Savannah River Site A/M Area Southern Sector Characterization Cone Penetrometer Report

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by

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Ebasco Services Inc.

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A/M AREA
SOUTHERN SECTOR CHARACTERIZATION
CONE PENETROMETER REPORT (U)**

Publication Date: May 1993

**Westinghouse Savannah River Company
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LIST OF ACRONYMS AND ABBREVIATIONS

ANSI	American National Standards Institute
ARA	Applied Research Associates, Inc.
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFM	Cubic Feet per Minute
CFR	Code of Federal Regulations
CPT	Cone Penetrometer Test
DNAPL	Dense Non-Aqueous Phase Liquid
FID	Flame Ionization Detector
GC-MS	Gas Chromatography-Mass Spectrometry
MSL	Mean Sea Level
OSHA	Occupational Safety and Health Act
OVA	Organic Vapor Analyzer
PCE	Tetrachloroethylene
PID	Photo Ionization Detector
ppb	Parts per billion
ppm	Parts per million
psi	Pounds per Square Inch
RCRA	Resource Conservation and Recovery Act
SHERP	Safety, Health and Emergency Response Plan
SRS	Savannah River Site
SRTC	Savannah River Technology Center
TCE	Trichloroethylene
TLV	Threshold Limit Value
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

The A/M Area is located in the extreme northwestern corner of the Savannah River Site (SRS) and covers approximately ten square miles (Figure 1). The A Area is the main administrative hub for the site while the M Area contains production facilities that fall under the regulatory requirements of either the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Of primary concern is the discharge of chlorinated solvents, mainly trichloroethylene (TCE) and tetrachloroethylene (PCE), between 1958 and 1985 that were routed to the M Area Settling Basin as well as localized sources such as the Process Sewer Line and the Savannah River Technology Center (SRTC). Elevated levels of dissolved and free phase volatile organic compounds (VOC) occur in the subsurface. Residual dense non-aqueous phase liquids (also called DNAPL) in the vadose and saturated zones below the Basin may also be contributing to the groundwater contamination.

Since the discovery of degreaser solvent contamination in the A/M Area groundwater in 1981, over 300 monitoring wells at more than 80 locations have been installed to determine the vertical and horizontal extent of the dissolved contaminant plumes. A groundwater remediation program has been in place since 1985 in the M Area and includes eleven recovery wells and an air stripping column. A second recovery well and air stripper system to remediate contaminated groundwater in the northern section of the A/M Area, near SRTC, was placed in operation in March, 1992. The tract south of the A/M Area, called the Southern Sector, includes approximately 12 widely spaced plume definition well clusters. A plume of dissolved chlorocarbons (TCE, PCE) contaminates groundwater in the upper aquifers of the Southern Sector; typical concentrations range up to 50,000 ppb at the source of the plume near the A-014 Outfall (Figure 2).

In an effort to understand the distribution and migration of contaminants in the groundwater system the Cone Penetrometer Investigation of the Southern Sector was implemented. The study will provide the additional hydrogeologic information necessary to better understand the nature and extent of the contaminant plume and the hydrogeologic system in the Southern Sector. This knowledge will be necessary for the optimization of the planned groundwater recovery system to remediate the groundwater aquifers in the study area. A number of other test locations were selected near the M Area Settling Basin during this study for lithologic calibration of the tool with geologic information and to collect confirmation water samples from the aquifer (Figure 2).

Cone Penetrometer Testing (CPT) and hydrocone sampling were performed during the period of October 5, 1992 through March 11, 1993. Seventeen sites (Figure 2) were tested. The hydrocone sampler (Figure 4) was used to collect four groundwater samples from the "Lost Lake" Aquifer Zone contained within the Steed Pond Aquifer. These samples were analyzed by SRTC laboratories onsite for their PCE and TCE concentrations. Elevated levels of these compounds were detected in CPT 10 (87.4 ppb TCE, 51.2 ppb PCE), CPT-11 (58,660 ppb TCE, 1197.1 ppb PCE) and CPT-20 (219.7 ppb TCE, 142.0 ppb PCE) and aid in further delineating the Southern Sector contaminant plume.

All locations and offsets were sampled using the CPT probe tool. This sophisticated electronic tool measures resistivity, sleeve resistance, tip pressure, and pore pressure while advancing through the subsurface at approximately four feet per minute. The Drilex mud rotary drill system was used at two locations where indurated sediment layers occurred in the subsurface. Groundwater samples were collected from four locations (CPT-10, 11, 15, and 20) using the hydrocone sampler modified for bailer sampling. Hardened or gravelly sediment layers inhibited the ability to collect other water samples from deeper zones. Refusal was generally first met at 72 to 115 feet below surface and cycling the rods up to a maximum of 20,000-30,000 psi tip pressure often resulted in penetration to greater depths (135 to 150 feet below surface), where refusal reoccurred or mechanical problems prevented further penetration.

Applied Research Associates, Inc. (ARA) cone penetrometer equipment and resources were used during this study. Ebasco provided technical oversight during the field investigation and technical support with research and reporting. In addition, health and safety oversight was supplied by Ebasco as well as maintenance of all pertinent field logs and documentation. A listing of the attached appendices includes:

- Appendix A ARA Final Report
- Appendix B Daily Activities Report
- Appendix C Cone Penetrometer Field Report
- Appendix D Field Calibrations
- Appendix E Health and Safety Daily Activities
- Appendix F Laboratory Results

1.0 INTRODUCTION

The Savannah River Site (SRS) is located in the Atlantic Coastal Plain geologic province. This area is characterized by low relief, predominantly unconsolidated sediments of Cretaceous through Tertiary age. A multiple aquifer system underlies the A/M Area and affects the definition and distribution of a contaminant plume. The water table and uppermost confined aquifer (Steed Pond Aquifer) are contaminated with elevated concentrations of trichloroethylene (TCE) and tetrachloroethylene (PCE) and their associated compounds. The deeper aquifers in this area have less widely spread chlorinated hydrocarbon contamination.

Cone penetrometer testing was selected as the method of investigation because it is minimally invasive, offers advanced technological capabilities in gathering lithologic data, and offers groundwater sampling capabilities. CPT testing utilizes a hydraulic push tool system. The probe collects real-time data that is processed by computer into soil/lithology classifications. The system can also be used to collect sediment and soil vapor samples although these features were not utilized during this project. Advantages of the CPT system include a small borehole diameter which minimizes cross-contamination of lithologic units, virtual elimination of drill cuttings and fluids that require disposal, collection of various types of undisturbed sediment and water samples and plotting of hydrostratigraphic and lithologic data while in the field.

1.1 Background

Construction of the SRS was initiated by the U.S. Government in 1950 as a means to produce nuclear material for national defense. The A/M Area is an approximately ten square mile area located in the northwest section of SRS. It serves as a main administrative hub for the entire SRS site and includes several production facilities being investigated under RCRA and CERCLA.

Between 1952 and 1979, approximately 1,500,000 pounds of non-radioactive degreaser solvents, primarily trichloroethylene and tetrachloroethylene, and effluents were discharged to the ground surface via the A-014 Outfall. A portion of the solvent evaporated and the remainder seeped into the subsurface contaminating the soil and groundwater. After discovery of groundwater contamination below the M Area Settling Basin in June 1981, a corrective action program was implemented involving extensive groundwater monitoring and recovery for treatment. In 1991, the M Area Settling Basin was certified closed under a RCRA standards clay cap constructed over dewatered and stabilized soils. Concentrations of dissolved VOCs in the groundwater treated have fluctuated during remediation efforts indicating active plume migration.

Groundwater remediation began in February 1983 through the operation of an experimental air stripping treatment system. In September 1985, a full scale

groundwater pump and treat system was installed encompassing 11 recovery wells and an air stripper. Groundwater is treated through the system at 500 gallons per minute and has removed over 280,000 pounds of degreaser solvents from over 1.5 billion gallons of groundwater. A second air stripper was installed near the northern plume boundary in March 1992 with a treatment capacity of 70 gallons per minute. Characterization of the extent of contamination in the Southern Sector continues.

Several changes in the geologic column are present in the A/M Area since it is updip from the central portion of SRS. Most notably, the "Tan Clay" is only a few feet thick, the "Calcareous Zone" is absent, the "Green Clay" is discontinuous and the Congaree Formation has fewer separated lenses of sand and clay. As a result, the subsurface hydrologic characteristics vary. Head changes are less abrupt and decline continuously with depth since the Congaree has fewer permeable sands and lateral conduction is slower. This is an important factor in the characterization of the Southern Sector since water soluble material released at the surface will tend to move to greater depths (duPont, DPST D-84-112).

2.0 TASK PERFORMANCE

CPT and groundwater hydrocone sampling at 17 locations was performed in the Southern Sector and at selected locations near the M Area Settling Basin during the period of October 5, 1992 through March 11, 1993. Test locations are shown in Figure 1. All test locations were logged for resistivity, sleeve resistance, tip pressure and pore pressure. Groundwater samples were acquired from locations CPT-10, 11, 15, and 20 using the hydrocone sampling assembly. Attempts to sample three different depths at CPT-13 failed due to lack of groundwater recovery in the push-hole. The remaining locations met refusal because of hardened sediments prior to reaching sampling depth. It should be noted that multiple CPT pushes were made at eight locations CPT-2, 6, 7, 13, 16, 17, 18, and 21. The Drilex mud rotary drilling system was used at locations CPT-7 and 18. It was also set up at CPT-22 but did not drill due to mud pump failure. Information from each test site is presented in Table 1 and includes the test location, number of attempts, test date, survey location, type of test, maximum depth of penetration, and grout closure volumes.

Ebasco Environmental supplied technical and health and safety oversight for the project duration and maintained all appropriate field logs and documentation. Appendix A includes all corrected sleeve resistance, tip pressure, pore pressure, and resistivity logs obtained during the project. Appendix B contains the Daily Activities Report and Appendix C has the completed Cone Penetrometer Field Reports with all pertinent location information and test data. Appendix D includes all sleeve resistance, tip pressure, pore pressure, and depth calibrations of the instrumentation performed prior to initiation of field work at each CPT location. Appendix E is a synopsis of the Health and Safety Daily Activities. Appendix F contains the laboratory results performed on the groundwater samples.

2.1 Equipment and Operations

ARA conducted CPT testing and provided hydrocone sampling equipment and test personnel. An ARA 20 ton penetrometer truck was employed with approximately 50,000 lbs (additional weight was added for this task) of push capacity. A detailed description of the equipment and operations is contained in Appendix A, Section 2, page 6. In addition, a Drilex demonstration was performed at two locations where a hardened layer of sediments prevented advancement of the CPT and water sampling probes. The Drilex system was composed of a downhole mud rotary drilling motor and assembly. Bentonite mud was pumped through the system causing the positive displacement motor to turn a carbide tip drag bit. Three jets in the bit aided in cutting the resistant formation as well as cooling the system and carrying cuttings back to surface. A more detailed description of the drilling system begins with a D170 drill motor from Drilex. This motor is used with a 2-inch diameter 3-point carbide tip drag bit. The drill motor is powered by fluid pressure and flow. The fluid pressure and flow is generated by a Chem-Grout CG-3x15DBL Double Plunger Pump. This pump

is air powered and demands 150 cfm at 100 psi to operate at the levels required. The pump output is connected by a 50 ft hose to an ARA designed water swivel. The water swivel connects to the 1.75-inch diameter cone rods which are used to lower the drill into the hole. A mud basin is located underneath the CPT rig to collect the drilling fluids and cuttings.

ARA assembled the drilling components and performed several checks to ensure that the entire system was operating properly. These tests including drilling through a variety of materials. The first material tested was a cinder block that was successfully penetrated by the drill. Next the drill was tested in a sandy type material. In this test, a CPT hole was pushed to 30 feet then the drill was run down to 25 ft in the same hole. The stop depth for both the CPT and the drill was not at refusal. This operation was smooth (except for the mud mixing operation, which was subsequently corrected) and the drilling rate for operating in the open hole was approximately 2 to 5 ft/min.

The final test of the system was in a layered gravel and clay soil. During this test the drill was operated through a 2 feet thick gravel fill material and 8 feet into a clay material. The drill operated smoothly in the clay materials, but did stall and require a cone push to resume drilling at a depth of 2 feet. It is believed that gravel materials larger than pea size may present problems for the drill system. The reason for the problem is two-fold. Pea-sized gravel or larger may be difficult to flush from the hole and may be accumulating at the bottom of the hole and binding up the bit. The second concern is that the drill is not able to generate enough torque to dislodge the gravel particles.

2.1.1 Instrument Calibration

Instrument calibration occurred prior to the advancement of each CPT penetration as a measure of quality control and instrument damage. This involved routine field calibration of the load cells and pressure transducer. The equipment calibration was referenced to ground surface and completed with the probe ready to insert into the subsurface. Further discussion of field calibrations is included in Appendix A, Section 2.

2.1.2 Decontamination

Decontamination of downhole rods and equipment was performed upon withdrawal from the borehole to prevent any possibility of cross-contamination and to ensure personnel safety. All rods were steam cleaned through the use of a steam cleaner module attached to the bottom of the guide tube. A steam cleaner powered by a portable generator was connected to a spray jet nozzle and used potable water as a cleaning fluid.

2.1.3 Grouting

Grouting operations were conducted using either the through-the-rod (or self-grouting) grouting method or the tremmie pipe method. The tremmie pipe method is the method of filling the test hole with grout by lowering the tremmie pipe down to the bottom of the penetration and low-pressure grouting the hole as pipe sections are withdrawn. The through-the-rod or self-grouting method allows for the injection of the grout mixture through a tube in the annulus of the push rod. This method of grouting allows for grout to fill the test hole from the bottom of the hole upward as the rod sections are removed. Both methods were used during the project. Additional grouting comments can be found in Appendix A, Section 2.

3.0 DATA OBTAINED

3.1 Resistivity

Electrical resistivity is one of the oldest geophysical exploration techniques developed to locate mineral deposits, oil and gas accumulations and groundwater supplies. It is a measure of the electrical resistance per unit length of a cross-sectional area of a material. Since an electrical contrast exists between different geological materials, this technique is effective in identifying various soils, minerals, and pore fluids. This study, in particular, dealt with the differentiation between clay and sand lithologies as well as identifying various groundwater bearing units. Higher resistivity measurements indicated vadose zone sands and saturated sands below the water table. Lower resistivity measurements indicated an increasing clay content, even when obtaining readings below the water table.

Resistivity surveys are being increasingly used in contaminated site investigation programs to delineate the extent and degree of contamination at a site. These surveys rely on the electric contrasts that typically exist between contaminated soils and uncontaminated soils. For example, leachate from a landfill will contain a higher concentration of dissolved solids, which will decrease the resistivity of the groundwater. Soils contaminated with hydrocarbons (fuel oils, cleaning solvents, etc.) will typically have higher resistivity than uncontaminated soils as the hydrocarbon can act as an insulator. Chlorinated hydrocarbons associated with the A/M Area would be expected to be poor conductors with high resistivity values (WSRC-RP-92-1302). Chlorinated hydrocarbons present in the water samples at CPT 10, 11 and 20 were not apparently reflected in the resistivity curve at each location, which may be due to lower concentration values that are not discernible to the tool at this sensitivity level or to the fact that the water samples collected were at total depth and an accurate and complete curve through the entire section has not been attained.

Figure 3 is a schematic of the ARA CPT probe. The probe consists of four electrodes separated by high strength plastic reinforced insulators. The outer two electrodes induce an electric current into the soil and the inner two electrodes measure the potential drop, which is proportional to the resistivity of the soil. To avoid polarization effects the four electrode array is operated at a frequency of 40 HZ. Electronics in the CPT vehicle are used to modulate and demodulate the current and potential measurement signals to and from the probe. The probe is calibrated in a large water solution in which the conductivity is varied. The data from the calibration tests is used to determine the probe calibration factor, which is dependent on the probe geometry.

3.2 Sleeve Resistance/Tip Pressure

Sleeve resistance is a measure of the resistance on the outer friction sleeve of the probe as it is pushed through a porous medium. Recommended maximum sleeve load measuring capacity of the probe is 7,000 lbs. Tip pressure as a measure of resistance on the conical tip has a recommended maximum tip load cell measuring capacity on the standard probe of 40,000 lbs. This is the maximum load under ideal circumstances. Variations in lithology and increasing friction on the sleeve will result in a decrease in the maximum tip load applied prior to rod breakage.

Sleeve and tip pressures varied greatly in the field, depending on the type of formation encountered. Tip pressures were generally less than 500 psi at shallow depths. High tip pressures occurred at depths greater than 75 feet below land surface. Tip pressures up to 30,000 psi were encountered and an attempt was made to stay below 20,000 psi to avoid rod breakage due to lateral instability from the truck floor into the subsurface. Sleeve pressures were also generally quite low until a resistant formation was encountered. Sleeve pressures greater than 8,000 psi resulted in refusal as a means to maintain the integrity of the string of rods.

