

M00263.AR.000017  
MCRD PARRIS ISLAND  
5090.3a

ADDENDUM NUMBER ONE TO REMEDIAL INVESTIGATION VERIFICATION STEP WITH  
TRANSMITTAL LETTER AND REPORT DOCUMENTATION PAGE MCRD PARRIS ISLAND  
SC  
6/1/1990  
MCCLELLAND ENGINEERS

01.03.000.0005

SECURITY CLASSIFICATION OF THIS PAGE

| REPORT DOCUMENTATION PAGE   |       |  |   | Form Approved<br>OMB No. 0704-0188               |                         |
|---|-------|--|---|--|-------------------------|
| 1a. REPORT SECURITY CLASSIFICATION<br>Unclassified  |       | 1b. RESTRICTIVE MARKINGS<br>N/A                                    |   |  |                         |
| 2a. SECURITY CLASSIFICATION AUTHORITY<br>N/A  |       | 3. DISTRIBUTION / AVAILABILITY OF REPORT<br><br>N/A                |   |  |                         |
| 2b. DECLASSIFICATION / DOWNGRADING SCHEDULE<br>N/A  |       |  |   |  |                         |
| 4. PERFORMING ORGANIZATION REPORT NUMBER(S)<br>0501-7007  |       | 5. MONITORING ORGANIZATION REPORT NUMBER(S)<br>N/A                 |   |  |                         |
| 6a. NAME OF PERFORMING ORGANIZATION<br>McClelland Consultants   |       | 6b. OFFICE SYMBOL<br>(if applicable)<br>N/A                        | 7a. NAME OF MONITORING ORGANIZATION<br>Marine Corps Recruit Depot                 |  |                         |
| 6c. ADDRESS (City, State, and ZIP Code)<br>P.O. Box 740010<br>Houston, Texas 77274  |       | 7b. ADDRESS (City, State, and ZIP Code)<br>Parris Island, SC 29905 |   |  |                         |
| 8a. NAME OF FUNDING / SPONSORING ORGANIZATION<br>SOUTHNAVFACENGCOM  |       | 8b. OFFICE SYMBOL<br>(if applicable)<br>N/A                        | 9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER<br>N62467-86-C-0661               |  |                         |
| 8c. ADDRESS (City, State, and ZIP Code)<br>2155 Eagle Drive<br>P.O. Box 10068<br>Charleston, SC 29411-0068  |       | 10. SOURCE OF FUNDING NUMBERS                                      |   |  |                         |
|   |       | PROGRAM ELEMENT NO   | PROJECT NO  | TASK NO  | WORK UNIT ACCESSION NO. |
| 11. TITLE (Include Security Classification)<br>Addendum Number One Remedial Investigation, Verification Step, Marine Corps Recruit Depot, Parris Island, SC UIC: M00263   |       |  |   |  |                         |
| 12. PERSONAL AUTHOR(S)<br>Harry C. Day, Jr.   |       |  |   |  |                         |
| 13a. TYPE OF REPORT<br>Final  |       | 13b. TIME COVERED<br>FROM _____ TO _____                           |   | 14. DATE OF REPORT (Year, Month, Day)<br>90 June | 15. PAGE COUNT          |
| 16. SUPPLEMENTARY NOTATION<br>N/A   |       |  |   |  |                         |
| 17. COSATI CODES  |       |  | 18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number) |  |                         |
| FIELD   | GROUP | SUB-GROUP  |   |  |                         |
| N/A   | N/A   | N/A  |   |  |                         |
| 19. ABSTRACT (Continue on reverse if necessary and identify by block number)  |       |  |   |  |                         |
| <p>A concrete pit located at Page Field was used for fire fighting training from the mid-1960s until 1976. This site was abandoned in 1976 when it developed cracks and reportedly began to leak. McClelland Engineers performed a soil gas vapor survey of the perimeter of the site using a VZV Probe<sup>R</sup>, and installed three groundwater monitoring wells. Water samples were collected from each of the three wells and submitted for chemical analysis.</p> <p>No volatile organic compounds were identified in the soil vapors at concentrations that exceeded 1 ppm total organic vapors (calibrated to methane). No organic compounds were identified in the samples that exceeded the lower limit of determination. Low concentrations of chromium and lead were present in the water samples. However, these concentrations were below the EPA Interim Primary Drinking Water Standards. This site is not recommended for additional evaluation.</p> |       |  |   |  |                         |
| 20. DISTRIBUTION / AVAILABILITY OF ABSTRACT<br><input type="checkbox"/> UNCLASSIFIED/UNLIMITED <input checked="" type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS   |       |  | 21. ABSTRACT SECURITY CLASSIFICATION<br>N/A                                       |  |                         |
| 22a. NAME OF RESPONSIBLE INDIVIDUAL<br>Glenn C. Bradley   |       |  | 22b. TELEPHONE (Include Area Code)<br>(803) 743-0582                              | 22c. OFFICE SYMBOL<br>115                        |                         |

ADDENDUM NUMBER ONE  
REMEDIAL INVESTIGATION VERIFICATION STEP  
MARINE CORPS RECRUIT DEPOT  
PARRIS ISLAND, SOUTH CAROLINA  
UIC: M00263

\* \* \*

Prepared by:

McClelland Consultants (Environmental), Inc.  
6100 Hillcroft  
Houston, Texas 77081

CONTRACT NO. N62467-86-C-0661

\* \* \*

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND

Cacky Barefoot, Engineer-in-Charge

Prepared for:

SOUTHERN DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
2155 Eagle Dr.  
P.O. Box 10068  
Charleston, South Carolina 29411-0068

June 1990



## McClelland consultants

Job No. 1387-3606  
0501-7007  
June 6, 1990

Southern Division  
Naval Facilities Engineering Command  
2155 Eagle Drive  
Charleston, South Carolina 29401

Attention: Ms. Cacky Barefoot

McClelland Consultants is pleased to submit this Addendum to Remedial Investigation, Verification Step, Marine Corps Recruit Depot, Parris Island, South Carolina. This addendum addresses the investigation at Site 7 - Page Field Fire Training Pit.

Sincerely,

McCLELLAND CONSULTANTS  
(ENVIRONMENTAL), INC.

Harry C. Day, Jr., C.P.G.  
Hydrogeologist

HCD/pv(a:7007BR)

Copies Submitted:

Ms. Cacky Barefoot, SOUTHDIVNAVFACENCOM, Charleston, SC (4)  
Ms. Johnsie Neighbors, MCRD Parris Island, SC (3)  
Mr. Art Linton, U.S. EPA, Region IV, Atlanta, GA (3)  
Mr. David Baize, SCDHEC, Columbia, SC (3)

CONTENTS

|   | <u>Page</u> |
|---|-------------|
| 1.0 INTRODUCTION .....  | 1-1         |
| 2.0 SITE SUMMARY .....  | 2-1         |
| 3.0 SITE SPECIFIC INVESTIGATIONS AND<br>RECOMMENDATIONS ..... | 3-1         |
| 3.1 Site 7 - Page Field Fire Training Pit.....                | 3-1         |
| 3.1.1 Site Description.....                                   | 3-1         |
| 3.1.2 Field Activities.....                                   | 3-1         |
| 3.1.3 Laboratory Analyses .....                               | 3-2         |
| 3.1.4 Results.....  | 3-2         |
| 3.1.5 Recommendations .....                                   | 3-2         |
| 4.0 SUMMARY OF RECOMMENDATIONS .....                          | 4-1         |
| 5.0 REFERENCES CITED.....                                     | 5-1         |

FIGURE

3.1-1 Sampling Locations at Site 7

TABLE

3.1-1 Summary of VZV Probe Results

APPENDICES

- APPENDIX A: WELL SURVEY AND ELEVATIONS
- APPENDIX B: BORING LOGS
- APPENDIX C: WELL CONSTRUCTION/DATA
- APPENDIX D: SOUTH CAROLINA WELL DATA
- APPENDIX E: LABORATORY AND FIELD DATA
- APPENDIX F: CHAIN-OF-CUSTODY RECORD

## 1.0 INTRODUCTION

This report addendum contains the investigation activities, results of chemical analyses and testing, and our recommendations for Site 7 - Page Field Fire Training Pit, Marine Corps Recruit Depot, Parris Island, South Carolina.

This work was originally funded such that this site could be investigated concurrent with ongoing verification step activities at the Marine Corps Recruit Depot (MCRD). The ongoing verification step was performed at six sites identified for verification by the Naval Energy and Environmental Support Activity, in their "Initial Assessment Study of the Marine Corps Recruit Depot, Parris Island, South Carolina" (IAS, September 1986), and three sites that were subsequently added for investigation.

This site is intended to be included in the Remedial Investigation Marine Corps Recruit Depot, Verification Step, Parris Island, South Carolina, which was submitted to the Southern Division Engineering Command, Charleston, South Carolina in May 1990. All supporting discussion and documentation of the field activities and investigative methods are included in the verification step report, and the reader is referred to this report for a discussion of the Naval Installation Restoration Program, the project and site history, and the field investigation procedures, including sample collection, well installation, and laboratory quality control/quality assurance procedures.

