080	450	1950
LEAD, TOTAL	6	12.4	19.4
MAGNESIUM, TOTAL	184	194	429
MANGANESE, TOTAL	4.6	2.4	10.4
MERCURY, TOTAL	0.05 U	0.05 U	0.06 U
NICKEL, TOTAL	1.9 U	1.9 U	1.8 U
POTASSIUM, TOTAL	148 U	152 U	145 U
SELENIUM, TOTAL	0.45 U	0.33 U	0.37 U
SILVER, TOTAL	0.67 U	0.68 U	0.65 U
SODIUM, TOTAL	57.8	623	839
THALLIUM, TOTAL	0.37 U	0.27 U	0.31 U
VANADIUM, TOTAL	3.1	1.5	3.5
ZINC, TOTAL	25	3.2	20