In addition to the tip resistance and sleeve friction, a friction ratio profile is plotted for each location. This ratio is the sleeve friction expressed as a percentage of the tip resistance at a given depth. In uncemented soils the friction ratio can be correlated to soil type.

3.3 Pore Pressure

Pore pressure is a combination of the induced pore pressure from probe advancement and the hydrostatic pore pressure of the formation. Induced pore pressure reflects the shearing action of the probe in various lithologies while the hydrostatic pore pressure reflects the weight of a column of water as it lies over a cross-sectional area around the point (Freeze and Cherry, 1979). An inferred hydraulic conductivity may be made from the measured pore pressure, in a generalized manner, resulting in higher hydraulic conductivity in clean sands and low to moderate conductivity in silty sands and clays. Pore pressure dissipation tests, where excess pore pressures dissipate towards the hydrostatic pore pressure, were executed at each groundwater sampling event. Pore pressure calibrations and a detailed description of the field measurements are included in Appendix A and D. Use of this method coupled with general knowledge of the various water table elevations in the A/M Area aided in correlation and determination of probable water table levels to be sampled.

3.4 Groundwater Sampling

Groundwater sampling was successfully conducted at CPT-10, 11, 15 and 20. Three attempts to collect a sample at CPT-13 proved futile due to lack of groundwater infiltration. In an effort to confirm and delineate plume distribution of dissolved VOCs in the "Lost Lake" Aquifer Zone these samples were analyzed for trichloroethylene (TCE) and tetrachloroethylene (PCE) concentrations (Table 3). The hydrocone was lowered to the subject depth and then pulled upward one foot to expose the porous filter to the groundwater. Sufficient time was allowed for water to enter the sampler whereupon a teflon bailer was lowered to the bottom and samples collected. A disposable sacrificial tip was subsequently grouted in the hole upon rod retrieval. Samples were bottled, labeled and properly stored to ensure sample quality.

3.5 Laboratory Results

Laboratory analysis of groundwater samples at four locations (CPT-10, 11, 15, and 20) was performed by the SRTC-Analytical Development Section. Volatile organic analyses were performed by Gas Chromatography-Mass Spectrometry (GC-MS), using the ADS version of EPA SW-846 method 8260A. Samples were concentrated using a OI Analytical model 4460A Dynamic Headspace concentrator (Purge and Trap), using a three stage (2,6-diphenylene oxide, silica gel and coconut charcoal) trap. Separation was performed with Hewlett Packard 5890 series II gas chromatograph on a 30m x 0.53 mm VOCOL fused silica capillary column with 3 μ m film thickness. Quantitation was performed with a Hewlett Packard model 5971 quadrupole mass spectrometer. A glass jet separator was inline prior to the inlet into the mass spectrometer. Internal standard and recovery surrogate compounds were added as specified in the Contract Laboratory Program for volatile organics (SOW 3-90). The mass spectrometer tuning was confirmed within 12 hours prior to each measurement using p-bromofluorobenzene. Tuning verification was performed against both RCRA SW-846 and CLP tuning requirements. Results of the analyses are attached in Appendix F. Of significant note are the results of CPT-10, CPT-11 and CPT-20 (Table 3). CPT-10 had TCE concentrations of 87.4 ppb and PCE concentrations of 51.2 ppb, CPT-11 had TCE concentrations of 58,660.0 ppb and PCE concentrations of 1197.1 ppb and CPT-20 had TCE concentrations of 219.7 ppb and PCE concentrations of 142.0 ppb. CPT-15 contained no detectable concentrations.

4.0 PROBLEMS ENCOUNTERED

Zones of highly resistant sediment were commonly found at almost every location. Refusal, or resistance to advancing the push-tool, prior to reaching the projected formation depth was the main problem encountered during the execution of this project. Only locations CPT-10, 11, and 15 were pushed successfully to the planned depth. All of the other locations encountered hardened sediments, generally between the depths of 72 to 115 feet and at another zone from 135 to 150 feet below surface. Table 2 contains a summary of this data. Cycling the rods (repeated up and down vertical movement) proved effective but was not always successful at penetrating the resistant zone completely. Rod breakage occurred five times during cycling events and usually snapped within a few feet of the surface, although downhole breaks also occurred. Through trial and error, a successful cycling guideline was developed in the latter stages of the program. This program consisted of 15 minutes of cycling prior to declaring refusal, with a maximum tip pressure of 20,000 psi, sleeve pressure of 5,000 to 8,000 psi, and a maximum hydraulic pressure of 1,500 psi. Future penetrations in this area with both the CPT probe and Drilex system should also include setting 5 to 10 feet of retrievable surface casing to prevent rod wobble and breakage. On three occasions the rods slipped through the clamping device and fell back downhole. The worst instance of this resulted in the loss of a Drilex bit, motor assembly, and 100' of rod when they were permanently lost and grouted downhole. An inferior clamping device on the ARA rig is scheduled to be replaced by a permanent hydraulic clamp.

The experimental use of a downhole pump assembly and Drilex mud rotary drilling system (Figure 5) were employed on CPT-7 and CPT-18. Initial problems arose when the mud pump kept sanding up but modifications were made by adding an additional in-line ARO brand double diaphragm pump and filter. CPT-18 was successfully drilled from 139 to 170 feet with no problems using this double filter method. The Drilex appears to be a viable solution to drilling through resistant layers of sediment, especially at depth. Problems occur when CPT or sampling rods are pushed back down the same hole. Refusal will occur due to any one of a combination of factors including sediment sloughing and bridging, erratic hole diameter due to mud jetting and hole deviation. This system is being improved one step further by developing a case-as-you-drill method where casing is automatically advanced downhole with the bit as it drills to total depth. At total depth the bit and assembly is detached from the casing and pulled out leaving the casing downhole.

Addition problems encountered during the project included hydraulic hose ruptures, steam cleaning equipment failure, fuel filter and fuel pump replacement on the mud pump, inaccessible locations due to inclement weather conditions, and grouting problems. A less viscous grout mixture alleviated the plugging problems caused when the mud pump could not pump the thickened grout far enough downhole and the grout solidified in the rods and had to be reamed out. Variance from WSRC-3Q5 (Savannah River Site hydrogeologic data collection procedural manual) neat cement mixture was granted as a result of this problem, and allowed a grout admixture of Sikament 10 and Interplast N to be used as an alternative.

5.0 HEALTH AND SAFETY

The site Safety, Health and Emergency Response Plan (SHERP) was prepared and followed in accordance with OSHA regulations set forth in CFR 1910.120. The primary chemical hazards associated with this effort were chlorinated hydrocarbons (TCE, PCE) which are volatile organic compounds (VOC). The major route of exposure to volatiles is through the respiratory system so all invasive and sampling activities were monitored. An organic vapor analyzer (OVA) employing flame-ionization detection (FID) was the chief method of detection. The Century Model OVA 128 was calibrated daily to a 99 ppm methane mixture. Additional backup was provided by a Microtip™ photo-ionization detector (PID). Monitoring was performed in the breathing zone of all personnel while engaged in work-related activities. Readings were also taken at the surface opening after each penetration withdrawal and immediately above all water sampling and bailing operations. No significant readings above background level were encountered except during sampling operations on CPT-11, the highest concentration borehole sampled, when an instantaneous spike reading of 3 ppm occurred. This dispersed immediately and was only slightly above background (1 ppm) and well below the TLV (threshold limit value) of 25 ppm for PCE and 50 ppm for TCE.

Health and Safety procedures included awareness of heat stress and its symptoms, as well as employing Level D personal protective equipment involving the use of American National Standards Institute (ANSI) approved hard hats, steel-toed boots, and protective eye wear. Latex or vinyl gloves were worn during bailing, water sampling and rod-pulling operations. Appendix E contains all Health and Safety Daily Activities Reports.

6.0 SUMMARY

The focus of this cone penetrometer investigation was to acquire data to further characterize the stratigraphy and hydrogeology of the Southern Sector, optimize placement of the Phase V monitor well program, and to further define the distribution and migration of dissolved TCE and PCE. Electric cone penetrometer testing was the characterization tool employed along with the hydrocone for groundwater sampling.

Between October 5, 1992 and March 11, 1993, 17 locations were pushed using the CPT tool. Multiple pushes at various locations resulted in 29 total attempts. A drilling demonstration test was performed at two locations employing the Drilex mud rotary system. The system was successful in drilling through two zones of refusal but does not allow for CPT hole re-entry. Geotechnical data collected included sleeve resistance, tip pressure, pore pressure and resistivity. This data was used to generate soil classification plots that allow for detailed correlation across the various lithologic units in the A/M Area. This subsurface lithologic control allows for detailed stratigraphic and structural interpretations and mapping.

Multiple refusals were encountered at various locations and were a factor of localized lithology conditions. Refusal in the same areas generally occurred at the same depth. Clay units displayed lower resistivity measurements, higher sleeve resistance and low tip pressures while indurated sand units exhibited higher tip measurements, lower sleeve resistance values and higher resistivity measurements prior to refusal. Soft sands generally had higher resistivity and lower sleeve resistance measurements. Higher pore pressure values were generally an indication of finer grain sediments, i.e., clay, silt. Although tool refusal prevented completion of the tests to total depth, all holes were logged to refusal in order to gain valuable lithologic data.

Groundwater sampling was successful at four locations using the hydrocone sampling method. These groundwater samples were collected from the Steed Pond Aquifer and ranged in depth from approximately 143 to 175 feet below ground surface. Several attempts to collect groundwater samples at CPT-13 were unsuccessful due to lack of water infiltration into the hydrocone filter chamber. All test holes were grouted to surface upon completion and groundwater samples were analyzed by SRTC. Results of the analyses indicated CPT-10, 11 and 20 were successful in further delineating a plume.

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Figure 2
Location of Cone Penetrometer Test Holes

Figure 3
Cone Penetrometer Probe Schematic

Figure 4
Water Sampler Schematic

Drilex Motor Assembly Schematic

Table 1
Cone Penetrometer Test Hole Completion Data

CPT Number (# of Attempts)	Date Tested (Initial Attempt)	Northing/Easting (Approx.)	Type of Test	Maximum Depth of Penetration	Grout Volume (Gal.) Theoretical/Actual
CPT-1 (1)	10/05/92	N 104000 E 52750	CPT	117'	19 /25
CPT-2 (2)	10/06/92	N 103875 E 52750	CPT	110'	17.6/22
CPT-4 (1)	10/16/92	N 100250 E 51500	CPT	133'	16.8/30
CPT-5 (1)	10/09/92	N 99250 E 53250	CPT	99'	17.6/19
CPT-6 (3)	10/20/92	N 98000 E 52125	CPT	119'	15 /10
CPT-7 (4)	10/22/92	N 97000 E 51500	CPT/DX	89'	15 /49
CPT-8 (1)	10/15/92	N 95520 E 52125	CPT	135'	17 /28
CPT-10 (1)	01/14/93	N 99000 E 46500	CPT/HC	143'	23 /30
CPT-11 (1)	03/10/93	N 103000 E 46250	CPT/HC	170'	21.4/45
CPT-13 (3)	01/09/93	N 102250 E 43500	CPT/HC	156'	25.5/31
CPT-15 (1)	02/10/93	N 102625 E 45500	CPT/HC	175'	22 /45
CPT-16 (2)	10/19/93	N 99125 E 51875	CPT	109'	13.8/18
CPT-17 (2)	10/22/93	N 99775 E 50475	CPT	127'	16 /22
CPT-18 (2)	02/12/93	N 96000 E 50000	CPT/DX	170'	16.3/28
CPT-20 (1)	03/11/93	N 100000 E 48000	CPT/HC	163'	20.5/42
CPT-21 (2)	10/06/92	N 104000 E 54500	CPT	74'	12 /13
CPT-22 (1)	01/15/93	N 102750 E 48500	CPT	107'	13.5/16
Total Locations	Total Attempts			Total Footage	
17	(29)			2196'	

HC - Hydrocone
CPT - Cone Penetrometer Test
DX - Drillex System

Table 2
Cone Penetrometer Test Hole Refusal Data

Location	Zone Of Resistance (R)	Refusal Depth or Total Depth (TD)	Problems Encountered
CPT-1	85	117	-
CPT-2	-	92	-
CPT-2	90	110	Sleeve pressure (9,000 p.s.i.) indicates rocky layer at 110'.
CPT-4	-	133	Cycle 15 min. with max. tip press. 23,000 p.s.i.
CPT-5	88	99	Cycling (push 20' in 1.5 hrs.) Broken rods
CPT-6	63-88 (soft) 98	115	Very soft sediments 63-88'. Cycle to 23,000 p.s.i. Broken rods.
CPT-6	93	119	Cycle from 93-119 with max. tip press. 21,000 p.s.i. Broken rods.
CPT-6	-	72	Max. tip pressure 23,000 p.s.i., hydraulic press. 1800 p.s.i.
CPT-7	-	72	Cycled to 30,000 p.s.i. tip press.
CPT-7	-	72	Soft layer at 65'. Cycle 30 min. to 29,000 p.s.i.
CPT-7	74	89	CPT refusal at 74' (32,000 p.s.i.). Switch to Drilex, drill 15'. Drill motor plugged. Mud pit broken when rods break.
CPT-7	-	89	CPT can't penetrate past 89' (28,000 p.s.i. tip press.) Drilex to 89'. Pump keeps sanding up.
CPT-8	99	135	Cycling from 99' to refusal at 135' (1.75 hrs.)
CPT-10	-	143 TD	-
CPT-11	-	170	-
CPT-13	-	115' TD	No groundwater infiltration into sampler. Broken rods.
CPT-13	60, 110	136	No groundwater infiltration into sampler. Drop 60' of rods.
CPT-13	-	156 TD	No groundwater infiltration into sampler.
CPT-15	-	175	-
CPT-16	100	109	Cycle from 100-109' for 15 min. with max. tip press. 18,000 p.s.i.
CPT-16	100	109	25' offset produced equivalent cycling/refusal results
CPT-17	80-85, 110-115	115	Cycling to 28,000 p.s.i. Dropped 50' of rods downhole.
CPT-17	80-92, 120-127	127	Cycling tip press. to 17,000 p.s.i., sleeve press. to 3000 p.s.i.
CPT-18	112	139 170 Drilex	Drop drill motor and 100' rod - grout assembly downhole
CPT-18	-	129	Max. tip press. 15,000 p.s.i., hydraulic press. 1500 p.s.i.
CPT-20	80-115	163	Max. tip press. 23,900 p.s.i., hydraulic press. 1500 p.s.i.
CPT-21	-	74	Cycle max. tip pressure 22,000 p.s.i. Grout plugged rods.
CPT-21	54	74	Cycle from 54 to 74', max. tip press. 23,000 p.s.i.
CPT-22	-	107	Set up Drilex at refusal-mud pump not working.

Table 3
Groundwater Sample Data

Location	Est. Ground Elevation (ft msl)	Water Table Depth (ft bls)	Water Table Elevation (ft. msl) Formation	TCE (ppb)	PCE (ppb)
CPT-10	328	143	185 Steed Pond	87.4	51.2
CPT-11	350	170	180 Steed Pond	58660.0	1197.1
CPT-15	355	175	180 Steed Pond	Not Detected	Not Detected
CPT-20	350	163	187 Steed Pond	219.7	142.0

APPENDIX A
ARA FINAL REPORT

**APPLIED
RESEARCH
ASSOCIATES, INC.**

Engineering and Applied Science

March 30, 1993

Mr. Bruce Raabe
EBASCO Services, Inc.
2528 Center West Parkway
Augusta, Georgia 30909

Dear Bruce:

Applied Research Associates, Inc. is pleased to submit the enclosed data report entitled, "Piezo/Resistivity-Cone Penetration Tests in Support of Subsurface Investigation of the Southern Sector, A/M Area Savannah River Site Aiken, South Carolina." This report documents field efforts from October 1992 to March 1993 in the Southern Sector, A/M Area.

Accompanying the report are seven 3.5" diskettes containing cone penetration data from the test locations. If you have any questions or concerns please contact David Timian or myself at (802) 763-8348.

Sincerely,

Bryan E. Fisk
Staff Engineer

BEF:jml
Enclosures
C:\5769\A-M.LTR

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included
in the
OSTI
package

**PIEZO/RESISTIVITY-CONE PENETRATION TESTS
IN SUPPORT OF SUBSURFACE INVESTIGATION
OF THE SOUTHERN SECTOR, A/M AREA
SAVANNAH RIVER SITE
AIKEN, SOUTH CAROLINA**

Prepared for:

**EBASCO Services, Inc.
2528 Center West Parkway
Augusta, Georgia 30909**

Prepared by:

**David A. Timian, PE
Bryan E. Fisk**

**Applied Research Associates, Inc.
120-A Waterman Road
South Royalton, Vermont 05068**

ARA Report No. 5769-A/M

March 29, 1993

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SECTION 1

PIEZO/RESISTIVITY-CONE PENETRATION TESTS AT THE SAVANNAH RIVER SITE AIKEN, SOUTH CAROLINA

INTRODUCTION

Applied Research Associates, Inc. (ARA), under contract to EBASCO Services, Inc., conducted Piezo/Resistivity-Electric Cone Penetration Tests (P/R-CPT) as part of the sub-surface investigation of the South Sector A/M Area at the Department of Energy Savannah River Site, Aiken, South Carolina. The purpose of the P/R-CPT investigation was to obtain information necessary to better define the groundwater contaminant plume southeast of the M Area Hazardous Waste Management Facility (HWMF) and south of the Outfall (A-014). This report documents ARA's site investigation efforts and test techniques for field work conducted from 5 October 1992 to 12 March 1993.