## 2.0 SITE SUMMARY

Site 7 - Page Field Fire Training Pit. A concrete pit located at Page Field was used for fire fighting training from the mid-1960s until 1976. This site was abandoned in 1976 when it developed cracks, and reportedly began to leak. McClelland Engineers performed a soil gas vapor survey of the perimeter of the site using a VZV Probe<sup>R</sup>, and installed three groundwater monitoring wells. Water samples were collected from each of the three wells and submitted for chemical analysis.

No volatile organic compounds were identified in the soil vapors at concentrations that exceeded 1 ppm total organic vapors (calibrated to methane). No organic compounds were identified in the samples that exceeded the lower limit of determination. Low concentrations of chromium and lead were present in the water samples. However, these concentrations were below the EPA Interim Primary Drinking Water Standards. This site is not recommended for additional evaluation.

### 3.0 SITE SPECIFIC INVESTIGATIONS AND RECOMMENDATIONS

#### 3.1 Site 7 - Page Field Fire Training Pit

3.1.1 Site Description. The Page Field Fire Training Pit (IAS, Site 7) was not originally recommended by the Navy for additional study, or for inclusion in the NACIP or NIRP investigations. This site was added to the verification step activities following the April 28, 1987, meeting between MCRD, Southern Division, McClelland, SCDHEC and EPA personnel.

According to the IAS, fire training occurred at Page Field during an 11-year period from the mid-1960s to 1976. Reportedly, the pit was abandoned in 1976 when it began to leak. The abandoned training pit is approximately 25 ft in diameter and sits on the edge of the concrete apron. An abandoned 500-gal waste oil/fuel tank sits approximately 60 ft from the pit and underground piping exists, connecting the tank to the pit. It was reported in the IAS that training practice was held one to two times per month during the period of operation of this pit. Typically, 300 to 400 gal of contaminated fuels and/or waste motor oil were burned per training session.

Because the pit was constructed with asphalt cover on a concrete apron and with cinder block walls, migration of contaminants to the soil underlying the concrete apron is unlikely. Release of leaked wastes occurred for only 2 to 4 months during the period when the pit began to crack until operations ceased in 1976. Horizontal migration of the small volume of oil which may have penetrated to the soil is unlikely. The IAS estimates that less than 50 gal of waste fuel/oil would have been released. Vertical migration of any contamination into the Tertiary limestone aquifer is unlikely due to the overlying confining beds of the Hawthorn Formation.

Contaminated fuels, waste lube oil, and petroleum-based solvents (including mineral spirits, kerosene, and diesel fuel) were burned in the pit.

3.1.2 Field Activities. McClelland performed a VZV Probe<sup>R</sup> survey of the site by sampling at ten locations spaced equidistantly around the perimeter of the site (Figure 3.1-1). Additionally, three shallow to (15 ft deep each) groundwater monitoring wells were installed and sampled.

3.1.3 Laboratory Analyses. No soil or sediment samples were collected at this site. Groundwater samples from each well were collected and analyzed for priority pollutant volatile organic compounds, base/neutral extractables, dissolved Cd, Cr, and Pb, and the indicator parameters pH, total organic carbon, and specific conductance.

3.1.4 Results. The results of the VZV Probe<sup>R</sup> survey (Table 3.1-1) indicate that no volatile organic vapors are present at the perimeter of the Page Field Fire Training Area. At no location were organic vapors identified at concentrations exceeding 2 ppm which is well below any level indicative of significant subsurface contamination by volatile organic contaminants expected to be associated with this type of facility.

Chemical analytical results of the three groundwater samples indicate that no dissolved Cd, Cr, or Pb exceed the Interim Primary Drinking Water Standards of 0.010 ppm, 0.050 ppm, and 0.050 ppm, respectively. No priority pollutant volatile organic compounds or acid and base/neutral extractable organic compounds were identified in the water samples collected at this site.

3.1.5 Recommendations. Based on these data, this site is not recommended for additional evaluation.

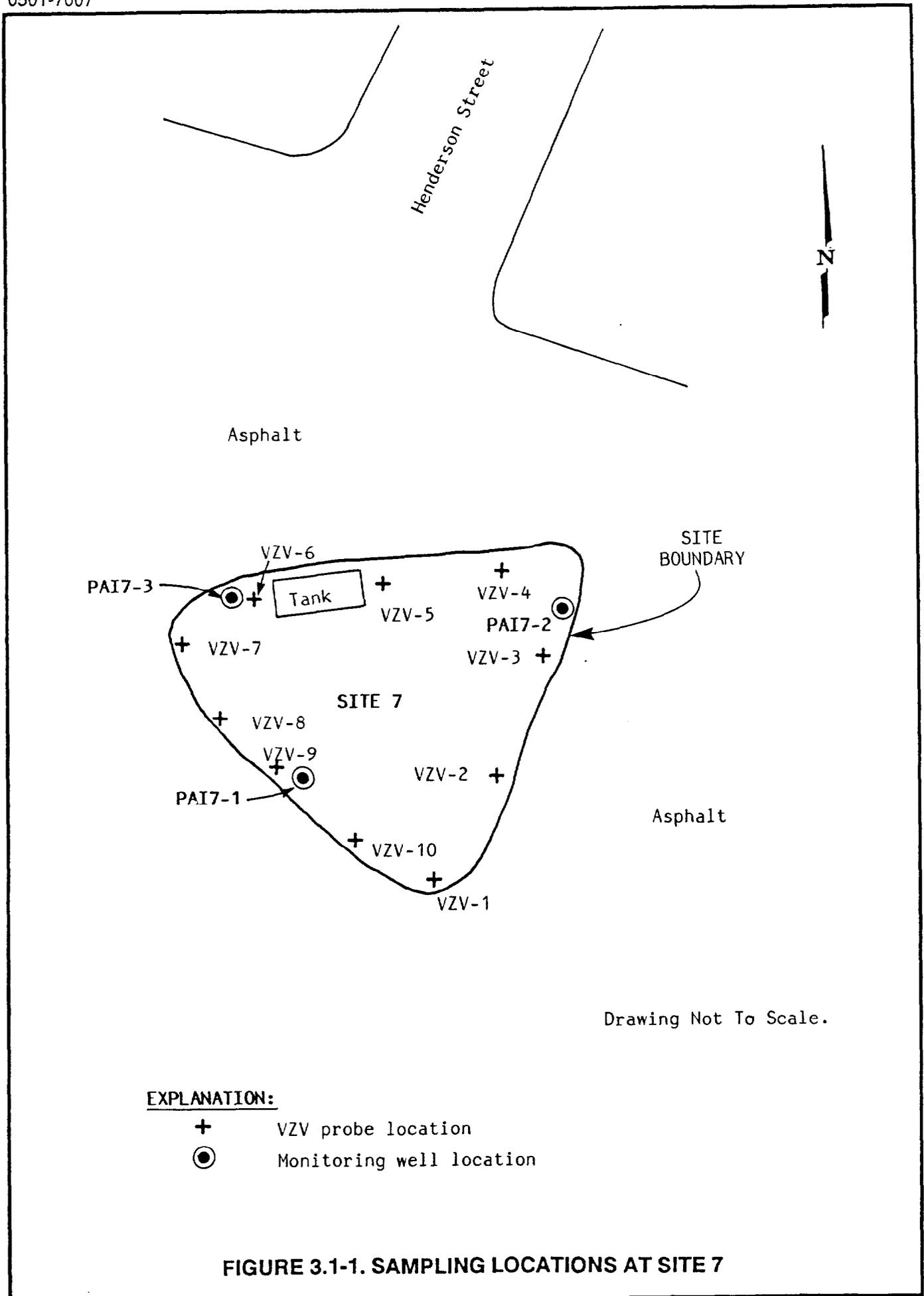


FIGURE 3.1-1. SAMPLING LOCATIONS AT SITE 7

Table 3.1-1  
Site 7 - Page Field Fire Training Pit  
Summary of VZV Probe<sup>R</sup> Results

| <u>Location</u> | <u>Depth (ft)</u> | <u>OVA (ppm)<sup>a</sup></u> |
|-----------------|-------------------|------------------------------|
| 1               | 1.5               | 0                            |
| 2               | 2.                | 0                            |
| 3               | 2.                | 0                            |
| 4               | 2.5               | 0                            |
| 5               | 2.                | 0                            |
| 6               | 2.                | 0.5                          |
| 7               | 2.                | 0                            |
| 8               | 2.                | 0.6                          |
| 9               | 2.                | 1.0                          |
| 10              | 1.                | 0.7                          |

---

<sup>a</sup> No chromatographs were recorded from vapors collected at this site.

#### 4.0 SUMMARY OF RECOMMENDATIONS

We recommend that Site 7 - Page Field Fire Training Pit be dropped from further evaluation under this and subsequent investigations.

## 5.0 REFERENCES CITED

Dames & Moore, 1986, Initial assessment study of Marine Corps Recruit Depot, Parris Island, South Carolina, UIC: M00263, prepared for Environmental Restoration Department, Navy Energy and Environmental Support Activity, Port Hueneme, California, Contract No. N62474-84-C-3385.

McClelland Engineers, Inc., 1990, Final report remedial investigation, Marine Corps Recruit Depot, verification step, Parris Island, South Carolina, UIC: M00263, prepared for Southern Division Naval Facilities Engineering Command, Charleston, South Carolina, Contract No. N62467-86-C-0661.