P/R-CPT LOCATIONS

Twenty-nine cone penetration tests were conducted at 17 locations as a part of this investigation with 18 of these tests including downhole resistivity measurements. The depth of each penetration and the type of data collected are listed in Tables 1.1 and 1.2. All 29 tests were conducted at test locations specified by EBASCO Services field engineer. Figure 1.1 is a site map displaying approximate P/R-CPT locations.

GROUNDWATER SAMPLING LOCATIONS

Attempts were made at five test locations for groundwater sample extraction. Water samples were successfully retrieved from four locations as denoted in Table 1.2. Three attempts were made at test location HC-13 to extract a sample.

DRILEX DEMONSTRATION

At a number of test locations, a hard layer prevented advancement of the CPT and water sampling probes. A technique for penetrating the hard layer, downhole drilling using the CPT advancement system, was demonstrated as a portion of this project. The drill system was able to penetrate the hard layers, however, soil collapse prevented the CPT and water samplers from following through the opening. Future systems should utilize a casing system to prevent the hole from closing upon retraction of the drill.

REPORT OUTLINE

This report is organized into the main body and Appendices. Section 2 discusses the P/R-CPT equipment, field procedures and data format. Section 3 discusses soil classification techniques and the standard penetration test (SPT). Plots of the CPT data and soil stratigraphy are presented in Appendix A. The CPT data plots present sleeve stress (tsf), tip resistance (tsf), friction ratio, penetration pore pressure (tsf), downhole resistivity (ohm-m) when acquired, and soil classification. SPT values are contained on 3.5" diskettes accompanying this report.

TABLE 1.1 SUMMARY OF TEST LOCATIONS DURING OCTOBER 1992

CPT ID	Test Date (1992)	Depth of Penetration (ft)	Test Type
CPT-1	Oct 5	117.6	P/R-ECPT
CPT-2	Oct 6	92.0	P/R-ECPT
CPT-21	Oct 6	74.0	P/R-ECPT
CPT-21B	Oct 8	74.6	P/R-ECPT
CPT-2B	Oct 8	110.6	P/R-ECPT
CPT-5	Oct 9	108.0	P/R-ECPT
CPT-8	Oct 15	135.5	P-ECPT
CPT-4	Oct 16	133.5	P-ECPT
CPT-16	Oct 19	109.0	P-ECPT
CPT-16B	Oct 19	105.0	P-ECPT
CPT-6	Oct 20	115.8	P-ECPT
CPT-6B	Oct 21	119.0	P-ECPT
CPT-7	Oct 22	72.6	P-ECPT
CPT-7B	Oct 22	72.4	P-ECPT
CPT-17	Oct 23	115.2	P-ECPT
CPT-17B	Oct 23	127.0	P-ECPT

TABLE 1.2 SUMMARY TEST LOCATIONS DECEMBER 1992 TO MARCH 1993

CPT ID	Test Date	Depth Of Penetration (ft)	Test Type
CPT-7A-D	Dec 15, 1992	74.1	P/R-ECPT
CPT-7B-D	Dec 16, 1992	87.4	P/R-ECPT
CPT-7D-D	Dec 17, 1992	74.0	P-ECPT
CPT-7F-D	Jan 5, 1993	74.4	P/R-ECPT
CPT-13A	Jan 9, 1993	115.0	P/R ECPT
HCPT-13A	Jan 9, 1993	115.5	H ₂ O Sample (no water)
CPT-13B	Jan 11, 1993	84.0	P/R-ECPT
CPT-13C	Jan 12, 1993	152.8	P/R-ECPT
HCPT-13C	Jan 12, 1993	136.6	H ₂ O Sample (no water)
CPT-13D	Jan 13, 1993	156.4	P/R-ECPT
HCPT-13D	Jan 13, 1993	140.5	H ₂ O Sample (no water)
CPT-10A	Jan 14, 1993	141.8	P/R-ECPT
HCPT-10A	Jan 14, 1993	143.1	H ₂ O Sample
CPT-15	Feb 11, 1993	175.5	P/R-ECPT
HCPT-15	Feb 11, 1993	175.0	H ₂ O Sample
CPT-18A	Feb 12, 1993	129.9	P/R-ECPT
CPT-18B	Feb 18, 1993	116.0	P/R-ECPT
CPT-18C	Mar 8, 1993	129.3	P/R-ECPT
CPT-6	Mar 9, 1993	73.3	P-ECPT
CPT-11	Mar 10, 1993	170.1	P-ECPT
HCPT-11	Mar 10, 1993	168.0	H ₂ O Sample
CPT-20	Mar 11, 1993	162.3	P-ECPT
HCPT-20	Mar 11, 1993	163.1	H ₂ O Sample

Figure 1.1. Cone penetration test location map.

SECTION 2

TESTING EQUIPMENT AND PROCEDURES

INTRODUCTION

The electric cone penetrometer test (CPT) was originally developed for use in soft soil. Over the years, cone and push system designs have evolved to the point where they can now be used in strong cemented soils and even soft rock. ARA's penetrometer consists of an instrumented probe which is forced into the ground using a hydraulic load frame mounted on a heavy truck with the weight of the truck providing the necessary reaction mass. The probe has a conical tip and a friction sleeve which independently measure vertical resistance beneath the tip as well as frictional resistance on the side of the probe as functions of depth. A schematic view of ARA's penetrometer probe is shown in Figure 2.1. A pressure transducer in the cone is used to measure the pore water pressure as the probe is pushed into the ground (Piezo-CPT).

PIEZO-ELECTRIC CONE PENETROMETER TEST

The cone penetrometer tests are conducted using the ARA penetrometer truck. The penetrometer equipment is mounted inside a van body attached to a ten-wheel truck chassis with a diesel engine. Ballast in the form of metal weights and a water tank, are added to the truck to achieve an overall push capability of 45,000 lbs. Penetration force is supplied by a pair of large hydraulic cylinders bolted to the truck frame. For this project, additional ballast was added, raising the push capacity to over 50,000 lbs.

The penetrometer probe is of standard dimensions having a 1.405 inch diameter, 60° conical tip, and a 1.405 inch diameter by 5.27 inches long friction sleeve. The shoulder between the base of the tip and the porous filter is 0.08 inches long. A 1.5 inch diameter expander, located 5.25 inches behind the top of the friction sleeve and shown in Figure 2.1, pushes the penetration hole open and reduces the frictional drag on the push tubes behind the

probe. The penetrometer is normally advanced vertically into the soil at a constant rate of 48 inches/minute, although this rate must sometimes be reduced as hard layers are encountered. The electric cone penetrometer test is conducted in accordance with ASTM D3441 (Ref. 1).

Inside the probe, two load cells independently measure the vertical resistance against the conical tip and the side friction along the sleeve. Each load cell is a cylinder of uniform cross section, which is instrumented with four strain gages in a full-bridge circuit. Forces are sensed by the load cells and the data are transmitted from the probe assembly via a cable running through the push tubes. The analog data are digitized, recorded, and plotted by computer in the penetrometer truck. A set of data is normally recorded each second, for a minimum resolution of about one data point every 0.8 in of cone advance. The depth of penetration is measured using a string potentiometer mounted on the push frame.

Electronic data acquisition equipment for the cone penetrometer consists of a computer with a graphics monitor and a rack of eight signal conditioners. Analog signals are transmitted from the probe to the signal conditioners where the CPT data are amplified and filtered at 1 Hz. Seismic signals are amplified as required and filtered at 1000 Hz. Once amplified, the analog signals are transmitted to a high speed analog-to-digital converter board, where the signals are digitized; usually at the rate of one sample per second for the penetration data and 10,000 samples per second for the seismic data. The digital data are then read into memory and written to the internal hard disk for future processing. Upon completion of the test, the penetration, dissipation, and seismic data are plotted. Floppy disks containing the data are brought to ARA's New England Division in South Royalton, Vermont, for analysis and preparation of report plots.

Saturation of the Piezo-Cone

Penetration pore pressures are measured with a pressure transducer located behind the tip in the lower end of the probe (shoulder of the cone tip). Water pressures in the soil are sensed through a 250 μ in porous polyethylene filter which is 0.25 inch height and 0.202 inch thick. The pressure transducer is connected to the porous filter through a pressure port as

shown in Figure 2.1. The pressure port and the filter are filled with a high viscosity silicone oil.

In order for the pressure transducer to respond rapidly and correctly to changing pore pressures upon penetration, the filter and pressure port must be saturated with oil upon assembly of the probe. A vacuum pump is used to de-air the silicone oil before use and also to saturate the porous filters with oil. The probe is assembled with the pressure transducer facing upwards and the cavity above the pressure transducer is filled with de-aired oil. A previously saturated filter is then placed on a tip and oil is poured over the threads. When the cone tip is then screwed into place, excess oil is ejected through the pressure port and filter thereby forcing out any trapped air.

Saturation of the piezo cone is verified with field calibrations performed before the probe is inserted into the ground. The high viscosity of the silicone oil coupled with the small pore space in the filter prevents the loss of saturation as the cone is pushed through dry soils. Saturation of the cone can be verified with a calibration check at the completion of the penetration. Extensive field experience has proven the reliability of this technique.

Field Calibrations

Many factors can effectively change the calibration factors used to convert the raw instrument readouts, measured in volts, to units of force or pressure. As a quality control measure, as well as a check for instrument damage, the load cells and the pressure transducer are routinely calibrated in the field. Calibrations are completed with the probe ready to insert into the ground so that any factor affecting any component of the instrumentation system will be included and detected during the calibration.

The tip and sleeve load cells are calibrated with the conical tip and friction sleeve in place on the probe. For each calibration, the probe is placed in the push frame and loaded onto a precision reference load cell. The reference load cell is periodically calibrated in ARA's laboratory against instruments traceable to NIST standards. To calibrate the pore

pressure transducer, the saturated probe is inserted into a pressure chamber with air pressure supplied by the compressor on the truck. The reference transducer in the pressure chamber is also periodically calibrated against an NIST traceable instrument in ARA's laboratory. Additionally, the string potentiometer, used to measure the depth of penetration, is periodically checked against a tape measure.

Each instrument is calibrated using a specially-developed computer code that displays the output from the reference device and the probe instrument in graphical form. During the calibration procedure, the operator checks for linearity and repeatability in the instrument output. At the completion of each calibration, this code computes the needed calibration factors using a linear regression algorithm. At a minimum, each probe instrument is calibrated at the beginning of each day of field testing. Furthermore, the pressure transducer is recalibrated each time the porous filter is changed and the cone resaturated. Calibrations are also performed to verify the operation of any instrument if any damage is suspected.

Penetration Data Format

A typical penetration profile, is shown in Figure 2.2. Plotted as a function of depth are the measured tip resistance, sleeve friction, and pore pressure. The results of the soil classification analysis are shown along with a generic layer description in Figure 2.3. The surveyed coordinates of each test location, if known, are given at the top of the plot. When the surface elevation of the test location is unknown, the penetration data is plotted against depth.

Tip resistance, q_t (tsf), is obtained by dividing the vertical force, in tons, on the conical tip by the effective tip area (0.0108 ft^2). The tip resistance is then corrected for pore pressures acting behind the conical tip as discussed in the next section. The corrected tip resistance, q_{tr} (tsf), is plotted in the penetration profile and labeled "Tip Stress COR." Sleeve friction, f_s (tsf), is obtained by dividing the total frictional force on the sleeve by the sleeve's surface area (0.1615 ft^2). The offset between the depth at the tip and the depth at the friction sleeve is corrected by shifting the sleeve friction profile downward so that is

corresponds to the depth at the centroid of the tip. In addition to the tip resistance and sleeve friction, a friction ratio profile is plotted for each location. This ratio is simply the sleeve friction expressed as a percentage of the tip resistance at a given depth. In uncemented soils, the friction ratio can be correlated to soil type.

The penetration pore pressure that is measured as the probe is advanced is also plotted in Figure 2.2. As shown in Figure 2.1, the piezo-cone probe senses the pore pressure immediately behind the tip. Currently, there is no accepted standard for the location of the sensing element. ARA chose to locate the sensing element behind the tip (shoulder of the cone tip) since the filter is protected from the direct thrust of the penetrometer and the measured pore pressure can be used to correct the tip resistance data (discussed in the next section) as recommended in Reference 2. The magnitude of the penetration pore pressure is a function of the soil compressibility and, most importantly, permeability. In freely draining soil layers, the measured pore pressures will be very close to the hydrostatic pressure computed from the elevation of the water table. When low permeability soil layers are encountered, excess pore pressures generated by the penetration process can not dissipate rapidly and this results in measured pore pressures which are significantly higher than the hydrostatic pressures. Whenever the penetrometer is stopped to add another section of push tube, or when a pore pressure dissipation test is run, the excess pore pressure may begin to dissipate. When the penetration is resumed, the pore pressure quickly rises to the level measured before the penetrometer was stopped. This process causes some of the spikes that appear in the penetration pore pressure data.

Pore Pressure Correction of Tip Stress

Cone penetrometers, by necessity, must have a joint between the tip and sleeve. Pore pressure acting behind the tip decreases the total tip resistance that would be measured if the penetrometer was without joints. The influence of pore pressure in these joints is compensated for by using the net area concept (Ref. 2). The corrected tip resistance is given by:

where: q_T = corrected tip resistance (psi)

$$q_T = q_c + u \left[1 - \frac{A_s}{A_T} \right] \quad (2.1)$$

q_c = measured tip resistance (psi)

u = penetration pore pressure measured behind the tip (psi)

A_s = net area behind the tip not subjected to the pore pressure (1.257 in²)

A_T = projected area of the tip (1.550 in²).

Hence, for the ARA cone design, the tip resistance is corrected as:

$$q_T = q_c + u(.1890) \quad (2.2)$$

Laboratory calibrations have verified Equation 2.2 for ARA's piezo-cone design.

A joint also exists behind the top of the sleeve (see Figure 2.1). However, since the sleeve is designed to have the same cross sectional area on both ends, the pore pressures acting on the sleeve cancel out. Laboratory tests have verified that the sleeve is not subjected to unequal end area effects. Thus, no correction for pore pressure is needed for the sleeve friction data.

The net effect of applying the pore pressure correction is to increase the tip resistance. Generally, this correction is only significant when the measured tip resistance is very low.

Numerical Editing of the Penetration Data

Any time that the cone penetrometer is stopped or pulled back during a test, misleading data can result. For instance, when the probe is stopped to add the next push tube section, or when a pore pressure dissipation test is run, the excess pore pressures will dissipate towards the hydrostatic pore pressure. When the penetration is resumed, the pore pressure generally rises very quickly to the pressures experienced prior to the pause in the test. In addition, the probe is sometimes pulled back and cycled up and down at intervals in

deep holes to reduce soil friction on the push tubes. This results in erroneous tip stress data when the cone is advanced in the previously penetrated hole.

To eliminate this misleading data from the penetration profile, the data is numerically edited before it is plotted or used in further analysis. Each time the penetrometer stops or backs up, as apparent from the depth data, the penetration data is not plotted. Plotting of successive data is resumed only after the tip is fully re-engaged in the soil by one tip length (1.22 in) of new penetration. This algorithm also eliminates any data acquired at the ground surface before the tip has been completely inserted into the ground. The sleeve data is similarly treated and this results in the first data point not occurring at the ground surface, as can be seen in the tip and sleeve profiles of Figure 2.2. These procedures ensure that all of the penetration data that is plotted and used for analysis was acquired with the probe advancing fully into undisturbed soil.

RESISTIVITY CONE PENETROMETER TEST

Resistivity, one of the oldest geophysical exploration techniques, was originally developed to locate mineral and oil deposits and ground water supplies. The measurement principal exploited by resistivity surveying is that an electrical contrast exists between different geological materials and that this electrical contrast can be used to identify and locate geologic materials. Resistivity surveys are being increasingly used in contaminated site investigation programs to delineate the extent and degree of contamination at a site. These surveys rely on the electric contrasts that typically exist between contaminated soils and uncontaminated soils. For example, leachate from a landfill will contain a higher concentration of dissolved solids, which will decrease the resistivity of the groundwater (Reference 3). Soils contaminated with hydrocarbons (fuel oils, cleaning solvents, etc.) will typically have higher resistivity than uncontaminated soils as the hydrocarbon can act as an insulator.

The Resistivity-ECPT (R-ECPT) is an adaptation of conventional borehole tools. The R-ECPT probe is in intimate contact with the soil and pore fluid which eliminates two problems associated with borehole resistivity surveys; 1) intrusion of drilling fluids into borehole walls which changes the resistivity of the media and 2) the requirement that any casing material be non-conducting.

Figure 2.1 is a schematic of ARA's R-ECPT probe. The probe consists of 4 electrodes separated by high strength plastic reinforced insulators. The outer two electrodes induce an electric current into the soil and the inner two electrodes measure the potential drop, which is proportional to the resistivity of the soil. To avoid polarization effects the four electrode array is operated at a frequency of 40 HZ. Electronics in the CPT vehicle are used to modulate and demodulate the current and potential measurement signals to and from the probe. The probe is calibrated in a large water solution in which the conductivity is varied. The data from the calibration tests is used to determine the probe calibration factor, which is dependent on the probe geometry.

WATER SAMPLING

Using cone penetrometer technology, groundwater samples can be efficiently obtained from specific depths. The water samples are obtained by pushing a hollow rod with a sampling tip down to the desired depth. The rods are then retracted 6 to 12 inches, exposing a polypropylene porous filter, as shown in Figure 2.4. The filter allows groundwater to enter the rods. The water samples are then bailed using a bottom filling Teflon® bailer. Samples are then labeled and properly stored to ensure sample quality.

STEAM CLEANING

To prevent the possibility of cross-contamination between boreholes and also to ensure worker safety, the rods are steam cleaned after removal from the ground and prior to

entering the truck. This operation takes place by drawing all the rods up through the steam cleaning module located on the bottom of the guide tube. High pressure hot water is applied to the rods in a swirling motion only as the rods are being drawn up. This operating process minimizes the amount of water used. The waste water generated can either be collected or allowed to drain away on the surface as directed by the client.

GROUTING UPON RETRIEVAL

Cone penetration testing, by nature of the test, leaves holes which represent potential contamination pathways for surface and subsurface contaminants to enter the groundwater and also for contaminated soil vapors to enter the atmosphere. To prevent these types of contamination, the test holes must be grouted to seal the hole and eliminate the contaminant pathway. Grouting of the CPT hole upon retraction increases worker safety and reduces risks to the environment. Due to the importance of retraction grouting, ARA operates two different grouting methods. The first method involves use of our self-grouting module. This module also allows grouting to be performed on retrieval of the cone equipment, saving time. The other method is a tremie grouting method and requires a second push to place the grout rods in the hole.

Self-Grouting Method

The self-grouting method involves a grouting module located behind the instrumented portion of the cone. This module allows the full complement of CPT instrumentation to be used (ie. resistivity, seismic and pore pressure), however, the diameter of the module is larger than the push rod's, and therefore requires higher push forces. The schematic for this module is shown in Figure 2.5. The module is connected to a flexible tube which runs through the center of the push rods. Upon retrieval of the cone the protective sleeve slides off of the probe, exposing the grouting holes and a grout mixture is pumped under pressure down the tube to the grouting modules. As the cone is retracted, the cavity is filled with grout. This process is continued until the cone is fully removed from the penetration hole.

Records are kept in the field log book of the amount of grout pumped into the hole. The volume of grout pumped can be compared to the volume of the hole to determine the effectiveness of the grouting. This method is the more efficient but requires the use of larger diameter push tubes thereby increasing the total penetration force needed to attain the desired test depth.

Tremie Grouting Method

The tremie grouting method requires that the instrumented cone be fully retracted from the hole and then empty push tubes with a sacrificial tip in place (not containing a cable) are pushed down the same hole. Once the empty push tubes are advanced to the same depth as the ECPT, a flexible tube is inserted into the top of the tubes and grout is pumped down the core. As the grout is pumped, the rods are retracted and removed from the stack. Grout is continuously pumped into the hole until the hole is full. The volume of grout used is recorded in the field log book.

Figure 2.1. Schematic of ARA's piezo-resistivity cone penetrometer.

Figure 2.2. Cone penetration profile from test location CPT-8.

ARA Water Sampler

Figure 2.4. Schematic of ARA water sampler.

Schematic of ARA Self-Grouting Cone

Figure 2.5. Schematic of ARA self-grouting cone.

SECTION 3

DATA ANALYSIS TECHNIQUES

SOIL CLASSIFICATION

Plots of normalized tip resistance versus friction ratio and normalized tip resistance versus penetration pore pressure can be used to determine soil classification as a function of depth. Both methods of soil classification are based on empirical charts developed by Robertson (Ref. 4), which have been modified by ARA to further describe the intermediate soil types. The soil classification is determined from the charts (see Figure 3.1) by using the normalized corrected tip stress in bars and pore pressure ratio, B_q or normalized friction ratio of f_{SN} . The pore pressure ratio is defined as:

$$B_q = \frac{u_{meas} - u_o}{q_T - \sigma_{vo}} \quad (3.1)$$

where: u_{meas} = measured penetration pore pressure
 u_o = static pore pressure, determined from the water table elevation
 q_T = corrected tip resistance
 σ_{vo} = total overburden stress.

and the normalized friction ratio is defined as:

$$f_{SN} = \frac{f_s}{q_T - \sigma_{vo}} \times 100 \quad (3.2)$$

and the normalized tip resistance is defined as:

$$q_{NT} = \frac{q_T - \sigma_{vo}}{\sigma_{vo}} \quad (3.3)$$

The intersection point of the q_T and B_q or f_{SN} values normally falls in a classification zone.

The classification zone number corresponds to a soil type as shown in the figure. At some depths, the CPT data will fall outside of the range of the classification chart. When this occurs, no data is plotted and a break is seen in the classification profile. Soil classification for this work were determined using both charts in Figure 3.1. Close analysis of these charts indicates that as the classification numbers vary, so does the soil grain size. What is missing in these charts are mixed soils, such as sandy clays or clayey sands. This type of mixed soil represents special cases and may be misclassified as silts.

The next step in developing the soil classification profile is reconciliation of the similarities and differences between the two soil classification methods shown in Figure 3.1 into a single recommendation as previously shown in Figure 2.3. This profile represents a point by point weighted average of the two methods with weighing factors based on confidence levels established for each measurement used in the classifications. These confidence levels are based on measurement amplitudes, consistency and engineering experience with CPT data.

The classification profiles are very detailed, frequently indicating significant variability in soil types over small changes in elevation. In order to provide a simplified soil stratigraphy for comparison to standard boring logs, a layering and generalized classification system was implemented. A minimum layer thickness of 1.5 feet was selected. Layer thicknesses are determined based on the variability of the soil classification profile. The layer sequence is begun at the ground surface and layer thicknesses are determined based on deviation from the running mean of the soil classification number. Whenever an additional 4.5 inch increment deviates from the running mean by more than 0.50, a new layer is started, otherwise, this material is added to the layer above and the next 4.5 inch section is evaluated.

The soil type for the layer is determined by the mean value for the complete layer. The eleven types are classified as:

<u>Classification Range</u>	<u>Soil Type</u>
1.00 - 2.25	Sensitive Clay
2.25 - 2.75	Soft Clay

3.75 - 4.25	Clayey Silt
4.25 - 4.75	Sandy Fine Grained
4.75 - 5.75	Sand Mixture
5.75 - 6.75	Sand
6.75 - 7.50	Gravelly Sand
7.50 - 9.00	Over Consolidated (OC)

Again, a more detailed classification can be determined from the classification profile plotted just to the left of the layering. The layering provides a summary of the soil stratigraphy.

STANDARD PENETRATION TEST

Correlations between the cone penetrometer tip stress measurements, q_c , and standard penetration test blow count (N) data have been made by a number of researchers. Robertson and Campanella (Ref. 2) have summarized many of these studies and presented a relationship between q_c , N and soil type. The blow count corresponding to 60 percent of the energy transferred to the sampler can be estimated from a ratio based on the soil type. For this site the ratios used to compute the N value were as follows:

<u>Soil Classification Number (SCN)</u>	<u>q/N ratio</u>
less than 1.5	2.0
1.5 to 7.5	SCN/1.5
greater than 7.5	1.5

This relationship shows that as the materials increase in grain size up to an overconsolidated or cemented material (SCN = 7.5 or more) the q_c/N ratio increases. The correlation between q_c and N should be considered an estimate only, due to the rapid fluctuations in tip stress which can result in large changes in the calculated blow count. Also, the techniques used in performing the SPT test in any geographical area need to be considered. If the energy level normally transferred to the sampler is not nearly 60 percent of the theoretical maximum, the local correlation will be either higher or lower than the data presented in this report.

Applied Research Associates
Friction Ratio Classification Chart

- Friction Ratio $\frac{f_t}{q_t - \sigma_{vo}} \times 100\%$
1. Sensitive, Fine Grained
  2. Organic Soils-Peat
  3. Clays - Clay to Silty Clay
  4. Silty Mixtures - Clayey Silt to Sandy Silt
  5. Sand Mixtures - Silty Sand to Sandy Silt

(*) Heavily Overconsolidated or Cemented

Applied Research Associates
Pore Pressure Classification Chart

- Pore Pressure Ratio $B_u = \frac{u - u_o}{q_t - \sigma_{vo}}$
6. Sands - Clean Sand to Silty Sand
  7. Gravelly Sand to Sand
  8. Very Stiff Sand to Clayey Sand
  9. Very Stiff, Fine Grained

Figure 3.1. Applied Research Associate's soil classification system based on CPT data.

SECTION 4

LIST OF REFERENCES

1. American Society for Testing Materials, "Standard Method for Deep Quasi-Static Cone and Friction-Cone Penetration Tests of Soil," ASTM Designation: D3441, 1986.
2. Robertson, P.K. and R.G. Campanella, *Guidelines for Using the CPT, CPTU and Marchetti DMT for Geotechnical Design*, Vol. II, University of British Columbia, Vancouver, BC, Canada, March 1988.
3. Shinn, J.D., and A.F. Rauch, "Resistivity Surveys with the Electric Cone Penetration Technique," Applied Research Associates, Inc., March 1990.
4. Robertson, P.K., "Soil Classification Using the Cone Penetrometer Test," Canadian Geotechnical Journal, Vol. 27, No. 1, February 1990.

APPENDIX A
CONE PENETRATION PROFILES

CPT-1

APPLIED RESEARCH ASSOCIATES, INC.
Investigation of the Southern Sector - A/M AREAS

10/05/92

CPT-1

APPLIED RESEARCH ASSOCIATES, INC.

10/05/92

Investigation of the Southern Sector - A/M AREAS

CPT-2

APPLIED RESEARCH ASSOCIATES, INC.

10/06/92

Investigation of the Southern Sector - A/M AREAS

CPT-2

APPLIED RESEARCH ASSOCIATES, INC.

10/06/92

Investigation of the Southern Sector - A/M AREAS

CPT-21

APPLIED RESEARCH ASSOCIATES, INC.

10/06/92

Investigation of the Southern Sector - A/M AREAS

CPT-2B

APPLIED RESEARCH ASSOCIATES, INC.

10/08/92

Investigation of the Southern Sector - A/M AREAS

CPT-2B

APPLIED RESEARCH ASSOCIATES, INC.

10/08/92

Investigation of the Southern Sector - A/M AREAS

CPT-21B

APPLIED RESEARCH ASSOCIATES, INC.

10/08/92

Investigation of the Southern Sector - A/M AREAS

CPT-5

APPLIED RESEARCH ASSOCIATES, INC.

10/09/92

Investigation of the Southern Sector - A/M AREAS

CPT-21B

APPLIED RESEARCH ASSOCIATES, INC.

10/08/92

Investigation of the Southern Sector - A/M AREAS

CPT-5

APPLIED RESEARCH ASSOCIATES, INC.

10/09/92

Investigation of the Southern Sector - A/M AREAS

CPT-8

APPLIED RESEARCH ASSOCIATES, INC.

10/15/92

Investigation of the Southern Sector - A/M AREAS

CPT-8

APPLIED RESEARCH ASSOCIATES, INC.

10/15/92

Investigation of the Southern Sector - A/M AREAS

CPT-4

APPLIED RESEARCH ASSOCIATES, INC.

10/16/92

Investigation of the Southern Sector - A/M AREAS

CPT-4

APPLIED RESEARCH ASSOCIATES, INC.

10/16/92

Investigation of the Southern Sector - A/M AREAS

CPT-16

APPLIED RESEARCH ASSOCIATES, INC.

10/19/92

Investigation of the Southern Sector - A/M AREAS

CPT-16

APPLIED RESEARCH ASSOCIATES, INC.

10/19/92

Investigation of the Southern Sector - A/M AREAS

CPT-16B

APPLIED RESEARCH ASSOCIATES, INC.

10/19/92

Investigation of the Southern Sector - A/M AREAS

CPT-16B

APPLIED RESEARCH ASSOCIATES, INC.

10/19/92

Investigation of the Southern Sector - A/M AREAS

CPT-6

APPLIED RESEARCH ASSOCIATES, INC.

10/20/92

Investigation of the Southern Sector - A/M AREAS

CPT-6

APPLIED RESEARCH ASSOCIATES, INC.
Investigation of the Southern Sector - A/M AREAS

10/20/92

CPT-6B

APPLIED RESEARCH ASSOCIATES, INC.

10/21/92

Investigation of the Southern Sector - A/M AREAS

CPT-68

APPLIED RESEARCH ASSOCIATES, INC.

10/21/92

Investigation of the Southern Sector - A/M AREAS

CPT-7

APPLIED RESEARCH ASSOCIATES, INC.

10/22/92

Investigation of the Southern Sector - A/M AREAS

CPT-7

APPLIED RESEARCH ASSOCIATES, INC.
Investigation of the Southern Sector - A/M AREAS

10/22/92

CPT-7B

APPLIED RESEARCH ASSOCIATES, INC.

10/22/92

Investigation of the Southern Sector - A/M AREAS

CPT-7B

APPLIED RESEARCH ASSOCIATES, INC.

10/22/92

Investigation of the Southern Sector - A/M AREAS

CPT-17

APPLIED RESEARCH ASSOCIATES, INC.

10/23/92

Investigation of the Southern Sector - A/M AREAS

CPT-17

APPLIED RESEARCH ASSOCIATES, INC.

10/23/92

Investigation of the Southern Sector - A/M AREAS

Investigation of the Southern Sector - A/M AREAS

CPT-17B

APPLIED RESEARCH ASSOCIATES, INC.

10/23/92

Investigation of the Southern Sector - A/M AREAS

CPT-7A-D

APPLIED RESEARCH ASSOCIATES, INC.

12/15/92

Investigation of the Southern Sector - A/M AREAS

CPT-7A-D

APPLIED RESEARCH ASSOCIATES, INC.

12/15/92

Investigation of the Southern Sector - A/M AREAS

Investigation of the Southern Sector - A/M AREAS

Investigation of the Southern Sector - A/M AREAS

Investigation of the Southern Sector - A/M AREAS

CPT-13A

APPLIED RESEARCH ASSOCIATES, INC.

01/09/93

Investigation of the Southern Sector - A/M AREAS

CPT-13A

APPLIED RESEARCH ASSOCIATES, INC.

01/09/93

Investigation of the Southern Sector - A/M AREAS

CPT-13B

APPLIED RESEARCH ASSOCIATES, INC.

01/11/93

Investigation of the Southern Sector - A/M AREAS

CPT-13B

APPLIED RESEARCH ASSOCIATES, INC.

01/11/93

Investigation of the Southern Sector - A/M AREAS

CPT-13C

APPLIED RESEARCH ASSOCIATES, INC.

01/12/93

Investigation of the Southern Sector - A/M AREAS

Investigation of the Southern Sector - A/M AREAS

CPT-13D

APPLIED RESEARCH ASSOCIATES, INC.

01/13/93

Investigation of the Southern Sector - A/M AREAS

CPT-13D

APPLIED RESEARCH ASSOCIATES, INC.

01/13/83

Investigation of the Southern Sector - A/M AREAS

CPT-10A

APPLIED RESEARCH ASSOCIATES, INC.

01/14/93

Investigation of the Southern Sector - A/M AREAS

CPT-10A

APPLIED RESEARCH ASSOCIATES, INC.

01/14/93

Investigation of the Southern Sector - A/M AREAS

CPT-15

APPLIED RESEARCH ASSOCIATES, INC.

02/11/93

Investigation of the Southern Sector - A/M AREAS

CPT-15

APPLIED RESEARCH ASSOCIATES, INC.

02/11/93

Investigation of the Southern Sector - A/M AREAS

CPT-15

APPLIED RESEARCH ASSOCIATES, INC.

02/11/93

Investigation of the Southern Sector - A/M AREAS

CPT-15

APPLIED RESEARCH ASSOCIATES, INC.

02/11/93

Investigation of the Southern Sector - A/M AREAS

CPT-18

APPLIED RESEARCH ASSOCIATES, INC.