**APPENDIX A**  
**WELL SURVEY AND ELEVATIONS**

Summary of Surveyed Well Elevations  
Marine Corps Recruit Depot  
Parris Island, South Carolina  
Addendum Report

| <u>Well Number</u> | <u>Ground Elevation<br/>(ft)</u> | <u>Well Casing Elevation<br/>(ft)</u> |
|--------------------|----------------------------------|---------------------------------------|
| PAI-7-1            | 9.8                              | 13.60                                 |
| PAI-7-2            | 10.0                             | 13.91                                 |
| PAI-7-3            | 9.4                              | 13.08                                 |



SITE 6

MICRO  
5/10/88  
4 or 7

| +    |       | -    | STP.  | ELEV |
|------|-------|------|---|------|
| 4.96 | 13.12 |      | T.P.  | 8.16 |
|      |       | 8.91 | T.P. T.P. ①   | 8.21 |
| 5.53 | 14.04 |      | WIND TO STOP  |      |
|      |       | 4.69 | T.P. T.P. ①   | 9.36 |
| 7.32 | 16.68 | 7.58 | B.M. P.F. 859 T.P.  | 8.10 |
|      |       |      | ACTUAL  | 7.98 |
|      |       |      | OUT   | 0.12 |
|      |       |      | 3/11/88   |      |
| 7.16 | 16.14 |      | B.M. P.F. 859   | 8.98 |
|      |       | 6.83 | T.P. ① {CHECKS<br>1 <sup>ST</sup> RUN}  | 9.26 |
| 4.70 | 5.95  |      |   |      |
|      |       | 5.83 | T.P. ① {CHECKS<br>1 <sup>ST</sup> RUN}  | 8.13 |
|      |       |      | BAD SHOT WAS ON<br>LOOP BACK AT T.P. ①<br>ELEVATION OF WELL IS<br>CORRECT. ACTUAL ERROR<br>IS 0.02', SHOT MISREAD<br>BY 0.10 @ T.P. ① |      |

SITE 7

MICRO  
5/10/88  
5-17

| (+)   |        | (-)   | STP.  | ELEV   |
|-------|--------|-------|---|--------|
| 9.25  | 13.395 |       | PAI 7-1 CASING                                  | 12.545 |
|       |        | 0.32  | TR<br>PAI 7-3 CASING                            | 12.075 |
| 0.53  | 13.605 |       |   |        |
|       |        | 1.070 | TIE<br>PAI 6-1 CASING                           | 12.525 |
|       |        |       | OUT   | 0.01   |
| 2.26  | 15.335 |       | PAI 7-3 CASING                                  | 13.075 |
|       |        | 5.9   | PAI 7-3 GROUND                                  | 9.4    |
|       |        | 5.3   | PAI 7-2 GROUND                                  | 10.0   |
|       |        | 1.43  | PAI 7-2 CASING                                  | 13.905 |
|       |        | 5.5   | PAI 7-1 GROUND                                  | 9.8    |
|       |        | 1.84  | PAI 7-1 CASING                                  | 13.595 |
| 0.24  | 14.145 |       | PAI 7-2 CASING                                  | 13.705 |
|       |        | 4.810 | T.P.  | 9.335  |
| 5.355 | 14.690 |       |   |        |
|       |        | 5.43  | T.P.  | 9.21   |
| 5.69  | 14.90  |       |   |        |
|       |        | 5.00  | T.P.  | 9.90   |
| 5.27  | 15.17  |       |   |        |
|       |        | 5.86  | T.B. 14 160 GAL IN BASE<br>OF UNTESTED CONCRETE | 9.31   |
| 5.92  | 15.23  |       |   |        |
|       |        | 5.35  | T.P.  | 9.78   |

site 7

MCRD  
3/11/23  
687

| +     | H.I.   | -     | STA                             | ELEV   |
|-------|--------|-------|---------------------------------|--------|
| 4.785 | 14.665 |       | T.P.                            | 9.88   |
|       |        | 5.455 | T.P.                            | 9.210  |
| 5.48  | 11.69  |       |                                 |        |
|       |        | 5.36  | T.P.                            | 9.33   |
| 4.735 | 14.265 |       |                                 |        |
|       |        | 0.170 | PA1-7.2 TIE CASING              | 13.895 |
|       |        |       | ACTUAL                          | 13.905 |
|       |        |       | INT                             | 0.020  |
| 5.62  | 14.93  |       | B.M. INFILTRATION CONCRETE SLAB | 9.31   |
|       |        | 6.04  | T.P.                            | 8.89   |
| 3.53  | 12.42  |       |                                 |        |
|       |        | 4.32  | T.P.                            | 7.60   |
| 5.03  | 12.63  |       |                                 |        |
|       |        | 6.03  | T.P.                            | 6.60   |
| 4.52  | 11.12  |       |                                 |        |
|       |        | 5.3   | PA1-INF.1 GROUND                | 5.8    |
|       |        | 1.93  | PA1-INF.1 CASING                | 9.19   |
|       |        | 5.0   | PA1-INF.2 GROUND                | 6.1    |
|       |        | 1.43  | PA1-INF.2 T.P. CASING           | 9.69   |
| 3.09  | 12.78  |       |                                 |        |
|       | ↓      | 5.0   | PA1-INF.3 GROUND                | 7.8    |
|       | ↓      | 1.35  | PA1-INF.3 CASING                | 11.43  |

site 7

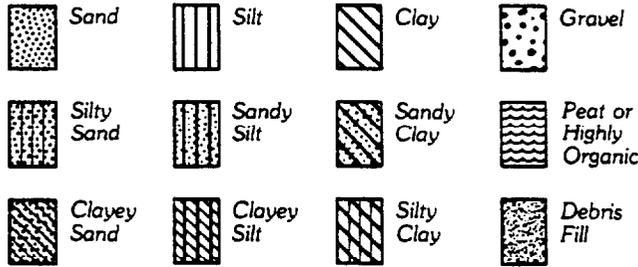
MCRD  
3/11/23  
787

| (+)  | HL    | (-)  | STA      | ELEV |
|------|-------|------|----------|------|
|      | 12.78 |      |          |      |
|      |       | 5.13 | T.P.     | 7.65 |
| 5.19 | 12.84 | 3.76 | T.P.     | 9.08 |
| 6.09 | 15.17 | 5.86 | B.M. TIE | 9.31 |
|      |       |      | ACTUAL   | 9.31 |
|      |       |      | OUT      | 0.00 |

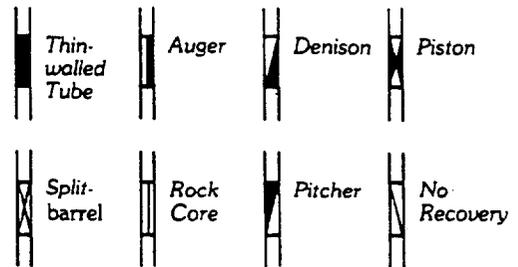
**APPENDIX B**  
**BORING LOGS**

# TERMS AND SYMBOLS USED ON BORING LOGS

## SOIL TYPES

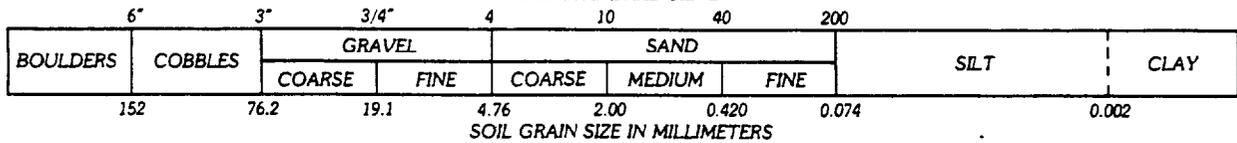


## SAMPLER TYPES



## SOIL GRAIN SIZE

U.S. STANDARD SIEVE



### STRENGTH OF COHESIVE SOILS <sup>(1)</sup>

| Consistency      | Undrained Shear Strength, Kips Per Sq Ft |
|------------------|--|
| Very Soft .....  | less than 0.25                           |
| Soft .....       | 0.25 to 0.50                             |
| Firm .....       | 0.50 to 1.00                             |
| Stiff .....      | 1.00 to 2.00                             |
| Very Stiff ..... | 2.00 to 4.00                             |
| Hard .....       | greater than 4.00                        |

### DENSITY OF GRANULAR SOILS <sup>(2,3)</sup>

| Descriptive Term   | *Relative Density, % |
|--------------------|----------------------|
| Very Loose .....   | less than 15         |
| Loose .....        | 15 to 35             |
| Medium Dense ..... | 35 to 65             |
| Dense .....        | 65 to 85             |
| Very Dense .....   | greater than 85      |

\*Estimated from sampler driving record

### SPLIT-BARREL SAMPLER DRIVING RECORD

| Blows Per Foot | Description   |
|----------------|---|
| 25 .....       | 25 blows drove sampler 12 inches, after initial 6 inches of seating.    |
| 50/7" .....    | 50 blows drove sampler 7 inches, after initial 6 inches of seating.     |
| Ref/3" .....   | 50 blows drove sampler 3 inches during initial 6-inch seating interval. |

Note : To avoid damage to sampling tools, driving is limited to 50 blows during or after seating interval.