02/12/93

Investigation of the Southern Sector - A/M AREAS

CPT-18

APPLIED RESEARCH ASSOCIATES, INC.

02/12/93

Investigation of the Southern Sector - A/M AREAS

Investigation of the Southern Sector - A/M AREAS

Investigation of the Southern Sector - A/M AREAS

Investigation of the Southern Sector - A/M AREAS

CPT-6

APPLIED RESEARCH ASSOCIATES, INC.

03/09/93

Investigation of the Southern Sector - A/M AREAS

CPT-6

APPLIED RESEARCH ASSOCIATES, INC.

03/09/93

Investigation of the Southern Sector - A/M AREAS

Investigation of the Southern Sector - A/M AREAS

Investigation of the Southern Sector - A/M AREAS

Investigation of the Southern Sector - A/M AREAS

Investigation of the Southern Sector - A/M AREAS

APPENDIX B
DAILY ACTIVITIES REPORT

DAILY ACTIVITIES REPORT

PROJECT WSRC - Cone Penetration - A/M AREA		DRILLING SUBCONTRACTOR ARA	
SOUTHERN SECTOR, PHASE IV		DRILLER Doug McIntosh	
WELL NUMBER CPT-2	TECHNICAL OVERSIGHT D. STERLING	OVERSIGHT FIRM EBASCO ENVIRONMENTAL	
LOCATION S.R.S. CP 2 N103875 E5275 S.R.S.	DATE 10/06/92	PAGE 1 OF 2	

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
8:10	8:30	Calibration of cone instrument
8:40	9:25	Began Push on CP2 - complete refusal at 92 feet
9:40	10:50	Grouted Hole using thicker grout mix - Rocks out
11:15		Began to move
11:20	12:00	Moved to CP-21 which is ^{right of way} ~~down~~ the road along - hard to remove couple of small trees to get access to the area
12:05		Neil O'Halloran came out to discuss the project - he had stopped at CP-2 - apparently, some subsidence of the grout had taken place. The problem of grout mixture has again come up - WSRC wants a mixture of 6.5 gal of H_2O to 99 lbs of cement - ^{D. Sterling} I explained that mixture would not pump through ARA's system - grout line is 1/2" diameter. He says that is the site standard and it has to be followed - if it means a change in the procedure. I would require different grouting equipment to do - can not be done with a self contained grout module. Neil also was concerned about not getting to the required depth - stated a meeting between WSRC + Ebasco had determined to do two tries and on the third to cycle for an hour before pulling out. Again D. Sterling explained ARA's equipment with the grouting module does not allow cycling as it jams the grout ports. Neil's reply was that something had to be worked out - as that was the agreed upon plan between WSRC + Ebasco. There is no mention of this plan in the spec. which was sent to ARA. This would be a complete change of work scope. D. Sterling agreed to go back and try another hole at CP2 - however requested that CP-21 be tried first - since

TECHNICAL OVERSIGHT SIGNATURE

David Sterling

DATE 10/6/92

DAILY ACTIVITIES REPORT

PROJECT Cone Penetration - A/M Southern Sector ARA		DRILLING SUBCONTRACTOR ARA	
PHASE IV		DRILLER D. McIntosh	
WELL NUMBER CPT-2, 21	TECHNICAL OVERSIGHT D. Sterling	OVERSIGHT FIRM EBASCO ENVIRONMENTAL	
LOCATION CPT #2, 21	2 - N103875 E 52760 21 - N104000 E 54500	DATE Oct. 7, 1992	PAGE 1 of 2

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
		ARA had to rent a pressure washer and pick-up truck in the morning. Will not be onsite till approx. noon. Talk with David Tremie at the Vermont office about the problems with depth not being reached and concerning grouting. Before talking with ARA, D. Sterling talked with Bob VanPelt WSPC Project Manager, Bob wanted to switch to the smaller 1.4" rods and to use the cycling technique - cycling for a minimum of 30 minutes before deciding to terminate for refusal. Bob realizes that ARA can not cycle with the 1.7" rods because of the grouting module. This also would eliminate the ability to grout as the cone is retracted. It would require going back down the hole with a different set of rods then grout as these are grouted retracted. ARA presently does not have enough 1.4" rod to do this on the truck. This was all explained to Bob and D. Sterling indicated that a change order - would be required to do things differently. More time would be required to do the operations with the small rods and grout with small rods. David Tremie confirmed this information saying he would tend to agree with the small rods and cycling. D. Sterling suggested to alter the grout module - (do away with it) and that is being considered - however there is more friction on the larger rods because of larger diameter. David Tremie voiced the need for a contract change on this matter and the grout. Thicker Grout will require a different system. Also, a decision on this has to be made.

TECHNICAL OVERSIGHT SIGNATURE

David Sterling

DATE **10/7/92**

DAILY ACTIVITIES REPORT

PROJECT Cone Penetration - A/M AREA		DRILLING SUBCONTRACTOR ARA	
SOUTHERN SECTOR, PHASE II		DRILLER D. McIntosh	
WELL NUMBER	TECHNICAL OVERSIGHT D. STERLING	OVERSIGHT FIRM EBASCO ENVIRONMENTAL	
LOCATION CPT #2, 21	2 N103875 E52750 21 N104000 E54500	DATE Oct. 6 1992	PAGE 2 of 2
START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS	
		the location is approximately 1/2 mile into the woods and would require much maneuvering to get out only to come back	
1:00		Began hole CP-21 - pushed to 74 ft and bit refusal the tip pressure was 21,000-22,000 psi; and the sleeve was 2,000-2500 psi., hydraulic pressure 2600 psi. attempted to cycle same with no change in the readings.	
1:30		Mixed grout at 8.0 gal. H ₂ O - 2 lbs. Bentonite - 94 lbs. Cement - could not pump it through half the length of rod - thinned down to 8.5 - then 9.0 then 9.5 before it would pump through the top half of the stack	
2:00		Had problems with the steam cleaner - the thermal overload on the motor continued high alert.	
3:00		Decided to pull rods without washing off rods - grout still would not pump down the hole	
3:20		Pulled rods without opening the collar had jammed from the cycling and plugged off the ports. - Have to go back down to grout the hole	
4:15			
4:50		Began going back down the hole to grout the hole - reached bottom	
5:35		Coming back out - grout ports are once again plugged and can not grout	
6:35		Sandy Clay backup into line for four feet	

TECHNICAL OVERSIGHT SIGNATURE

David Kitterling

DATE 10/6/92

DAILY ACTIVITIES REPORT

[illegible]

TECHNICAL OVERSIGHT SIGNATURE

David L. Sterling

DATE 10/6/92

DAILY ACTIVITIES REPORT

PROJECT Cone Penetration A/M Southern Sector		DRILLING SUBCONTRACTOR ARA	
PHASE II		DRILLER WSPCC D. McIntosh	
WELL NUMBER CPT #21	TECHNICAL OVERSIGHT D. Sterling	OVERSIGHT FIRM EBASCO ENVIRONMENTAL	
LOCATION CPT #21 N104000 E54500 S.R.S		DATE 10/08/92	PAGE 1

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
7:00-	8:00	- Problem with the computer - screen would not come on
8:05	8:45	- Calibrate
8:50	9:50	Push a second try at CPT-21 - had to begin cycling at 54' to 58' then again hit a hard layer at 74' which cycling did not help - cycled for ten minutes with no progression. Tip pressure at 23,000 lbs sleeve at 25,000 lbs. To cycle and not plug the grout module - ART pumped water the entire time - speed of pumping would change depending on the layer. Total volume ≈ 23 gal.
10:00	10:35	Grinding - Volume - 15.0 gal. Ma
12:00	12:30	Calibration
12:35	1:45	Begin second push at CP2 previous hole went to 92
Tip Pressure 13, -15,000 and sleeve 3,000		St. At 90-92 St. again hit resistance however several cycle movements allowed the tip to pass through At 110 St. again resistance was encountered - the tip pressure was 8-9000 psi however 50 was the sleeve pressure. After several attempts of cycling with no advancement of tip, ART called refusal as the sleeve pressure could indicate a rocky layer pushing the cone off center.

TECHNICAL OVERSIGHT SIGNATURE

DATE 4/8/62

DAILY ACTIVITIES REPORT

PROJECT Cone Penetration - A/M Area Southern Sector		DRILLING SUBCONTRACTOR ARA	
PHASE V		DRILLER P. McInish	
WELL NUMBER CPT-5	TECHNICAL OVERSIGHT D. Sterling	OVERSIGHT FIRM Ebasco Environ.	
LOCATION CP#5 N99250 E53250 S.R.S		DATE 10/9/92	PAGE 1 OF 1

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
8:05		Start Point CP#5
8:55	9:20	Cycling with 1.7" rods pumping water - progress was slow $\approx .5'$ then
9:25	9:35	+ broke through ^{28K - 23K} ~~88.2~~ - 88.8 95.9 - 99.00
9:40	10:18	^{24K} 104.5 ^{30K} 105 ^{20K} 108 end of attempt at this hole basically have been cycling since 8:55 and went 20 ft. in 1.5 hours with ≈ 20 ft. to go to reach depth
	11:11	Complete pulling out of the hole with rods could not grant as the mud was packed with clay (a grayish-green color) will have to go back down the hole to grant
	12:15	Remove the rod again as the grouting rod line is base inside
12:30	2:00	A. Gallogly + D. Sterling went to determine which of the next locations is accessible. Had difficulty finding the locations
2:00		ARA broke off the large rod while going down the hole to grant it ≈ 80 feet of rod and the cone section are in the ground. Attempts were made to dig the broken end out - and remove the broken sections - the break is only 3 feet in the ground.
	4:30	End the day ARA will try to remove the thread tomorrow Sat. 10/10.
		Downtime actually from 11:15 on - as they were attempting to grant the hole - down for equipment failure from 2:00 p.m.

TECHNICAL OVERSIGHT SIGNATURE

David L. Sterling

DATE

10/9/92

DAILY ACTIVITIES REPORT

PROJECT Cone Penetration A/M Area Southern Sector		DRILLING SUBCONTRACTOR ARA	
PHASE VI		DRILLER Doug McIntosh	
ELL NUMBER CPT-5	TECHNICAL OVERSIGHT D. STERLING	OVERSIGHT FIRM EED	
LOCATION C.P. #5 N99250 E53250 S.R.S.		DATE 10/12/92	PAGE 1 OF 1

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
8:45		Got through on phone to the truck - ARA did not make any progress over the weekend - they are going to bring in a backhoe to dig to the second joint in the ground.
10:30		Backhoe complete and a plastic casing was used to protect the hole while area was backfilled and smoothed out.
11:30	12:45	ARA was successful in tying up and putting on additional length of rod to reject the piezcone and 80 feet of rod. Removed the rod. ARA was able to reconnect to the grant line and grouted the hole as they came out. The hole which was dug by the backhoe to retrieve the rod washed out some and required a large volume of grant to top off the hole.
2:15		Bob Van Pelt, WSRC Project Manager, came out to the site C.P. #5 to discuss the next steps for the task. Forestry Service has not been able to clear the locations yet and so they will be moved closer to the road. This should eliminate the need for access. Bob was going to restake these points. Bob also talked to ARA home office and agreed not to use the resistivity module with the 1.4 inch rods, except at CP22 where there exist a contamination plume DNAPL they want to see if the resistivity module can pick it up. AR ARA will be down until the additional 1.4 inch rods to grant are shipped Wednesday or Thursday.

TECHNICAL OVERSIGHT SIGNATURE

David H Sterling

DATE

10/12/92

DAILY ACTIVITIES REPORT

PROJECT Phase V Conc Penetration H/m Area		DRILLING SUBCONTRACTOR ARA	
SOUTHER SECTOR		DRILLER D. McIntosh	
WELL NUMBER CPT-8	TECHNICAL OVERSIGHT D. STERLING	OVERSIGHT FIRM EED	
LOCATION CP-8 N95520 E52125 S.R.S		DATE 10/15/92	PAGE 1 OF 1
START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS	
		10/13/92 - ARA is down today waiting for the grouting rod 1 1/4" diameter to arrive	
		10/14/92 - ARA still not pushing as the truck with the rods has not arrived	
		10/15/92	
8:30		ARA on-site to move to CP-8 - had to resting the grout rods:-	
12:00		Calibration	
1:00		Began push on CP-8	
2:00		@ 99' first resistance layer required several cycles to push through. Tip pressure - 8,000 psi - 10,000 psi	
2:30		122' began to cycle and make slow progress up to 15,000 psi	
2:45		123' Pushed through layer after ~ 10 minutes	
		continued to require cycling with pressures up to 18,000 psi	
3:20		133' still cycling 3:30 complete 133	
3:45		135.5' cycled for 15 minutes and advanced 2.5 feet	
		Terminated the test	
3:50	4:35	Remove Rods	
4:50	5:30	Going Back in hole to grout	
5:50	6:45	Complete with grouting	

TECHNICAL OVERSIGHT SIGNATURE

DATE 10/15/92

DAILY ACTIVITIES REPORT

PROJECT		Phase II Cone Penetration A/m/dra		DRILLING SUBCONTRACTOR		ARA	
WELL NUMBER		CPT-4		DRILLER		D. McIntosh	
TECHNICAL OVERSIGHT		D. Sterling		OVERSIGHT FIRM		EBASCO ENV.	
LOCATION		C.P-4 N100250 E51500 S.R.S		DATE		10/16/92	
				PAGE		1 OF 1	
START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS					
		Moved from location after conversation with Bob Van Pelt to report the characteristics of the hole. Ask Van Pelt if he wanted to attempt a second push on CPT-8 ~~and then~~ move on. Since it will not be a water sample decided to move on to CPT-4					
	8:30	Moved ~~and~~ set up for push at CPT-4					
8:30	9:15	Calibration					
9:30	10:40	Pushed to a depth of 133' at which point the tip pressure jumped to 20,000 psi at 23,000 psi and 133.5' began to cycle					
9:30	9:40	15 minutes of cycling did not produce any advancement and pressure was still at 23,000 psi. Terminated the hole					
	11:00	Removed cone rod					
11:15	1:30	Insert groutrod and grout out the hole					
		Pressure washer belt broke ^{while} removing the grout rods down waiting for new belt.					
	3:30	Pressure Washer repaired but it is too late to begin to push another hole. Will continue with CP #16 on Monday					

TECHNICAL OVERSIGHT SIGNATURE

DATE 10/16/92

DAILY ACTIVITIES REPORT

PROJECT		DRILLING SUBCONTRACTOR	
PHASE V Cone Penetration		ARA	
ALM AREA - SOUTHERN SECTOR		DRILLER	
CP16 + CP16 B		D. McIntosh	
TECHNICAL OVERSIGHT		OVERSIGHT FIRM	
D. Sterling		EBASCO ENVIRONMENTAL	
LOCATION		DATE	
N99125 E51875		10/19/92	
S.R.S.		PAGE	
		1 OF 1	
START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS	
7:00	7:45	Check calibration	
7:55		Begin push on CP16 -	
	8:45	First encountered refusal at 100' - cycling began with success at first - tip pressure continued to increase with depth from 8,000psi to 18,000psi	
	9:00	at 108.25' - 109' terminated the hole after 15 minutes of cycling with no progress	
9:15	9:50	Remove cone rods	
10:00	10:30	Insert the grouting rods	
10:35	11:55	Grouting the hole	
		Moved for a 25 foot offset on the location	
12:00		Began 16 B the push was very similar to that of 16	
	12:45	the same layers were found until the very bottom at which point refusal was met at a slightly more shallow depth. Cycling did not progress the tip any further	
1:20	3:30	Grouting	

TECHNICAL OVERSIGHT SIGNATURE

David L. Sterling

DATE _____

10/19/92

DAILY ACTIVITIES REPORT

PROJECT		DILLING SUBCONTRACTOR	
WELL NUMBER		DRILLER	
TECHNICAL OVERSIGHT		OVERSIGHT FIRM	
LOCATION		DATE	
PAGE		1 OF 1	
Phase V Cone Penetration		ARA	
A/M AREA Southern Sector		D. McIntosh	
CPT-6		EPASCO ENVIRONMENTAL	
D. Sterling		10/20/92	
CP#6 N98000 E52125 S.R.S.			
START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS	
7:00	8:15	Completion of change over of a new cone	
8:15	8:45	Calibration	
8:55		Began Push of CP#6 - at 6.3 ft. to 88 ft. the soil was very soft only a few hundred psi. These concerned the ARA operator when resistance became greater	
9:50	10:00	The resistance is increasing 8,000-11,000 psi approx. 98 feet periodic cycling	
10:00	10:10	Began cycling continuously @ 115.4 ft. tip pressure @ 22,000 psi	
10:10		Cycling for 10 minutes advanced to 115.8 ft. tip pressure @ 20,000-23,000 psi - broke off the rod. Rod broke approx. 3 ft. into the ground	
10:45		ARA able to remove broken thread and screw on another rod section to remove the entire string	
12:15	12:50	Putting the grout rods in the hole	
12:50	1:45	Complete grouting hole CP#6 ARA now must repair the spc cable for the cone.	
1:45	2:00	ARA driven remaining of day 2:00-	

TECHNICAL OVERSIGHT SIGNATURE

DATE 10/20/92

DAILY ACTIVITIES REPORT

PROJECT Phase V Cone Penetration A/m Area		DRILLING SUBCONTRACTOR ARA	
SOUTHERN SECTOR		DRILLER D. McIntosh	
ELL NUMBER GPT-6B	TECHNICAL OVERSIGHT D. Sterling	OVERSIGHT FIRM EED	
LOCATION CP#6B N98000 E52125 S.R.S		DATE 10/21/92	PAGE 1 OF 1

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
		New ARA Truck Operator Robert Wilson on site for first day
8:20		Begin the second attempt at this location (CP#6) The hole was offset by 25'. ARA will watch for the salt layer at the 50' depth area.
9:00	9:15	ARA began cycling at 93.3' ^{21,000-25,000 psi.} progress was very slow
	9:20	after 10 minutes progress picked up - at 94.1 feet resistance dropped down from 15,000-18,000 psi to 8,000-9,000
		had to continue cycling but making steady progress:
9:45		at 117.4' the resistance returned to 18,000-21,000 psi
		cycling progress has dropped to 0.1' every 4 to 5 minutes
		117.8' appears to have pushed through
	10:00	The Rods Broke at 118.2' - this is the second time the rods broke at this location.
10:15		It appears the rod broke at approx. 40-45 feet below the surface this time.
10:25		Began inserting grouting rods - approx. 90' of rod is still in the
	11:45	hole. Pushed down to broken rods and grouted from there up.
		Down remainder of the day - repairing the broken equipment
		ARA management not happy with the turn of events and the attempts at cycling does not appear to be the solution

TECHNICAL OVERSIGHT SIGNATURE

DATE

10/21/92

DAILY ACTIVITIES REPORT

PROJECT Phase V Cone Penetration		DILLING SUBCONTRACTOR ARA	
WELL NUMBER CP# 7		DRIER D. McIntosh	
TECHNICAL OVERSIGHT D. Sterling		OVERSIGHT FIRM EED	
LOCATION A/M/area - N97000 ES1500		DATE 10/22/92	PAGE 1 OF 1

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
9:15		Began to push at location CP#7 the push progressed easily until at 72 ft. the Tip Pressure ~~was~~ went instantly
9:55		from approx. 600psi to 20,000psi, cycling increased the tip pressure to 30,000psi with no advancement in depth hole was terminated before breaking another rod and will be affect for another attempt.
11:15		Complete with grouting operation, Decision to abandon this attempt was made because of rapid nature of the increase and increase to 30,000psi ~~go~~ with cycling. Better to attempt a second hole than to break a third rod in three attempts. More cycling will be attempted if the layer appears with the second hole.
11:45		CPT 7 B - the hole advanced similar to the first attempt at location 7, at 65 ft. the layer is soft 300psi at 71.8 ft. the tip pressure goes straight up to 25,000psi. Cycling moved it to 72.3 ft and a tip pressure of 29,000psi cycled for 30 minutes with no advancement and no reduction of the tip pressure.
12:30	1:00	Termination of attempt
1:00		Removal of the cone and going back down the hole with grout rods; grouting the hole.
3:15	4:00	Moved over to location #17 which is way back in the woods. Were able to get to the location will attempt it tomorrow

TECHNICAL OVERSIGHT SIGNATURE

David Sterling

DATE 10/22/92

DAILY ACTIVITIES REPORT

PROJECT Phase IV Cone Penetration		DRILLING SUBCONTRACTOR ARA	
A/M AREA - SOUTHERN SECTOR		DRILLER D. McIntosh	
WELL NUMBER CPT-17	TECHNICAL OVERSIGHT D. Sterling	OVERSIGHT FIRM EED	
LOCATION CP#17 N99775 E50475	S.R.S.	DATE 10/23/92	PAGE 1 OF 2

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
7:00	8:15	Calibration and set-up.
8:30		Begin push on CP-17 - this hole is acting similar to others in this area #4, #16, #6 - a hard layer @ 80-85, a much harder layer at 110-115 ft
9:45	10:00	Cycling at 115 ft with 25,000 psi tip pressure no advancement - Terminated
10:00	10:40	Begin to remove the cone rods
10:45		Going down with grouting rods
	11:00	rods drop from head clamp down into the hole, ARA was able to hold rods with the grouting line and run down enough rod to connect to the end in the hole. They pulled out the rods to be sure all the connections were intact. (50 ft) Then started down the hole again with the rods
11:50		Begin grouting and removing the rods
	12:30	complete with grouting operation
12:30	1:00	relocating to a second attempt at CP#17
1:15		Doug McIntosh - ARA leaves the site and turns operation over to Robert Wilson
1:30		Begin pushed CPT #17B
2:00		difficult pushing at 80-92 ft. required cycling and slow advancement then became easier till 120 ft. at 127 ft. tip pressure increased to 12,000 psi? Sleeve pressure to 3,000 psi
2:30	3:00	cycling with no advancement of hole - terminated
	3:30	rod out of hole
3:45		going back down the hole for grouting
		Bob Van Pelt came out to the site and said the next thing to be tried is ARA is going to bring in a mud driven rotary bit

TECHNICAL OVERSIGHT SIGNATURE

D. Sterling

DATE

10/23/92

DAILY ACTIVITIES REPORT

[illegible]

TECHNICAL OVERSIGHT SIGNATURE

David L. Sterling

DATE 10/23/92

DAILY ACTIVITIES REPORT

PROJECT Phase V Cone Penetration ALL NUMBER A/M AREA - SOUTHERN SECTOR CPT-7		DRILLING SUBCONTRACTOR ARA DRILLER Wayne Russell OVERSIGHT FIRM Ebasco Environ. DATE 12/15/92	
LOCATION S.R.S Point #7 - Cone & Drilling Combination		TECHNICAL OVERSIGHT D. Sterling PAGE 1 OF 2	

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS -
7:30		Met ARA at the first of four locations on which the new process of pushing and drilling will be used. The previous ^{two} attempt at this location resulted in refusal with the 1.2" rods and the 65,000 lbs truck at 22' ft. on both attempts. ARA is setting up on this location it will probably require several hours before pushing begins.
9:00		Began the cone push for the upper area. ARA personnel on site: David Timian, Bryan Fisk, Wayne John Cook, and South Carolina Driller - Sam Environmenta! Testing.
9:50		Refusal at 24' with a tip pressure of 32000 psi - will now remove the cone and attempt to insert the drill.
10:30		The cone was removed completely.
11:15		Began insertion of the drill tip. ARA is drilling down the entire length of the previous hole. Progress is slow at the present time as they are just beginning to get familiar with the system and what it is capable of doing on a production basis.
1:15		They have gone down 18' ft. and are beginning to move quicker than on the first 2 lengths of rod. ARA has a connection which screws into the end of the rods which has to be taken loose and moved to the next rod with each 3 feet of push.
2:10		ARA reached the confining layer where refusal was met from the CPT. They are able to advance past the layer and after the first 1 foot, progress is easier and quicker.

TECHNICAL OVERSIGHT SIGNATURE David L. Sterling DATE 12/15/92

DAILY ACTIVITIES REPORT

PROJECT: CONE PEN. / A/M AREA		DRILLING SUBCONTRACTOR: ARA	
SOUTHERN SECTOR / PHASE II		DRILLER: D. McINTOSH	
ELL NUMBER: CPT-7	TECHNICAL OVERSIGHT: D. STERLING	OVERSIGHT FIRM: EED	
LOCATION: S.R.S. #7 - Drilling + Cone Penetration	NAT000 ES1500	DATE: 12/15/92	PAGE: 2

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
	3:00	ARA was able to complete the 15 foot interval estimated to require getting through the "green clay" confining zone.
2:15		Jim Jordan of WSRC came out to look at the site and to see what was going on. We asked whether ARA appeared to know what they were doing or were they just trying to get by. He was concerned about the image projection as he anticipates a DOE audit of the operation. He wanted to have all the bases covered and to possibly have to answer procedural questions. Have all documentation of acceptance of drilling mud and grout additives. To have all the emergency equipment in place - coveralls, respirators etc, drums and lake in case the drill fluids have to be contained.
3:10		The drill motor has plugged up and as a result the entire ~~the~~ run of pipe is full of water. This is spilling out as they break down the rocks.
4:00		all the rocks are out of the hole and the drilling apparatus is plugged up with sand. This is why the drill stopped at the bottom of the push.
5:00		There is not enough time to complete the cone push so it will be completed tomorrow morning and the sample will be collected. The area profile for the drilling from this area ^{indicates} that the water level which WSRC ~~says~~ (Bob Van Pelt ^{wants} to collect is located at $\approx 130'$ not $180'$

TECHNICAL OVERSIGHT SIGNATURE

David Sterling

DATE

12/15/92

DAILY ACTIVITIES REPORT

PROJECT Phase V Cone Penetration A/M Area		DRILLING SUBCONTRACTOR ARA	
SOUTHERN SECTOR		DRILLER Wayne Russell	
WELL NUMBER CPT-7	TECHNICAL OVERSIGHT D. Sterling	OVERSIGHT FIRM ERGSCO Environmental	
LOCATION CPT #7 N97000 E51500 S.R.S.		DATE 12/16/92	PAGE 1 of 2

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
7:00		ARA is attempting to clear the drilling ~~apparatus~~ ^{apparatus} of the sand. They have to heat the section joints to take the drill apart. Part of the crew is ~~is~~ going to do this while the other complete the push.
9:35		ARA began going back down the hole to finish the CPT portion of the hole and to then obtain a water sample. There was no resistance at all until at 74.5 feet, which is where the refusal was originally encountered, resistance was 2000 psi up to a high of 6,000 psi. At 84.4 feet the resistance again increased to 6,000-7,000 psi when the rods suddenly broke at the surface. When the rods bent it also damaged the mud pit which was still around the hole. The mud pit broke at the collar which the rods go through and the mud returns to the surface.
10:30	10:10	Bob Van Pelt and Neil Halloran arrived they were briefed on the situation. Bob gave instructions on the target depths of the other holes. CPT #19 will not be pushed and CPT 17 will be used instead. 19 was not one of the original hydrocone points in the sampling plan approved by DHEC. CPT #17 will be 130 ft. CPT 13 will be 130' or 150' depending on the lithology. CPT # 22 will be 150-155 ft. These are the depths of the water sample.
11:10		ARA continues to dig to get to a good point of rock they will have to go 6' down from the surface.
12:30		ARA was attempting to pull the rods out of the hole with the front bumper of the truck and the front hydraulic

TECHNICAL OVERSIGHT SIGNATURE David L Sterling DATE 12/16/92

DAILY ACTIVITIES REPORT

PROJECT Phase IV CONE PENETROMETER TESTING		DRILLING SUBCONTRACTOR ARA	
A/M AREA - SOUTHERN SECTOR		DRILLER WAYNE RUSSELL	
WELL NUMBER CPT-7	TECHNICAL OVERSIGHT D. STERLING	OVERSIGHT FIRM EPASCO ENVIRONMENTAL	
LOCATION CPT #7 N97000 E51500 SRS.		DATE 12/16/92	PAGE 2 OF 2

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
		rod, the force sheared the bolts holding the frame and the box together. ART had to replace the the bolts before they could attempt to pull the rods again. They also dug down 6 feet again and replaced an additional length of rod which was bent from the original push. The ARA had some problem reaching the bottom joint. They completed extraction of the rods at approx 6:30 p.m.
3:00		Joe Sorabee from Westinghouse came out to check out the progress of the project. He was involved in the first resistivity testing ART did over in by the M-Area basin.
		The overall effectiveness of the process was proven. ART was able to go back down the hole and appeared to be able to stay straight without any side skew. This was evidenced by the lack of tip pressure until ~50 feet and only minimal pressure at that point on to the 74 ft level. The pressure at 74 to 86 was much less than at refusal 6,000-7,000 psi versus 25,000 to 30,000 on the initial entry.

TECHNICAL OVERSIGHT SIGNATURE

David A. Sterling

DATE _____

12/16/92

DAILY ACTIVITIES REPORT

PROJECT Phase II Cone Penetrometer		DRILLING SUBCONTRACTOR ARA	
ALM AREA - SOUTHERN SECTOR		DRILLER Wayne Russel	
ELL NUMBER CPT-7	TECHNICAL OVERSIGHT D. Sterling	OVERSIGHT FIRM EED	
LOCATION CPT #7 N97000 E51500 SRS		DATE 12/17/92	PAGE 1 of 3

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
7:00		on arrival at the site ARA was resoldering the broken cable for the cone penetrometer.
9:30	10:30	Calibration of the cone, a problem was found in the resistivity module. A check of the module found no problem inside the cone section. ARA then realized that the problem was in their electronic box. D. Sterling made the decision to go down the hole again without the resistivity module working.
11:45		ARA began to go back down hole #7 with the CPT equipment. At the initial tip pressures were again zero. At 36 feet water was encountered in the hole as evidenced by the pore pressure. At approx. 48 feet the tip pressure went up to 2,000 psi but returned to only 200-400 after 53 feet or so. At 68 feet the pressure began to rise to 2,000-3,000 psi. At 73.8 feet the tip pressure went to 29,000 psi, which was the original refusal pressure. Apparently at the bottom of the hole the probe did have some side skew and got off the main hole. ARA began retracting the rods.
12:25	12:50	at 12:25
1:15		ARA was going to attempt to re-drill the hole a second time in order to open it up again. The driller however was concerned that the loose top six feet of sand which had been dug out earlier would blow out and the mud would not re-circulate to the surface. ARA requested that they be allowed to grant the hole and attempt to move for an offset at the same location. The previous agreement with Bob Van Pelt of SRC was no offsets. D. Sterling called Van Pelt to discuss.

TECHNICAL OVERSIGHT SIGNATURE David L. Sterling DATE 12/17/92

DAILY ACTIVITIES REPORT

PROJECT PHASE II CONE PENETROMETER		DRILLING SUBCONTRACTOR ARA	
A/M AREA - SOUTHERN SECTOR		DRILLER Wayne Russell	
ELL NUMBER CPT-7	TECHNICAL OVERSIGHT D. STERLING	OVERSIGHT FIRM EED	
LOCATION CPT #7 N97000 E51500 S.R.S.		DATE 12/17/92	PAGE 2 of 3

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
		the situation. Van Pelt agreed on the offset under the circumstances of trying to verify the process of drilling and pushing cone.
1:30		ARA began back down the hole in order to begin the grouting process. They are using 1.7" O.D. rods for grouting. ARA mixed the grout to the 3-Q-5 spec of 2 lbs Sodium Benzoate, 194 lb bag cement and 7.5 gallons of water. The mixture was mixed and checked with a mud balance and resulted in a 13.9 lb/gal mixture. The
2:15 began pumping		mixture was thinned to 13.2. The 13.9 was a pudding consistency, the 13.2 was not much better but was more fluid. If pump the grout ARA used their conventional air diaphragm but only inserted the 1/2 chase into the first length of rod and pumped till the column was full. They would then extract one rod and allow the column of grout to empty. The method worked though it was time consuming.
3:30		complete with the grouting usage 26 gallons.
4:25		Began drilling operation from the surface after offsetting from the hole by 15 feet. This proved to be ineffective as the loose sand at the top of the hole flew out under ARA's mud pump. This prevented the return of their drilling fluid to the surface. The driller from Environmental Testing & Monitoring felt this would continue to be a problem with the existing system. It was decided by all involved to have ARA go back and refine their drilling equipment to try again after Jan. 1 1993. The potential for the process was shown but it is not refined.

TECHNICAL OVERSIGHT SIGNATURE David Sterling DATE 12/17/92

DAILY ACTIVITIES REPORT

PROJECT PHASE II CONE PENETROMETER		DRILLING SUBCONTRACTOR ARA	
WELL NUMBER A/M AREA - SOUTHERN SECTOR CPT-7		DRILLER WAYNE RUSSEL	
TECHNICAL OVERSIGHT D. STERLING		OVERSIGHT FIRM EDASCO ENVIRONMENTAL	
LOCATION N97000 E51500		DATE Dec. 17, 1992	PAGE 3 of 3
START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS	
		as of yet. The blow out was not encountered in the first hole since there was an existing opening to take the initial pressure of the drilling mud exiting the drill. The pump which was used to drive the drill is capable of 1000 psi at 20 gpm which is much too high for the sand. The holes which were accomplished Cone Push from 0 to 74 ft. Drilling with Drillex 12/15/92 12:30 - 3:10 complete with drilling operation 4:00 out of the hole 9:35 10:10 Returning down the hole with cone 9:35 broke mud at 10:10 at 84 ft. 10:10 11:45 Going down hole for 3rd time 11:45 to 12:15 at which point refusal was met at 23.8 ft.	