### SOIL STRUCTURE <sup>(1)</sup>

- Slickensided ..... Having planes of weakness that appear slick and glossy. The degree of slickensidedness depends upon the spacing of slickensides and the ease of breaking along these planes.
- Fissured ..... Containing shrinkage or relief cracks, often filled with fine sand or silt; usually more or less vertical.
- Pocket ..... Inclusion of material of different texture that is smaller than the diameter of the sample.
- Parting ..... Inclusion less than 1/8 inch thick extending through the sample.
- Seam ..... Inclusion 1/8 inch to 3 inches thick extending through the sample.
- Layer ..... Inclusion greater than 3 inches thick extending through the sample.
- Laminated ..... Soil sample composed of alternating partings or seams of different soil type.
- Interlayered ..... Soil sample composed of alternating layers of different soil type.
- Intermixed ..... Soil sample composed of pockets of different soil type and layered or laminated structure is not evident.
- Calcareous ..... Having appreciable quantities of carbonate.

#### REFERENCES :

- (1) ASTM D 2488
- (2) ASCE Manual 56 (1976)
- (3) ASTM D 2049

*Information on each boring log is a compilation of subsurface conditions and soil or rock classifications obtained from the field as well as from laboratory testing of samples. Strata have been interpreted by commonly accepted procedures. The stratum lines on the logs may be transitional and approximate in nature. Water level measurements refer only to those observed at the times and places indicated, and may vary with time, geologic condition or construction activity.*

# LOG OF BORING NO. PAI 7-1

Site 7 - Page Field Fire Training Area  
Marine Corps Recruit Depot  
Beaufort County, South Carolina

| Depth, Ft            | Samples | Penetration Resistance, Blows/Ft | Location: See Plate ><br>Surface Elevation: 9.8' | Shear Strength, ksf          |                        |                      | Confining Pressure, ksf | Unit Dry Weight pcf | Water Content, % | Liquid Limit | Plastic Limit | Percent Passing No. 200 Sieve |
|----------------------|---------|----------------------------------|--|------------------------------|------------------------|----------------------|-------------------------|---------------------|------------------|--------------|---------------|-------------------------------|
|                      |         |                                  |  | Penetrometer (P) Torvane (T) | Unconfined Compression | Triaxial Compression |                         |                     |                  |              |               |                               |
| MATERIAL DESCRIPTION |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
|                      |         |                                  | SILTY SAND, dark brown (1.5')                    |                              |                        |                      |                         |                     |                  |              |               |                               |
|                      |         |                                  | CLAYEY SAND, brown, wet (6.5')                   |                              |                        |                      |                         |                     |                  |              |               |                               |
| 5                    |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
|                      |         |                                  | SILTY SAND, light brown, wet (15.0')             |                              |                        |                      |                         |                     |                  |              |               |                               |
| 10                   |         |                                  | - gray at 14.0'                                  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 15                   |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 20                   |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 25                   |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 30                   |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 35                   |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 40                   |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 45                   |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 50                   |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 55                   |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |

See Key for Terms and Symbols.

Completion Depth: 15.0'  
Water First Noticed: 1.5'  
Date: February 27, 1988  
Depth to Water: --  
Cased: --  
Date: --

Job No.: 0501-7007  
Drilled By: A. Clark  
Logged By: J. Byars  
Dry Auger: 0' to 15'  
Wet Rotary: --  
Boring Sealed: well installed

# LOG OF BORING NO. PAI 7-2

Site 7 - Page Field Fire Training Area  
Marine Corps Recruit Depot  
Beaufort County, South Carolina

| Depth, Ft | Samples | Penetration Resistance, Blows/Ft | Location: See Plate ><br><br>Surface Elevation: 10.0'  | Shear Strength, ksf             |                        |                      | Confining Pressure, ksf | Unit Dry Weight pcf | Water Content, % | Liquid Limit | Plastic Limit | Percent Passing No. 200 Sieve |
|-----------|---------|----------------------------------|--|---------------------------------|------------------------|----------------------|-------------------------|---------------------|------------------|--------------|---------------|-------------------------------|
|           |         |                                  |  | Penetrometer (P)<br>Torvane (T) | Unconfined Compression | Triaxial Compression |                         |                     |                  |              |               |                               |
|           |         |                                  | MATERIAL DESCRIPTION   |                                 |                        |                      |                         |                     |                  |              |               |                               |
| 5         |         |                                  | SILTY SAND, dark brown<br>- with rubble, 2.0' to 2.5'<br>- light brown at 3.0'<br>- wet at 4.0'<br><br>- gray at 9.5'<br><br>(15.0') |                                 |                        |                      |                         |                     |                  |              |               |                               |
| 10        |         |                                  |  |                                 |                        |                      |                         |                     |                  |              |               |                               |
| 15        |         |                                  |  |                                 |                        |                      |                         |                     |                  |              |               |                               |
| 20        |         |                                  |  |                                 |                        |                      |                         |                     |                  |              |               |                               |
| 25        |         |                                  |  |                                 |                        |                      |                         |                     |                  |              |               |                               |
| 30        |         |                                  |  |                                 |                        |                      |                         |                     |                  |              |               |                               |
| 35        |         |                                  |  |                                 |                        |                      |                         |                     |                  |              |               |                               |
| 40        |         |                                  |  |                                 |                        |                      |                         |                     |                  |              |               |                               |
| 45        |         |                                  |  |                                 |                        |                      |                         |                     |                  |              |               |                               |
| 50        |         |                                  |  |                                 |                        |                      |                         |                     |                  |              |               |                               |
| 55        |         |                                  |  |                                 |                        |                      |                         |                     |                  |              |               |                               |

See Key for Terms and Symbols.

Completion Depth: 15.0'  
 Water First Noticed: 4.0'  
 Date: February 27, 1983  
 Depth to Water: --  
 Caved: --  
 Date: --

Job No.: 0501-7007  
 Drilled By: A. Clark  
 Logged By: J. Byars  
 Dry Auger: 0' to 15'  
 Wet Rotary: --  
 Boring Sealed: Well Installed

**LOG OF BORING NO. PAI 7-3**  
**Site 7 - Page Field Fire Training Area**  
**Marine Corps Recruit Depot**  
**Beaufort County, South Carolina**

| Depth, Ft | Samples | Penetration Resistance, Blows/Ft | Location: See Plate ><br><br>Surface Elevation: 9.4' | Shear Strength, ksf          |                        |                      | Confining Pressure, ksf | Unit Dry Weight pcf | Water Content, % | Liquid Limit | Plastic Limit | Percent Passing No. 200 Sieve |
|-----------|---------|----------------------------------|--|------------------------------|------------------------|----------------------|-------------------------|---------------------|------------------|--------------|---------------|-------------------------------|
|           |         |                                  |  | Penetrometer (P) Torvane (T) | Unconfined Compression | Triaxial Compression |                         |                     |                  |              |               |                               |
|           |         |                                  | <b>MATERIAL DESCRIPTION</b>                          |                              |                        |                      |                         |                     |                  |              |               |                               |
|           |         |                                  | SILTY SAND, dark brown                               |                              |                        |                      |                         |                     |                  |              |               |                               |
|           |         |                                  | - brown and gray at 3.0'                             |                              |                        |                      |                         |                     |                  |              |               |                               |
|           |         |                                  | - wet below 3.0'                                     |                              |                        |                      |                         |                     |                  |              |               |                               |
| 5         |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 10        |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 15        |         |                                  |  | (15.0')                      |                        |                      |                         |                     |                  |              |               |                               |
| 20        |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 25        |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 30        |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 35        |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 40        |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 45        |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 50        |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |
| 55        |         |                                  |  |                              |                        |                      |                         |                     |                  |              |               |                               |

See Key for Terms and Symbols.

Completion Depth: 15.0'  
 Water First Noticed: 3.0'  
 Date: February 27, 1988  
 Depth to Water: --  
 Caved: --  
 Date: --

Job No.: 0501-7007  
 Drilled By: A. Clark  
 Logged By: J. Byars  
 Dry Auger: 0' to 15'  
 Wet Rotary: --  
 Boring Sealed: Well Installed