TECHNICAL OVERSIGHT SIGNATURE

DATE _____

12/17/92

DAILY ACTIVITIES REPORT

PROJECT Phase V Cone Penetrometer		DRILLING SUBCONTRACTOR ARA	
ELL NUMBER A/M AREA - SOUTHERN SECTOR		DRILLER Wayne Russel	
TECHNICAL OVERSIGHT CPT-7		OVERSIGHT FIRM EBASCO ENVIRONMENTAL	
LOCATION CPT 7 A/M Area Southern Sector		DATE 1/5/93	PAGE 1 of 2

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
7:30		Went to badging area to meet Bryan Fisk with paper work for badging. Bryan was not there.
8:00		Went to Barca well house, ARA was still there, receiving a cone. Bryan was at the machine shop.
10:30		Leave Barca to go to the location of CPT #7
11:15	11:45	Begin to push a pilot hole down to 20 feet to get past the soft sand.
11:45	12:30	Environmental Monitoring Testing. Drillers could not get their water truck started.
1:00	2:00	ARA pushed a 2 inch pipe casing down to six feet then pushed the mud pit casing which is 8" pipe down 2 feet around the outside of the 2" casing. The thought is to drill through the 2 inch casing which will prevent the sand from blowing out at the surface.
2:30		Began drilling the hole for CPT #7 - the casing idea appears to have worked on this particular hole as the drilling is progressing rapidly. 3:00 - 23' ft. 3:30 - 60 ft.
3:45		reach confining layer at ~ 72 ft. drilling hard through the top 1 ft. then easier for 9 ft then much easier.
4:05		complete with drilling at 89 ft.
4:40		all the drill rock had been removed from the hole.
5:11		Begin down the hole with the Cone - resistance was encountered at 55 ft of 3,000 to a high of 6,000 psi tip pressure when the cone got below the confining zone the tip pressure dropped back down to 200-300 psi.

TECHNICAL OVERSIGHT SIGNATURE

David L. Sterling

DATE 1/5/93

BUILDING SUBCONTRACTOR

Phase II Core Penetrant

A/M AREA - SOUTHERN SECTOR

CPT-7

D. STEINING

EBASCO ENVIRONMENTAL

DATE 1/5/93

97000 351500

LOCATION

START	STOP

DESCRIPTION OF ACTIVITIES; REMARKS	DATE	TIME	LOCATION	PERSONS	REMARKS
...	...	...	...	...	...

The right cut of the gene was identical to the previous
 some information for this depth at 23' the
 top pressure ~~at~~ went to 2800 psi which is the
 same as the previous pusher. The cone had moved off
 line and missed the opening drilled through the
 confining zone. Apparently the hole through the
 sand layers open up more than that through the
 confining zone. The hole is close to 2 inches
 in diameter and the cone records are 1.4" in diameter.
 The cone only had to be off by more than 1/2 a
 diameter and to miss the hole on approximately
 7" in a 28" hole.
 When APT missed the hole in the first layer
 which they can pick through, then they were guaranteed
 to miss the ~~top~~ lower hole. The upper
 cone always confirming zone. And then the hole off coast

TECHNICAL OVERSIGHT SIGNATURE

1) Card Reading

DATE JAN 5, 1993

DAILY ACTIVITIES REPORT

PROJECT Phase IV Cone Penetration		DRILLING SUBCONTRACTOR ARA	
A/M AREA- SOUTHERN SECTOR		DRILLER Wayne Russell	
WELL NUMBER CPT-7	TECHNICAL OVERSIGHT D. Sterling	OVERSIGHT FIRM EEP	
LOCATION CPT #7 N97000 E51500 S.R.S.		DATE 1/6/93	PAGE 1 of 2

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
7:00		Arrive at the site and discuss the potential problems and solutions. It was decided that the larger diameter rods may be a better ~~last~~ choice to go back down the hole after it has been drilled. The larger rods have less room to move in the hole as they are 1.7 inches diameter and the would tend to flex less. ARA did not want to go down the same hole and drill it again as it may only surface to open the sidewalls up even more. They are going to push a pilot hole down to 74 feet with the 1.7" diameter then drill or seam the hole with the drill system, and drill through the confining zone.
		To change rods the 1.4" rods had to be unstrung and the 1.7" rods strung on the CPT cable. This operation required approximately 3.5 hours.
10:05		ARA ~~do~~ begins to push the pilot hole while unstrung the 1.4" rods, as the 1.7" rods are removed from the hole they are placed on the CPT cable. Hole Complete
12:30		Begin pushing the 2" surface casing for the next attempt at CPT #7
9:00		Bob Van Pelt came out to check on the operation and stated that if this attempt can not be completed then he wants to take a sample above the "green clay" confining zone.
3:10		ARA begins to drill the hole with the drill system, at approximately 30 feet the mud pump stopped pumping. After repeated attempts to get the pump ~~primed~~ primed

TECHNICAL OVERSIGHT SIGNATURE David SterlingDATE 1/6/93

DAILY ACTIVITIES REPORT

PROJECT PHASE II CONE PENETRATION		DRILLING SUBCONTRACTOR ARA	
A/M AREA - SOUTHERN SECTOR		DRILLER WAYNE RUSSEL	
CELL NUMBER CPT-7	TECHNICAL OVERSIGHT D. STERLING	OVERSIGHT FIRM EBASCO ENVIRONMENTAL	
LOCATION N97000 E51500 S.R.S.		DATE 1/6/93	PAGE 20/2

[illegible]

TECHNICAL OVERSIGHT SIGNATURE

David H Sterling

DATE 11/6/93

DAILY ACTIVITIES REPORT

PROJECT		Cone Penetration Testing		DRILLING SUBCONTRACTOR		APR	
ELL NUMBER		CPT-7		DRILLER		Wayne Russel	
TECHNICAL OVERSIGHT		D. STERLING		OVERSIGHT FIRM		EED	
LOCATION		CPT #7 N97000 E51500 S.R.S		DATE		PAGE 1 of 1	
START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS					
7:00		Arrive at the site and APR is met here					
8:00		APR arrives two of the APR personnel are sick, which is why they were late arriving.					
8:30		They tore apart the pressure pump again and found the valves had sand and pine needles in them again. The pumps were put back together and an attempt was made to circulate the mud in the mud tank without pumping. Driving the drill bit the pump worked for 3-4 minutes then stopped again. APR is trying to come up with an answer but they are running out of excuses and time.					
10:30		Bob Van Pelt and Neil C'Halloran come out again. Bob wants to grout the holes that are open at CPT #9 and move on to CPT #13. He has had enough with this hole and does not want to waste any more time or money.					
11:30		APR begins to put the grout rods down the hole they are presently over.					
1:30	3:00	Complete with grouting of the first hole					
3:00	4:30	Pull casing and prepare to move to the next hole					

TECHNICAL OVERSIGHT SIGNATURE

DATE 11/19/92

DAILY ACTIVITIES REPORT

PROJECT Cone Penetrometer M Area Southern Sector		DRILLING SUBCONTRACTOR ARA	
ELL NUMBER CPT-7		DRILLER Wayne Russell	
TECHNICAL OVERSIGHT D. Sterling		OVERSIGHT FIRM F & D	
LOCATION N97000 E51500		DATE 1/08/93	PAGE 1 OF 1
START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS	
8:00		ARA moved to mount the second CPT hole to grout it. As the pulled forward to align the truck the front end of the truck sank into the wet earth. Rain for the last week has made the area very soft.	
8:30		ARA had to go out to get wood to put under the tires to get out of the hole.	
11:00	11:45	ARA was able to get the truck out and align to push back the grout rock.	
12:00		Going down to the grout hole.	
1:30		Began to grout the hole, it is taking a large quantity of grout to fill the hole.	
	2:30	The hole required a total of 49 gallons of grout.	
	4:30	Moved on to hole CPT #13 which is over by the M Area basin.	

TECHNICAL OVERSIGHT SIGNATURE

DATE 7/8/93

DAILY ACTIVITIES REPORT

PROJECT		DRILLING SUBCONTRACTOR	
Cone Penetration Phase v Al Marra Southern Sector		ARA	
WELL NUMBER		DRILLER	
CPT # 13		Wayne Russell	
TECHNICAL OVERSIGHT		OVERSIGHT FIRM	
D. Sterling		EED	
LOCATION		DATE	PAGE
N 102250, E 43500		1/11/92	1 of 1
START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS	
7:30		Arrived at location 13 - the rods had been left in the hole from the push on Saturday 1/9/92. The hole had been pushed to 115' with the cone penetrometer, then the sampling rods were inserted. The sample rods were left in the ground over the Sunday.	
8:30		There was still no water in the hole at 115'. The rods were removed and the CPT cone will be pushed on down to ~160' another sample will be taken at that depth.	
9:30		Began inserting CPT rods in the existing hole. At approximately 55 ft the tip resistance began to increase to ~6000 psi. It continued in this area from 55' to 85' at which point the rods broke at approximately 2 ft below the surface. Dug down to replace the broken rod.	
10:00	11:00	Putting existing rods down the hole to grind the hole able to push the gravel rod completely to 115'.	
1:15	2:30	Begin grouting the hole.	
2:45	4:15	Complete with grouting.	

TECHNICAL OVERSIGHT SIGNATURE

DATE 4/11/93

PROJECT Cone Penetration Testing		DRILLING SUBCONTRACTOR ARA	
Southern Sector - A/M Area		DRILLER Wayne Russell	
WELL NUMBER CPT #13-2	TECHNICAL OVERSIGHT D. Sterling	OVERSIGHT FIRM EED	
LOCATION CPT #13-2 N102250 E43500 S.R.S.		DATE Jan. 12, 1993	PAGE 1 of 1

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
7:00	8:00	Calibration
8:25		Begin to push the second attempt at CP 13 - resistance encountered at $\approx 60'$ - 4,000psi. 110' - 115' 8,000-10,000psi - Water @ 132'
	10:00	Stop with the push at 152.8 ft. which should be just above the "green clay" confining layer. This is the level at which B. Van Pelt wants to take the first water sample. B. Van Pelt wants a second one at a level below the confining zone if possible.
10:35	11:14	Removing the cone rods in order to return down the hole with the sample rods.
11:45		Insertion of the sampling rods begins at 12:00 while going down the hole. A string of 60 feet of rods slipped out of the barrel clamp and fell into the hole.
	2:00	ARA was able to go down the hole with more rods and attach to the 60 feet of rods which were chopped down the hole. ARA was able to retrieve the entire string of rods. Rods were removed - steamed and then returned down the hole.
	2:40	Began putting the rods back down the hole. They pushed the cone sampling tubes with a disposable tip on it down to 136.8 feet at which point they met
	4:00	refusal in a clay layer which the piezometer had been able to penetrate. This depth is just below the water table though and so a sample was attempted. The tight formation though did not have any water. The rods were left in so see if water would accumulate during the night.

TECHNICAL OVERSIGHT SIGNATURE

D. Sterling

DATE Jan. 12/93

PROJECT Cone Penetration Testing		DRILLING SUBCONTRACTOR ARA	
Southern Sector - A/M AREA		DRILLER Wayne Russel	
WELL NUMBER CPT*13-2	TECHNICAL OVERSIGHT Dr. Sterling	OVERSIGHT FIRM EED	
LOCATION CPT # 13-2 N102250 E43500 S.R.S.		DATE Jan. 13 1993	PAGE 1 of 2

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
7:00		Arrive on site to check the hole for water accumulation. There is still no water in the hole. After discussions with Balkan Pelt, who wanted to pull the rods and go back with the piezocane to try and open the hole again then go back with the sample rods. The ARA Vermont office did not feel comfortable doing this as there were already two stoppable tips in the hole and they had broken a core at this location on Monday.
9:30		Begin to graft the hole using the sampling rods
	11:15	which were already in the hole. Complete with the grafting operation
11:30	12:00	Steam cleaning the rods
12:30		Begin a third hole with the piezocane. Pushed down to 156.4 feet at this point the tip pressure went up to 13,000 psi indicating the potential surface of the confining unit hole was terminated at this point and a water sample will be attempted.
	2:30	Removed the piezocane rods from the hole
3:15		Replacing the sampling tubes to 140 ft
	5:00	Checked for water, there was no water in the hole

TECHNICAL OVERSIGHT SIGNATURE

TECHNICAL OVERSIGHT SIGNATURE David A. Testing

DATE 1/13/93

DATE 1/13/93

DAILY ACTIVITIES REPORT

PROJECT Cone Penetration ALM Southern Sector		DRILLING SUBCONTRACTOR ARA	
WELL NUMBER CPT-13-3		DRILLER Wayne Russell	
TECHNICAL OVERSIGHT D. Sterling		OVERSIGHT FIRM EED	
LOCATION CPT # 13-3 N102250 E43500 SRS		DATE 1/13/93	PAGE 1 OF 1

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
7:30		the sample rods left in the ground overnight show no sign of water in the hole. This is below the interpreted water table however it is in a "tight clay zone" which often does not produce water easily.
8:30		Discussion with B. Van Pelt, Bob does not want to lose the hole and wants to attempt to go down with the piezocone again and then try to get deeper with the hydrocone (sampling rods).
9:00		ARA main office does not want to go down the hole again with the piezocone because of the problem of breaking rods in the unconfined sands at the surface.
9:15		Begin grouting through the sample rods as they removed them.
12:45	12:30	Pushing the third attempt at CP-13 with the piezocone were able to reach 156.4 ft. At this point the tip pressure went to 13,000 psi the ARA operator was afraid to push any harder because of unconfined clays above this layer. This probably indicated the "Green Clay Confining zone" anyway.
3:00		Removing cone and return with the sample rods.
4:30		No water in the hole at this time will wait till morning.

TECHNICAL OVERSIGHT SIGNATURE

David R. Sterling

DATE

1/13/93

DAILY ACTIVITIES REPORT

[illegible]

DAILY ACTIVITIES REPORT

[illegible]

TECHNICAL OVERSIGHT SIGNATURE

Bruce A. Ruabe

DATE 2/11/93

DAILY ACTIVITIES REPORT

PROJECT PHASE I CONE PENETROMETER INVESTIGATION		DRILLING SUBCONTRACTOR A.R.A.	
A/M AREA - SOUTHERN SECTOR		DRILLER WAYNE RUSSELL	
WELL NUMBER CPT #18	TECHNICAL OVERSIGHT RAABE, BRUCE	OVERSIGHT FIRM ERASCO ENVIRONMENTAL	
LOCATION S.R.S. AIKEN CO., S.C. N96000 E50000		DATE 2/12/93	PAGE FRIDAY 1 of 1

[illegible]

H&S - Tom Moore

TECHNICAL OVERSIGHT SIGNATURE

Bruce A. Peabe

DATE 2/12/93

DAILY ACTIVITIES REPORT

[illegible]

TECHNICAL OVERSIGHT SIGNATURE

Bruce A. Roabe

DATE 2/16/93

DAILY ACTIVITIES REPORT

[illegible]

TECHNICAL OVERSIGHT SIGNATURE

Bruce A. Ruabe

DATE 2/17/93

DAILY ACTIVITIES REPORT

[illegible]

TECHNICAL OVERSIGHT SIGNATURE: *Bruce A. Kase*

DATE 2/18/93

DAILY ACTIVITIES REPORT

PROJECT PHASE V CONE PENETROMETER INVESTIGATION		DRILLING SUBCONTRACTOR A.R.A.	
A/M AREA - SOUTHERN SECTOR		DRILLER JOHN CLARK	
WELL NUMBER CPT #18	TECHNICAL OVERSIGHT RAABE, B.	OVERSIGHT FIRM EBASCO ENVIRONMENTAL	
LOCATION S.R.S.	N96000 AIKEN COUNTY, S.C. E 50000	DATE 2/19/93	PAGE FRIDAY 1 OF 1