**APPENDIX C**  
**WELL CONSTRUCTION/DATA**

DEPARTMENT OF THE NAVY

SOUTHERN DIVISION

NAVAL FACILITIES ENGINEERING COMMAND

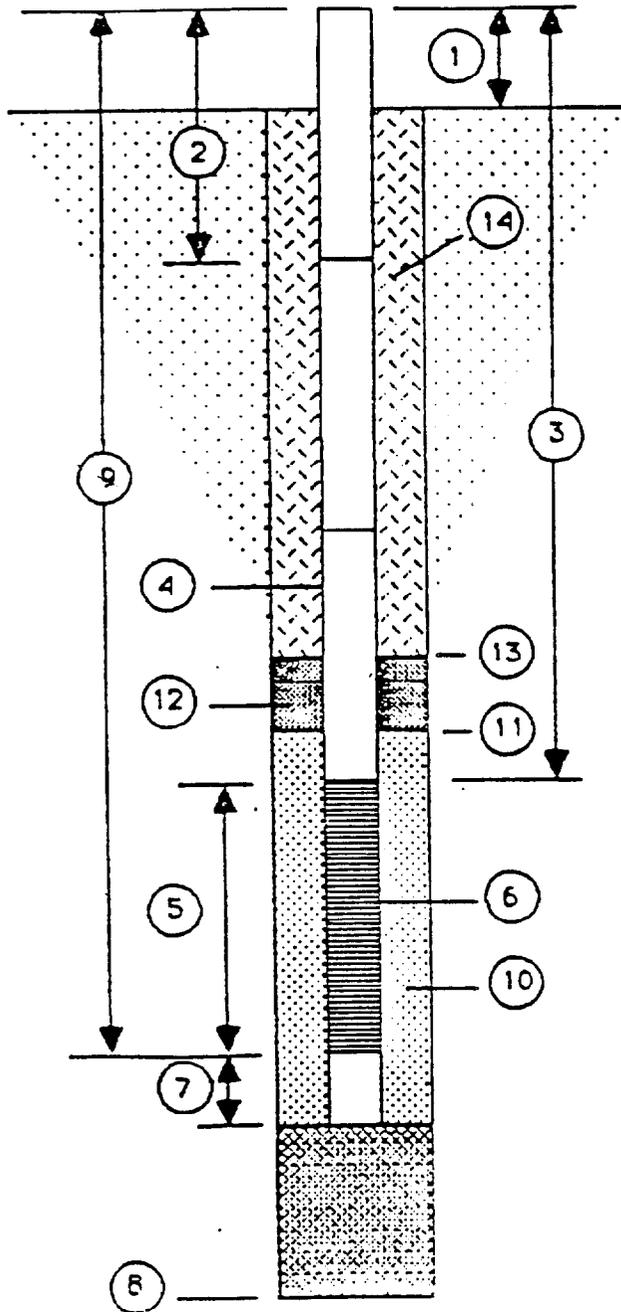
2155 EAGLE DR., P. O. BOX 10068

CHARLESTON S C 29411-0068

WELL CONSTRUCTION DETAILS

WELL NUMBER PAI-7-1

DATE OF INSTALLATION 2-27-88



1. Height of Casing above ground 3.5'

2. Depth to first Coupling 3.0'

Coupling Interval Depths \_\_\_\_\_

3. Total Length of Blank Pipe 6.5'

4. Type of Blank Pipe 2" Sch 40 PVC Threaded

5. Length of Screen 10.0'

6. Type of Screen 2" Sch 40 PVC Threaded 0.010"

7. Length of Sump \_\_\_\_\_

8. Total Depth of Boring 15.0' Hole Diameter 6.0"

9. Depth To Bottom of Screen 13.0'

10. Type of Screen Filter Frac Sand

Quantity Used 200 LBS Size 16/30 U/C

11. Depth To Top of Filter 2.0'

12. Type of Seal Bentonite Pellets

Quantity Used 25 LB

13. Depth To Top of Seal 0.8'

14. Type of Grout Cement / Bentonite

Grout Mixture 5/94

Method of Placement Pour in dry hole

COMMENTS ON INSTALLATION \_\_\_\_\_

DEPARTMENT OF THE NAVY  
SOUTHERN DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
2155 EAGLE DR P O BOX 1006R  
CHARLESTON S C 29411-0068

WELL DATA REPORT

WELL NUMBER PAI-7-1 AREA PAI Site 1

DATE OF INSTALLATION 2-27-88

WELL HOLE DATA

Drill Date 2-27-88 Well Driller J.A. Byars

Depth of Boring 15.0' Purpose of Boring Monitor

Drilling Method Dry Auger Mud Type -

WATER LEVEL DATA (All measurements from top of casing)

Water Level 6.5' Date of Measurement 3-23-88

DEVELOPMENT DATA

Development Method Hand Pump

Length of Time Developed 20 min. - clear, evacuated

LOCATION OF BOREHOLE INFORMATION

Drillers Log  Geophysical Log \_\_\_\_\_

Physical Core  Cutting Samples \_\_\_\_\_

Water Level Observations 1.5 ft.

DRILLED BY J.A. BYARS SCCWD# 588

DEVELOPED BY J.A. BYARS SCCWD# 588

TECHNICAL OVERSIGHT BY \_\_\_\_\_



DEPARTMENT OF THE NAVY  
SOUTHERN DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
2155 EAGLE DR P O BOX 1006R  
CHARLESTON S C 29411-0068

WELL DATA REPORT

WELL NUMBER PAI-7-2 AREA PAI Site 7

DATE OF INSTALLATION 2-27-88

**WELL HOLE DATA**

Drill Date 2-27-88 Well Driller J.A. Byars

Depth of Boring 15.0' Purpose of Boring Monitor

Drilling Method Dry Auger Mud Type -

**WATER LEVEL DATA (All measurements from top of casing)**

Water Level 6.7' Date of Measurement 3-23-88

**DEVELOPMENT DATA**

Development Method Hand Pump

Length of Time Developed 20 min. - clear, evacuated

**LOCATION OF BOREHOLE INFORMATION**

Drillers Log ✓ Geophysical Log \_\_\_\_\_

Physical Core ✓ Cutting Samples \_\_\_\_\_

Water Level Observations 4. ft.

DRILLED BY J.A. BYARS SCCWD# 588

DEVELOPED BY J.A. BYARS SCCWD# 588

TECHNICAL OVERSIGHT BY \_\_\_\_\_

DEPARTMENT OF THE NAVY

SOUTHERN DIVISION

NAVAL FACILITIES ENGINEERING COMMAND

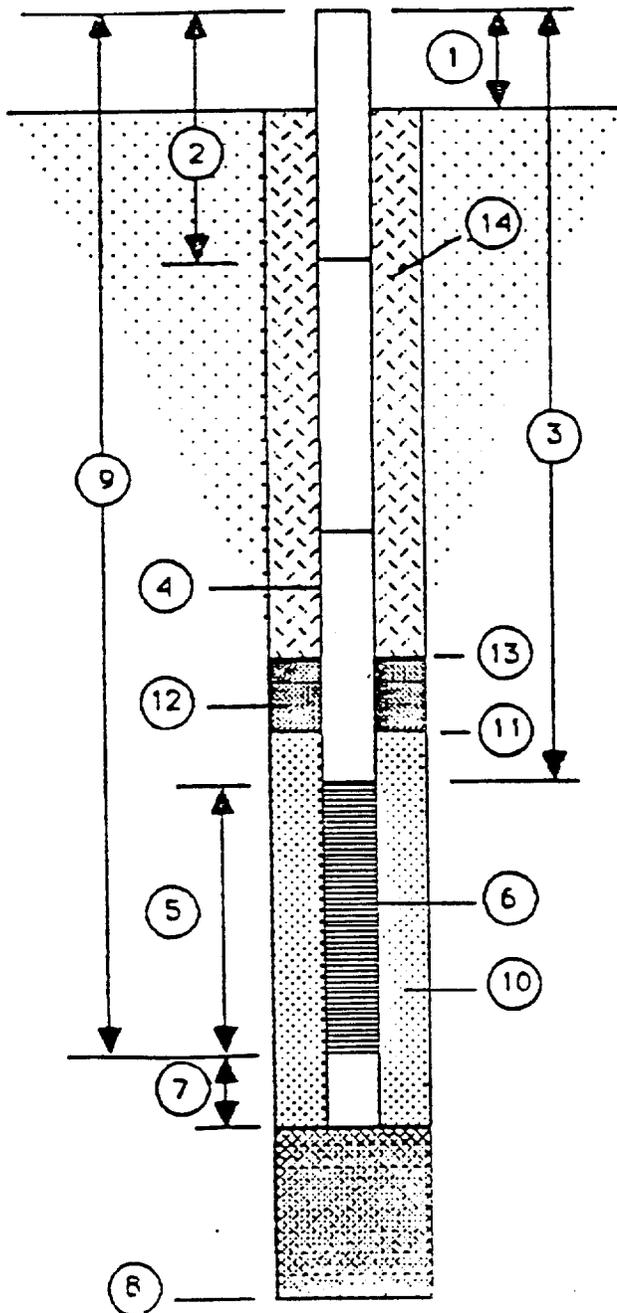
2155 EAGLE DR., P. O. BOX 10068

CHARLESTON S C 29411-0068

WELL CONSTRUCTION DETAILS

WELL NUMBER PAI-7-3

DATE OF INSTALLATION 2-27-88



1. Height of Casing above ground 3.5'

2. Depth to first Coupling 3.0'

Coupling Interval Depths \_\_\_\_\_

3. Total Length of Blank Pipe 6.5'

4. Type of Blank Pipe 2" Sch 40 PVC Threaded

5. Length of Screen 10.0'

6. Type of Screen 2" Sch 40 PVC Threaded OD10"

7. Length of Sump \_\_\_\_\_

8. Total Depth of Boring 15.0' Hole Diameter 6.0"

9. Depth To Bottom of Screen 13.0'

10. Type of Screen Filter Frac Sand

Quantity Used 200 LBS Size 16/30 U/C

11. Depth To Top of Filter 2.0'

12. Type of Seal Bentonite Pellets

Quantity Used 25 LBS

13. Depth To Top of Seal 0.7'

14. Type of Grout Cement / Bentonite

Grout Mixture 94/5

Method of Placement Pour in dry hole

COMMENTS ON INSTALLATION:

DEPARTMENT OF THE NAVY  
SOUTHERN DIVISION  
NAVAL FACILITIES ENGINEERING COMMAND  
2155 EAGLE DR P O BOX 10068  
CHARLESTON S C 29411-0068

WELL DATA REPORT

WELL NUMBER PAI-7-3 AREA PAI Site 7

DATE OF INSTALLATION 2-27-88

**WELL HOLE DATA**

Drill Date 2-27-88 Well Driller J.A. Byars

Depth of Boring 15.0' Purpose of Boring Monitor

Drilling Method Dry Auger Mud Type -

**WATER LEVEL DATA (All measurements from top of casing)**

Water Level 5.8' Date of Measurement 3-23-88

**DEVELOPMENT DATA**

Development Method Hand Pump

Length of Time Developed 20 min. - clear, evacuated

**LOCATION OF BOREHOLE INFORMATION**

Drillers Log  Geophysical Log \_\_\_\_\_

Physical Core  Cutting Samples \_\_\_\_\_

Water Level Observations 3 ft.

DRILLED BY J.A. BYARS SCCWD# 588

DEVELOPED BY J.A. BYARS SCCWD# 588

TECHNICAL OVERSIGHT BY \_\_\_\_\_

**APPENDIX D**  
**SOUTH CAROLINA WELL DATA**







**APPENDIX E**  
**LABORATORY AND FIELD DATA**

SUMMARY OF FIELD ANALYTICAL DATA  
MARINE CORPS RECRUIT DEPOT  
SITE 7  
PARRIS ISLAND, SOUTH CAROLINA<sup>a</sup>

| <u>Sample Type</u> | <u>Sample Number</u> | <u>Temperature<br/>(°C)</u> | <u>pH</u> | <u>Specific<br/>Conductivity<br/>(umhos/cm)</u> |
|--------------------|----------------------|-----------------------------|-----------|---|
| Groundwater        | PAI7-GW1-00          | 18                          | 5.5       | 280   |
|                    | PAI7-GW2-00          | 20                          | 5.5       | 260   |
|                    | PAI7-GW3-00          | 19                          | 5.5       | 180   |

---

<sup>a</sup> Field measurements collected by McClelland Engineers.



# GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly F. Greene  
President

George C. Greene, P.E., Ph.D.  
Vice President  
SC Registration No. 9103

Laboratory Certifications:  
FL E87156/87294  
NC 233  
SC 10120  
VA 00151  
NACIP Approved

## CERTIFICATE OF ANALYSIS

CLIENT: McCLELLAND ENGINEERS  
P.O. BOX 740010  
HOUSTON, TX 77274

DATE: 05/11/88

CONTACT: MR. HARRY DAY

RELEASED BY: *Henry J. Stinson*  
for: ALLAN M. CRANE

CC/FC: MCHD/MCHD5

PAGE NO.: 1

| PARAMETER      | SAMPLE ID : PA17-<br>GW1-00 | PA17-<br>GW2-00 | PA17-<br>GW3-00 |
|----------------|-----------------------------|-----------------|-----------------|
| LAB ID         | : 88031247                  | 88031248        | 88031249        |
| SAMPLE TYPE    | : 11                        | 11              | 11              |
| DATE RECEIVED: | 03/25/88                    | 03/25/88        | 03/25/88        |
| COLLECTED BY : | MCHD                        | MCHD            | MCHD            |

|                             |            |            |            |
|-----------------------------|------------|------------|------------|
| TOTAL ORGANIC CARBON        | 12.6 ppm   | 9.73 ppm   | 23.1 ppm   |
| CADMIUM - DISSOLVED         | <0.010 ppm | <0.010 ppm | <0.010 ppm |
| CHROMIUM - DISSOLVED        | <0.03 ppm  | <0.03 ppm  | 0.04 ppm   |
| LEAD - DISSOLVED            | 0.015 ppm  | 0.005 ppm  | 0.007 ppm  |
| ACID DIGESTION              | YES        | YES        | YES        |
| PP Volatiles by Method 8240 |            |            |            |
| ACROLEIN                    | <100 ppb   | <100 ppb   | <100 ppb   |
| ACRYLONITRILE               | <100 ppb   | <100 ppb   | <100 ppb   |
| BENZENE                     | <5 ppb     | <5 ppb     | <5 ppb     |
| BROMOFORM                   | <10 ppb    | <10 ppb    | <10 ppb    |
| CARBON TETRACHLORIDE        | <10 ppb    | <10 ppb    | <10 ppb    |
| CHLOROBENZENE               | <10 ppb    | <10 ppb    | <10 ppb    |
| CHLORODIBROMOMETHANE        | <10 ppb    | <10 ppb    | <10 ppb    |
| CHLOROETHANE                | <10 ppb    | <10 ppb    | <10 ppb    |
| 2-CHLOROETHYL VINYL ETHER   | <10 ppb    | <10 ppb    | <10 ppb    |
| CHLOROFORM                  | <10 ppb    | <10 ppb    | <10 ppb    |
| DICHLOROBENZENE (1,2)       | <10 ppb    | <10 ppb    | <10 ppb    |
| DICHLOROBENZENE (1,3)       | <10 ppb    | <10 ppb    | <10 ppb    |
| DICHLOROBENZENE (1,4)       | <10 ppb    | <10 ppb    | <10 ppb    |
| DICHLOROBROMOMETHANE        | <10 ppb    | <10 ppb    | <10 ppb    |
| DICHLORODIFLUOROMETHANE     | <10 ppb    | <10 ppb    | <10 ppb    |
| DICHLOROETHANE (1,1)        | <10 ppb    | <10 ppb    | <10 ppb    |
| DICHLOROETHANE (1,2)        | <10 ppb    | <10 ppb    | <10 ppb    |
| DICHLOROETHYLENE (1,1)      | <10 ppb    | <10 ppb    | <10 ppb    |
| DICHLOROETHYLENE (1,2-T)    | <10 ppb    | <10 ppb    | <10 ppb    |
| DICHLOROPROPANE (1,2)       | <10 ppb    | <10 ppb    | <10 ppb    |
| DICHLOROPROPYLENE (1,2)     | <10 ppb    | <10 ppb    | <10 ppb    |
| DICHLOROPROPYLENE (1,3)     | <10 ppb    | <10 ppb    | <10 ppb    |
| ETHYLBENZENE                | <10 ppb    | <10 ppb    | <10 ppb    |
| METHYL BROMIDE              | <10 ppb    | <10 ppb    | <10 ppb    |
| METHYL CHLORIDE             | <10 ppb    | <10 ppb    | <10 ppb    |
| METHYLENE CHLORIDE          | <10 ppb    | <10 ppb    | <10 ppb    |
| TETRACHLOROETHANE (1,1,2,2) | <10 ppb    | <10 ppb    | <10 ppb    |



# GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly F. Greene  
President

George C. Greene, P.E., Ph.D.  
Vice President  
SC Registration No. 9103

Laboratory Certifications:  
FL E87156/87294  
NC 233  
SC 10120  
VA 00151  
NACIP Approved

## CERTIFICATE OF ANALYSIS

CLIENT: McCLELLAND ENGINEERS  
P.O. BOX 740010  
HOUSTON, TX 77274  
CONTACT: MR. HARRY DAY

DATE: 05/11/88

CC/FC: MCHD/MCHDS

PAGE NO.: 2

| SAMPLE ID                     | PA17-<br>GW1-00 | PA17-<br>GW2-00 | PA17-<br>GW3-00 |
|-------------------------------|-----------------|-----------------|-----------------|
| LAB ID                        | 88031247        | 88031248        | 88031249        |
| DATE RECEIVED:                | 03/25/88        | 03/25/88        | 03/25/88        |
| TETRACHLOROETHYLENE           | <10 ppb         | <10 ppb         | <10 ppb         |
| TOLUENE                       | <10 ppb         | <10 ppb         | <10 ppb         |
| TRICHLOROETHANE (1,1,1)       | <10 ppb         | <10 ppb         | <10 ppb         |
| TRICHLOROETHANE (1,1,2)       | <10 ppb         | <10 ppb         | <10 ppb         |
| TRICHLOROETHYLENE             | <10 ppb         | <10 ppb         | <10 ppb         |
| TRICHLOROFLUOROMETHANE        | <10 ppb         | <10 ppb         | <10 ppb         |
| VINYL CHLORIDE                | <10 ppb         | <10 ppb         | <10 ppb         |
| PP Acid Ext. by Method 8270   |                 |                 |                 |
| CHLOROPHENOL (2)              | <10 ppb         | <10 ppb         | <10 ppb         |
| DICHLOROPHENOL (2,4)          | <10 ppb         | <10 ppb         | <10 ppb         |
| DINITROPHENOL(2-METHYL-4,6)   | <30 ppb         | <30 ppb         | <30 ppb         |
| DIMETHYLPHENOL (2,4)          | <10 ppb         | <10 ppb         | <10 ppb         |
| DINITROPHENOL (2,4)           | <45 ppb         | <45 ppb         | <45 ppb         |
| NITROPHENOL (2)               | <10 ppb         | <10 ppb         | <10 ppb         |
| NITROPHENOL (4)               | <10 ppb         | <10 ppb         | <10 ppb         |
| P-CHLORO-M-CRESOL             | <10 ppb         | <10 ppb         | <10 ppb         |
| PENTACHLOROPHENOL             | <10 ppb         | <10 ppb         | <10 ppb         |
| PHENOL                        | <10 ppb         | <10 ppb         | <10 ppb         |
| TRICHLOROPHENOL (2,4,6)       | <10 ppb         | <10 ppb         | <10 ppb         |
| PP B/N Ext. by Method 8270    |                 |                 |                 |
| ACENAPHTHENE                  | <10 ppb         | <10 ppb         | <10 ppb         |
| BENZIDINE                     | <10 ppb         | <10 ppb         | <10 ppb         |
| BIS (CHLOROMETHYL) ETHER      | <10 ppb         | <10 ppb         | <10 ppb         |
| BIS (2-CHLOROETHOXY) METHANE  | <10 ppb         | <10 ppb         | <10 ppb         |
| BIS (2-CHLOROETHYL) ETHER     | <10 ppb         | <10 ppb         | <10 ppb         |
| BIS (2-CHLOROISOPROPYL) ETHER | <10 ppb         | <10 ppb         | <10 ppb         |
| BROMOPHENYL PHENYL ETHER      | <10 ppb         | <10 ppb         | <10 ppb         |
| CHLOROETHYL VINYL ETHER       | <10 ppb         | <10 ppb         | <10 ppb         |
| CHLOROPHENYL PHENYL ETHER     | <10 ppb         | <10 ppb         | <10 ppb         |
| CHLORONAPHTHALENE (2)         | <10 ppb         | <10 ppb         | <10 ppb         |
| DICHLOROBENZIDINE (3,3')      | <10 ppb         | <10 ppb         | <10 ppb         |
| DINITROTOLUENE (2,4)          | <10 ppb         | <10 ppb         | <10 ppb         |
| DINITROTOLUENE (2,6)          | <10 ppb         | <10 ppb         | <10 ppb         |
| DIPHENYLHYDRAZINE (1,2)       | <10 ppb         | <10 ppb         | <10 ppb         |
| FLUORANTHENE                  | <10 ppb         | <10 ppb         | <10 ppb         |



# GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly F. Greene  
President

George C. Greene, P.E., Ph.D.  
Vice President  
SC Registration No. 9103

Laboratory Certifications:  
FL E87156/87294  
NC 233  
SC 10120  
VA 00151  
NACIP Approved

## CERTIFICATE OF ANALYSIS

CLIENT: McCLELLAND ENGINEERS  
P.O. BOX 740010  
HOUSTON, TX 77274  
CONTACT: MR. HARRY DAY

DATE: 05/11/88

CC/FC: MCHD/MCHD5

PAGE NO.: 3

| SAMPLE ID      | PAI7-<br>GW1-00 | PAI7-<br>GW2-00 | PAI7-<br>GW3-00 |
|----------------|-----------------|-----------------|-----------------|
| LAB ID         | 88031247        | 88031248        | 88031249        |
| DATE RECEIVED: | 03/25/88        | 03/25/88        | 03/25/88        |

|                              |         |         |         |
|------------------------------|---------|---------|---------|
| HEXACHLORO BENZENE           | <10 ppb | <10 ppb | <10 ppb |
| HEXACHLORO BUTADIENE         | <10 ppb | <10 ppb | <10 ppb |
| HEXACHLORO CYCLOPENTADIENE   | <10 ppb | <10 ppb | <10 ppb |
| HEXACHLORO ETHANE            | <10 ppb | <10 ppb | <10 ppb |
| ISOPHORONE                   | <10 ppb | <10 ppb | <10 ppb |
| NAPHTHALENE                  | <10 ppb | <10 ppb | <10 ppb |
| NITROBENZENE                 | <10 ppb | <10 ppb | <10 ppb |
| N-NITROSODIMETHYLAMINE       | <10 ppb | <10 ppb | <10 ppb |
| N-NITROSODIPHENYLAMINE       | <10 ppb | <10 ppb | <10 ppb |
| N-NITROSO-DI-N-PROPYLAMINE   | <10 ppb | <10 ppb | <10 ppb |
| TRICHLORO BENZENE (1,2,4)    | <10 ppb | <10 ppb | <10 ppb |
| BIS (2-ETHYLHEXYL) PHTHALATE | <10 ppb | <10 ppb | <10 ppb |
| BTYL BENZYL PHTHALATE        | <10 ppb | <10 ppb | <10 ppb |
| DIETHYL PHTHALATE            | <10 ppb | <10 ppb | <10 ppb |
| DIMETHYL PHTHALATE           | <10 ppb | <10 ppb | <10 ppb |
| DI-N-BUTYL PHTHALATE         | <10 ppb | <10 ppb | <10 ppb |
| DI-N-OCTYL PHTHALATE         | <10 ppb | <10 ppb | <10 ppb |
| ACENAPHTHYLENE               | <10 ppb | <10 ppb | <10 ppb |
| ANTHRACENE                   | <10 ppb | <10 ppb | <10 ppb |
| BENZO (A) ANTHRACENE         | <10 ppb | <10 ppb | <10 ppb |
| BENZO (B) FLUORANTHENE       | <10 ppb | <10 ppb | <10 ppb |
| BENZO (K) FLUORANTHENE       | <10 ppb | <10 ppb | <10 ppb |
| BENZO (GHI) PERYLENE         | <10 ppb | <10 ppb | <10 ppb |
| BENZO (A) PYRENE             | <10 ppb | <10 ppb | <10 ppb |
| BENZOFLUORANTHENE (3,4)      | <10 ppb | <10 ppb | <10 ppb |
| CHRYSENE                     | <10 ppb | <10 ppb | <10 ppb |
| DIBENZO (A,H) ANTHRACENE     | <10 ppb | <10 ppb | <10 ppb |
| FLUORENE                     | <10 ppb | <10 ppb | <10 ppb |
| INDENO (1,2,3-CD) PYRENE     | <10 ppb | <10 ppb | <10 ppb |
| PHENANTHRENE                 | <10 ppb | <10 ppb | <10 ppb |
| PYRENE                       | <10 ppb | <10 ppb | <10 ppb |
| ALDRIN                       | <10 ppb | <10 ppb | <10 ppb |
| DIELDRIN                     | <10 ppb | <10 ppb | <10 ppb |
| CHLORDANE (TECHNICAL)        | <10 ppb | <10 ppb | <10 ppb |
| O,P'-DDE                     | <10 ppb | <10 ppb | <10 ppb |



# GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly F. Greene  
President

George C. Greene, P.E., Ph.D.  
Vice President  
SC Registration No. 9103

Laboratory Certifications:  
FL E87156/87294  
NC 233  
SC 10120  
VA 00151  
NACIP Approved

## CERTIFICATE OF ANALYSIS

CLIENT: McCLELLAND ENGINEERS  
P.O. BOX 740010  
HOUSTON, TX 77274  
CONTACT: MR. HARRY DAY

DATE: 05/11/88

CC/FC: MCHD/MCHDS

PAGE NO.: 4

| SAMPLE ID                  | PA17-<br>GW1-00 | PA17-<br>GW2-00 | PA17-<br>GW3-00 |
|----------------------------|-----------------|-----------------|-----------------|
| LAB ID                     | 88031247        | 88031248        | 88031249        |
| DATE RECEIVED:             | 03/25/88        | 03/25/88        | 03/25/88        |
| O,P'-DDD                   | <10 ppb         | <10 ppb         | <10 ppb         |
| O,P'-DDT                   | <10 ppb         | <10 ppb         | <10 ppb         |
| P,P'-DDE                   | <10 ppb         | <10 ppb         | <10 ppb         |
| P,P'-DDD                   | <10 ppb         | <10 ppb         | <10 ppb         |
| P,P'-DDT                   | <10 ppb         | <10 ppb         | <10 ppb         |
| ENDOSULFAN I               | <10 ppb         | <10 ppb         | <10 ppb         |
| ENDOSULFAN II              | <10 ppb         | <10 ppb         | <10 ppb         |
| ENDOSULFAN SULFATE         | <10 ppb         | <10 ppb         | <10 ppb         |
| ENDRIN                     | <10 ppb         | <10 ppb         | <10 ppb         |
| ENDRIN ALDEHYDE            | <10 ppb         | <10 ppb         | <10 ppb         |
| HEPTACHLOR                 | <10 ppb         | <10 ppb         | <10 ppb         |
| HEPTACHLOR EPOXIDE         | <10 ppb         | <10 ppb         | <10 ppb         |
| A-BHC                      | <10 ppb         | <10 ppb         | <10 ppb         |
| B-BHC                      | <10 ppb         | <10 ppb         | <10 ppb         |
| LINDANE                    | <10 ppb         | <10 ppb         | <10 ppb         |
| D-BHC                      | <10 ppb         | <10 ppb         | <10 ppb         |
| TOXAPHENE                  | <10 ppb         | <10 ppb         | <10 ppb         |
| AROCLOR 1016               | <150 ppb        | <150 ppb        | <150 ppb        |
| AROCLOR 1221               | <150 ppb        | <150 ppb        | <150 ppb        |
| AROCLOR 1232               | <150 ppb        | <150 ppb        | <150 ppb        |
| AROCLOR 1242               | <150 ppb        | <150 ppb        | <150 ppb        |
| AROCLOR 1248               | <150 ppb        | <150 ppb        | <150 ppb        |
| AROCLOR 1254               | <150 ppb        | <150 ppb        | <150 ppb        |
| AROCLOR 1260               | <150 ppb        | <150 ppb        | <150 ppb        |
| AROCLOR 1262               | <150 ppb        | <150 ppb        | <150 ppb        |
| EXTRACTION & CONCENTRATION | YES             | YES             | YES             |



# GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly F. Greene  
President

George C. Greene, P.E., Ph.D.  
Vice President  
SC Registration No. 9103

Laboratory Certifications:  
FL E87156/87294  
NC 233  
SC 10120  
VA 00151  
NACIP Approved

## CERTIFICATE OF ANALYSIS

CLIENT: McCLELLAND ENGINEERS  
P.O. BOX 740010  
HOUSTON, TX 77274  
CONTACT: MR. HARRY DAY

DATE: 05/11/88

RELEASED BY: *[Signature]*  
for: ALLAN M. CRANE

CC/FC: MCHD/MCHD5

PAGE NO.: 1

SAMPLE ID : PA17-  
GW3-00B  
LAB ID : 88031250  
SAMPLE TYPE : 11  
DATE RECEIVED: 03/25/88  
COLLECTED BY : MCHD

PARAMETER

PP Volatiles by Method 8240

|                             |          |
|-----------------------------|----------|
| ACROLEIN                    | <100 ppb |
| ACRYLONITRILE               | <100 ppb |
| BENZENE                     | <5 ppb   |
| BROMOFORM                   | <10 ppb  |
| CARBON TETRACHLORIDE        | <10 ppb  |
| CHLOROBENZENE               | <10 ppb  |
| CHLORODIBROMOMETHANE        | <10 ppb  |
| CHLOROETHANE                | <10 ppb  |
| 2-CHLOROETHYL VINYL ETHER   | <10 ppb  |
| CHLOROFORM                  | <10 ppb  |
| DICHLOROBENZENE (1,2)       | <10 ppb  |
| DICHLOROBENZENE (1,3)       | <10 ppb  |
| DICHLOROBENZENE (1,4)       | <10 ppb  |
| DICHLOROBROMOMETHANE        | <10 ppb  |
| DICHLORODIFLUOROMETHANE     | <10 ppb  |
| DICHLOROETHANE (1,1)        | <10 ppb  |
| DICHLOROETHANE (1,2)        | <10 ppb  |
| DICHLOROETHYLENE (1,1)      | <10 ppb  |
| DICHLOROETHYLENE (1,2-T)    | <10 ppb  |
| DICHLOROPROPANE (1,2)       | <10 ppb  |
| DICHLOROPROPYLENE (1,2)     | <10 ppb  |
| DICHLOROPROPYLENE (1,3)     | <10 ppb  |
| ETHYLBENZENE                | <10 ppb  |
| METHYL BROMIDE              | <10 ppb  |
| METHYL CHLORIDE             | <10 ppb  |
| METHYLENE CHLORIDE          | <10 ppb  |
| TETRACHLOROETHANE (1,1,2,2) | <10 ppb  |
| TETRACHLOROETHYLENE         | <10 ppb  |
| TOLUENE                     | <10 ppb  |
| TRICHLOROETHANE (1,1,1)     | <10 ppb  |
| TRICHLOROETHANE (1,1,2)     | <10 ppb  |
| TRICHLOROETHYLENE           | <10 ppb  |



# GENERAL ENGINEERING LABORATORIES

Environmental Engineering and Analytical Services

Molly F. Greene  
President

George C. Greene, P.E., Ph.D.  
Vice President  
SC Registration No. 9103

Laboratory Certifications:  
FL E87156/87294  
NC 233  
SC 10120  
VA 00151  
NACIP Approved

## CERTIFICATE OF ANALYSIS

CLIENT: McCLELLAND ENGINEERS  
P.O. BOX 740010  
HOUSTON , TX 77274  
CONTACT: MR. HARRY DAY

DATE: 05/11/88

CC/FC: MCHD/MCHD5

PAGE NO.: 2

SAMPLE ID : PA17-  
GW3-00B

LAB ID : 88031250  
DATE RECEIVED: 03/25/88

TRICHLOROFLUOROMETHANE <10 ppb  
VINYL CHLORIDE <10 ppb

**APPENDIX F**  
**CHAIN-OF-CUSTODY RECORD**

# CHAIN OF CUSTODY RECORD

General Engineering Laboratories  
 2040 Savage Road  
 Charleston, South Carolina 29414  
 PO Box 30712  
 Charleston, South Carolina 29417  
 803-556-8171

| Client Name / Facility Name      |              |         | SAMPLE ANALYSIS REQUIRED(x) - use remarks area to specify specific compounds or methods |      |                     |      |                 |                  |         |         |                             |                 |                               |                  |           | Use F or P in the boxes to indicate whether sample was filtered and/or preserved |              |                   |                  |      |         |                         |         |                                    |
|----------------------------------|--------------|---------|---|------|---------------------|------|-----------------|------------------|---------|---------|-----------------------------|-----------------|-------------------------------|------------------|-----------|--|--------------|-------------------|------------------|------|---------|-------------------------|---------|------------------------------------|
| McClelland Engineers / BFT & PAI |              |         |   |      |                     |      |                 |                  |         |         |                             |                 |                               |                  |           | ←  |              |                   |                  |      |         |                         |         |                                    |
| Collected By / Company           |              |         |   |      |                     |      |                 |                  |         |         |                             |                 |                               |                  |           |  |              |                   |                  |      |         |                         |         |                                    |
| Seifer Millard / McClelland      |              |         |   |      |                     |      |                 |                  |         |         |                             |                 |                               |                  |           |  |              |                   |                  |      |         |                         |         |                                    |
| SAMPLE ID                        | DATE         | TIME    | WELL  | SOIL | COMP                | GRAB | # of containers | pH, conductivity | TOC/DOC | TOX     | Chloride, Fluoride, Sulfate | Nitrite/Nitrate | VOC - Specify Method required | METALS - specify | Pesticide | Herbicide  | Total Phenol | Acid Extractables | B/N Extractables | PCBs | Cyanide | Coliform - specify type | Remarks |                                    |
| 1245                             | BFT3-GW2-00  | 3/23/88 | 1330  | ✓    |                     |      | 5               | ✓                |         |         |                             |                 | ✓                             | ○                |           |  |              |                   |                  |      |         |                         |         | not enough sample for complete set |
| 1246                             | BFT8-GW3-00  | "       | 1345  | ✓    |                     |      | 4               | ✓                |         |         |                             |                 | ✓                             | ○                |           |  |              |                   |                  |      |         |                         |         | TOC almost filled, only 3 VOC      |
| 1249                             | PAI7-GW3-00  | "       | 1630  | ✓    |                     |      | 8               | ✓                |         |         |                             |                 | ✓                             | ✓                |           |  |              | ✓                 | ✓                |      |         |                         |         | dissolved metals                   |
| 1250                             | PAI7-GW3-00B | "       | 1630  |      |                     |      | 2               |                  |         |         |                             |                 | ✓                             |                  |           |  |              |                   |                  |      |         |                         |         | trip blank                         |
| 1248                             | PAI7-GW2-00  | "       | 1700  | ✓    |                     |      | 8               | ✓                |         |         |                             |                 | ✓                             | ✓                |           |  |              | ✓                 | ✓                |      |         |                         |         | dissolved metals                   |
| 1247                             | PAI7-GW1-00  | "       | 1715  | ✓    |                     |      | 8               | ✓                |         |         |                             |                 | ✓                             | ✓                |           |  |              | ✓                 | ✓                |      |         |                         |         | dissolved metals                   |
|                                  | BFT8-GW2-00  | 3/24/88 | 0915  | ✓    |                     |      | 1               |                  |         |         |                             |                 |                               | ✓                |           |  |              |                   |                  |      |         |                         |         | dissolved metals - 1/3 full        |
|                                  | BFT8-GW3-00  | "       | 0930  | ✓    |                     |      | 1               |                  |         |         |                             |                 |                               | ✓                |           |  |              |                   |                  |      |         |                         |         | dissolved metals - 1/5 full        |
| END OF RECORD                    |              |         |   |      |                     |      |                 |                  |         |         |                             |                 |                               |                  |           |  |              |                   |                  |      |         |                         |         |                                    |
| Relinquished by:                 |              |         | Date  | Time | Received by:        |      |                 | Relinquished by: |         |         | Date                        | Time            | Received by:                  |                  |           |  |              |                   |                  |      |         |                         |         |                                    |
| A. K. Kiba                       |              |         | 5/24/88   | 1300 |                     |      |                 |                  |         |         |                             |                 |                               |                  |           |  |              |                   |                  |      |         |                         |         |                                    |
| Relinquished by:                 |              |         | Date  | Time | Received by lab by: |      |                 | Date             | Time    | Remarks |                             |                 |                               |                  |           |  |              |                   |                  |      |         |                         |         |                                    |
|                                  |              |         |   |      | Seifer Millard      |      |                 | 5/25/88          | 1221    |         |                             |                 |                               |                  |           |  |              |                   |                  |      |         |                         |         |                                    |

White • sample collector    Yellow • file    Pink • with report

BATCH #17