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
7:05	7:20	ARRIVE ONSITE - CLEAR, 28°C - MUD PUMP BATTERY IS DEAD - CHARGE BATTERY
7:20	8:35	DRILLER LEFT FOR MORE WATER / CALL BOB VAN PELT WITH REPORT
8:35	9:32	DRILLER RETURNS - CARB ON TRUCK FROZEN - HAD TO THAW / START MUD PUMP
9:32	11:18	ENTER HOLE WITH DRILLEX - GO TO 153'
11:18	11:33	DRILL TO 170.037 (17' ADDITIONAL DRILLING)
11:33	12:30	THICKEN MUD - LOST CIRCULATION AFTER MIXING 2ND BATCH OF BARGOID BENTONITE. TONEY (SAMPLER W/ W) STOPPED BY TO CHECK PROGRESS
12:30	13:00	LUNCH BREAK WHILE MIXING MUD. INFORMED A PERSON STOPPED BY LOOKING FOR EBASCO AND WOULD RETURN. HE DID NOT IDENTIFY SELF. BEGAN PULLING DRILLEX RODS OUT OF HOLE
13:00	15:56	LOST 100' OF PIPE (ESTIMATED) DOWN HOLE WHEN USE SLIPPED GOING BACK IN HOLE TO FISH FOR AND STRING INTO DROPPED PIPE FIRST ATTEMPT UNSUCCESSFUL - GO BACK IN HOLE
15:56	—	MEASURE DEPTH TO STRING - 73' - PULL OUT OF HOLE WITH 2ND ATTEMPT
16:10	16:25	CALL BOB VAN PELT AND INFORM OF PROGRESS
		TALK TO DAVE TIMION (ARA) - HE WANTS TO KNOW HOW 2ND ATTEMPT WENT BEFORE GROUTING
16:30	17:00	DRIVE BACK TO RIG - JOHN CLARK INFORMS US THEY DID NOT RETRIEVE LOST PIPE
17:00	17:46	JOHN CLARK DRIVES IN TO WELL HOUSE TO TALK WITH DAVE TIMION - UPON RETURN HE RELAYS THAT THEY ARE EXPLORING OTHER ALTERNATIVES AND WE NEED TO CALL HIM AT 9:00 PM (21:00) AT HIS MOTEL
17:46	18:10	POLICE SITE, GATHER NOTES, DISCUSS OPTIONS
18:12		LEAVE SITE
21:02	21:30	TALK WITH JOHN CLARK AT HIS MOTEL. ARA DECIDES BEST OPTION IS TO BEND A ROD 1/2" AND TRY TO GO BACK IN AND FISH FOR LOST STRING. WILL FABRICATE IN MORNING AT WELL DRILLERS SHOP (STEVE REESE) AND MEET AT SITE.
ARA/RIG DOWN TIME = 5 HRS (SINCE LOSING PIPE)		
HEALTH & SAFETY - MIKE CRUZ		

TECHNICAL OVERSIGHT SIGNATURE Bruce A. Raabe

DATE 2/19/93

PROJECT PHASE V CONE PENETROMETER INVESTIGATION		DRAWING SUBCONTRACTOR A.R.A.	
A/M AREA - SOUTHERN SECTOR		DRILLER JOHN CLARK	
ILL. NUMBER CPT #18	TECHNICAL OVERSIGHT RAABE B.	OVERSIGHT FIRM EBASCO ENVIRONMENTAL	
LOCATION N96000 E50000 S.R.S. AIKEN COUNTY, S.C.		DATE 2/20/93 SAT.	PAGE 1 OF 1

ARA RIG DOWNTIME = 6 HRS

TECHNICAL OVERSIGHT SIGNATURE Bruce A. Rader

DATE 2/20/93

PROJECT PHASE V CONE PENETROMETER INVESTIGATION		DRILLING SUBCONTRACTOR A.R.A.	
A/M AREA - SOUTHERN SECTOR		DRILLER WAYNE RUSSELL / ROBERT WILSON ("WIL")	
WELL NUMBER CPT #18-2	TECHNICAL OVERSIGHT RAABE, B.	OVERSIGHT FIRM EBASCO ENVIRONMENTAL	
LOCATION N46000 E50000 SRS AIKEN COUNTY, S.C.		DATE 3/8/93 MON	PAGE 1 OF 1

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
6:38	----	ONSITE AT EBASCO OFFICE TO MEET HEALTH & SAFETY OFFICER (AL GALLOS) ^{JOHN WALKER}
6:39	7:00	TRANSFER EQUIPMENT, ENTER OFFICE - LEAVE FOR SRS AT 7:00
7:30	-----	ARRIVE ONSITE AT SRS - CPT 18 - SEARCH FOR APA RIG AT CPT 18
-----	-----	INTO TOWN FOR SPARE PARTS FOR STEAM CLEANER & RODS
8:05	8:10	LOCATE CREW AT WELL HOUSE - CALIBRATE EQUIPMENT ON TRUCK, MASTER PROBLE
8:10	8:15	TALK TO SCOTT MCKILLIP AT EBASCO
8:15	8:25	TALK TO BOB VAN FELT W/ WESTINGHOUSE - INFORM HIM OF ACTIVITIES
8:30	8:35	TALK TO JIM SHENN W/ A.R.A. - POOR COMMUNICATION FOR CREW & EBASCO
8:35	8:57	TALK TO BOB VAN FELT ABOUT DRILLING PROCEDURES { DRILL (RUSH) 4 MORE HOLES, NO DRILLER, 1 ADDITIONAL TRY @ CPT 18
8:57	9:01	TALK TO JIM SHENN ABOUT DRILLING PROCEDURE - HE MAY VISIT OFFICE NEXT WED.
-----	9:25 ^{RAK} 11:25	RELAY INFORMATION TO SCOTT MCKILLIP
1:25	12:45	WAYNE RUSSELL ARRIVES BACK WITH PARTS
12:45	-----	CLEAN AND BORE GROUT OUT OF RODS, PICK UP ADDITIONAL RODS AT WAREHOUSE
13:20	13:55	R. WILSON RUNS TO TOWN FOR SPARE GENERATOR TO RUN STEAM CLEANER (OTHER MODEL) (IS TOO WEAK)
-----	13:55	MOVE CPT RIG TO CPT #18-2, SET UP SITE AND EQUIPMENT, #18-1 IS GROUTED
13:55	15:20	R. WILSON ARRIVES WITH MORE POWERFUL GENERATOR
15:20	-----	PROBLEMS WITH CONE TIP CALIBRATIONS - RECALIBRATE CPT CONE TIP
15:20	-----	BEGIN PUSHING CONE TIP ON CPT #18-2
	-----	MADE 50 FEET IN 20 MIN. (150 FPM)
	-----	MADE 82 FEET IN 30 MIN. (164 FPM)
	-----	MADE 115 FEET IN 45 MIN (153 FPM)
	-----	MOLE MODERATELY TIGHT FROM 104 TO 118' (MAX. TIP PRESS = 7000 #)
16:16	16:31	10,500# @ 129' - UP TO 15,000# REFUSAL AT 129.6' 1500 psi at hydraulic CYCLE TIME: 15 min
16:32	16:35	INFORM BOB VAN FELT OF REFUSAL - DECISION TO MOVE ON TO NEXT LOCATION (#6)
16:35	17:45	PULL CPT RODS OUT OF HOLE WHILE STEAM CLEANING
17:45	-----	LEAVE SITE AFTER FINDING CPT #6 - NO CLEAR ACCESS TO STAKE, SLASH PILE
	-----	IS TOO HIGH FOR TRUCK TO CLIMB

NEW PHONE # (RIG) 803-640-1400 CERTIFIED DRILLER: BOB HEUSSY ^{GRAVES ENV.}

TECHNICAL OVERSIGHT SIGNATURE Bruce A. Raabe DATE 3/8/93

DAILY ACTIVITIES REPORT

PROJECT						DRLING SUBCONTRACTOR
<u>PHASE V COLE PENETROMETER INVESTIGATION</u>						A.R.A.
<u>A/M AREA - SOUTHERN SECTOR</u>						DRILLER WAYNE RUSSELL
JOB NUMBER		TECHNICAL OVERSIGHT				OVSERSHT FIRM
CPT #18-2 / CPT #6	RAABE, B.				EBASCO ENVIRONMENTAL	
LOCATION #18-2 N96000 E50000						DATE
#6 N9800 E52125 AIKEN COUNTY, S.C. SRS					3/9/93 TUES.	PAGE 1 OF 1
START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS				
7:15	10:20	ARRIVE ONSITE, BEGIN ENTERING WELL WITH GROUT RODS CPT#18-2				
10:00	10:15	(ORG TRIED TO CALL AT 8:00 AM - NO ANSWER) CALLED BOB VAN PELT TO INFORM OF PROGRESS - LEFT MESSAGE 28 BAR				
10:20	11:00	FINISH GROUTING OUT OF HOLE, STEAM CLEAN RODS, CLEAN UP SITE (GROUT MIXTURE: 28 GAL.)				
11:00	11:30	MOVE TO CPT #6 ARRIVE AT SITE - CAN'T GAIN ACCESS TO LOCATION DUE TO				
11:30	11:45	DIRTY SLASH / BERM. CALL BOB VAN PELT - NOT IN, LOCATE NEIL O'HALLORAN - HE WILL				
-- --	-- --	CALL PIG BACK AT 12:00 - CREW TAKES LUNCH BREAK (11:45 ~ 12:15)				
11:45	12:30	CONTINUOUS ATTEMPTS TO CALL NEIL FAIL - NO CALL BACK FROM HIM				
12:30	14:00	STANDBY AT CPT #6 - TONEY DWARKE (WESTINGHOUSE) ARRIVED @ 1300 LOOKED FOR ACCESS ROAD-GAVE ORDER TO MOVE LOCATION @ 14:00 (DOWNGRADING TO MSB-33 ON 180')				
		INFORMED TONEY WE COULD NOT FIND CPT #21 WHILE ON STANDBY AND WILL NEED GUIDANCE TO CPT #21 & CPT #11 (CHANGE OF LOCATION AS PER VAN PELT)				
		-- ALL SITES NEED BETTER FLAGGING AND ACCESS-SUGGEST THIS ALL SHOULD BE ACCOMPLISHED IN EARLY STAGES OF TASK COMMUNICATION PROBLEMS BY PHONE				
14:00	15:20	MOVE RIG ONSITE, RIG UP, CALIBRATE CPT				
15:20	16:00	ENTER GROUND PUSHING CPT				
16:00	16:15	AT 72' HIT HARD SPOT WITH 23,000# MAX TIP PRESSURE WHILE CYCLUNG 1800# ON HYDRAULICS - TRUCK WAS LIFTING - HIT "REFUSAL"- SAME AS CPT #7 LOCATED NEARBY				
16:15	17:50	PULL CPT RODS OUT WHILE STEAM CLEANING, WILL SET 20' OF ROD IN HOLE AND GROUT OUT IN THE MORNING				
17:55		LEAVE SITE				
STANDBY TIME 12:30-14:00 (1.5 hrs)						

TECHNICAL OVERSIGHT SIGNATURE Bruce A. Ruabe

DATE 3/9/93

PROJECT PHASE I CONE PENETROMETER INVESTIGATION		DRILLING SUBCONTRACTOR A.R.A.	
A/M AREA - SOUTHERN SECTOR		DRILLER WAYNE RUSSELL	
ELL NUMBER CPT#6 & CPT#11	TECHNICAL OVERSIGHT JAVANEI, K.D.	OVERSIGHT FIRM EBASCO ENVIRONMENTAL	
LOCATION #6 N47800/E51500 #11 N102000/E45700	S.R.S. Aiken County, SC	DATE 3/10/93 WED	PAGE 1/1

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
7:30	7:40	ARRIVE ON SITE, MIX GROUT
7:40	8:35	FINISH GROUTING OUT HOLE, STEAM CLEAN RODS, CLEAN UP AREA
8:35	9:35	WAIT FOR BOB VAN PELT AT WELL CLUSTER MSB 33 PER INSTRUCTIONS LAST NIGHT (B. RAABE CALLED VAN PELT).
9:35	10:00	BOB VAN PELT & TONY DUNBAR ARRIVE, TAKE CREW TO NEW LOCATION FOR CPT #11. (NEAR WELL CLUSTER MSB 17). VAN PELT REQUESTED DEPTH OF $\pm 175'$ TO GET SAMPLE FROM LOWER CONGAREE. HOWEVER IF REFUSAL IS HIT AT $\pm 150'$ HE WILL ACCEPT SAMPLE FROM THAT ELEVATION. IF REFUSAL IS REACHED WELL ABOVE $150'$ THEN OFFSET $\pm 25'$ FROM ORIGINAL POINT TO RETRY.
10:00	10:45	SET UP EQUIPMENT @ NEW LOCATION, CALIBRATE CONE TIP
10:45	11:15	H&S EQUIPMENT NOT WORKING PROPERLY. A. GALLOGLY ON HIS WAY OUT WITH H&S REPLACEMENT EQUIPMENT. CREW TAKES LUNCH BREAK.
11:15	12:35	
11:35		A. GALLOGLY ARRIVES, BEGIN CPT #11
	13:00	REACH 170.1' DEPTH, ~~SAMPLE~~ TONY DUNBAR ARRIVED TO ~~100'~~ SAMPLE. T. DUNBAR LOCATED NEXT CPT
13:00	14:00	REMOVE CONE PEN FROM HOLE
14:00	15:30	PLACE SAMPLING TUBES IN HOLE
15:30	16:15	RETRIEVE TWO SAMPLES @ 170.1' ELEV & ONE BLANK (T. DUNBAR)
16:15	18:10	GROUT HOLE, STEAM CLEAN RODS
18:10		LEAVE ~~FOR~~ SITE CPT AREA (PARKED $\frac{1}{2}$ MILE NEAR M BASIN)
		★ GROUT VOLUME = 45 gals
		JOHN WALKER ON SITE AS H&S SUPERVISOR

TECHNICAL OVERSIGHT SIGNATURE Kathleen D. Javaheri DATE 03/10/93

DAILY ACTIVITIES REPORT

PROJECT PHASE II CONE PENETROMETER INVESTIGATION		DRILLING SUBCONTRACTOR A.R.A.	
A/M AREA - SOUTHERN SECTOR		DRILLER WAYNE RUSSELL	
WELL NUMBER CPT #20	TECHNICAL OVERSIGHT JAVANERI, K. D.	OVERSIGHT FIRM EBASCO ENVIRONMENTAL	
LOCATION S.R.S. N100000 E40000 Aiken County, SC		DATE 3/11/93 THURS	PAGE 1 of 1

START	STOP	DESCRIPTION OF ACTIVITIES; REMARKS
7:00	8:35	~~ARRIVE~~ MOVE ARRIVE ON SITE, MOVE TO NEW LOCATION, SET UP, CALIBRATE EQUIPMENT
8:35	---	BEGIN ENTERING WITH CPT MADE 79' IN 40 MINUTES
---	---	AT 88' TIP PRESS INCR. TO 6700# AT 89' 12,500# - CYCLED THROUGH
---	9:25	MADE 100' DEPTH - CONTINUE PUSHING AT 115' - HARD STREAK (10000#) BUT CYCLED OK
9:25	9:42	HIT 130' AT 9:42 (MADE 30' IN 17 MINUTES)
		DISSIPATION TEST AT 135' (8 PSI WILL GIVE 10' OF H ₂ O & need 2' to get above that) (NEED 8 PSI STATIC to push H ₂ O INTO SCREEN) 4.5 min / 8 psi and DROPPING.
		DISSIPATION TEST AT 136', 138' BOTH APPEAR DRY
10:17	10:18	DISSIPATION TEST AT 144' APPEARS TO BE BEST ZONE TO TRY FOR WATER
10:18	10:24	CONTINUE PUSHING TO 162' / COLE TIP PRESSURE 23,800# - REFUSAL MAX. HYDRAULIC 1500 IF
10:30	10:35	ATTEMPT TO CALL BOB VAN PELT - LEFT MESSAGE
10:35	10:40	BEN MCWHORTER STOPPED BY TO CHECK ON SAMPLING / TALKED TO TONEY DUNBAR
10:45	11:30	PULL CPT RODS OUT OF HOLE
11:30	12:00	RIG UP WATER SAMPLING TIP AND RODS
12:00	12:58	GOING IN HOLE WITH SAMPLING RODS - ARA ONLY HAS 1 SAMPLING TIP LEFT (NONE IN WAREHOUSE)
12:58	13:45	OPEN SAMPLER AT 163' - WAIT FOR WATER TO INFILTRATE
13:45	13:55	BOB VAN PELT ARRIVED ON SITE AS WELL AS TONEY DUNBAR
13:55	14:30	BOB VAN PELT / BRUCE RAABE COLLECTED 3 WATER SAMPLES (40ml VIALS) & 1 FIELD BAK
14:45	14:50	BEN MCWHORTER ARRIVED - CHECKED ON SAMPLING - BEN, TONEY & BOB LEAVE SITE
14:50	15:53	BEGIN PULLING SAMPLE RODS, START CLEANING ^{BAR} AND GROUTING
15:53	16:07	STEAM CLEANING SAMPLE RODS & EQUIPMENT
16:07	16:18	CLEAN UP CPT AREA
16:30		LEAVE CPT AREA
		★ GROUT VOLUME 42 gals

TONEY DUNBAR - SAMPLER 803-644-6770 / BEN MCWHORTER	
JOHN WALKER ON SITE AS H'S SUPERVISOR	

TECHNICAL OVERSIGHT SIGNATURE

Ruthen D. Javaneri
Bruce A. Raabe

DATE 3/11/93

APPENDIX C

CONE PENETROMETER FIELD REPORT

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAA,NNN,AA) 01 CP	
GENERAL			
Project Name Phase V Cone Penetrometer A/m Area Southern Sector			
Project Manager (last name, first initial) VAN PELT, R.		Department WSRC - ERD	
Type of Cone Penetrometer Test PIEZOCONE / HYDROCON	County AIKEN CO., S.C.	Location Description Open field behind the admin. service shops area	
SRS North Grid Coordinate 104000	SRS East Grid Coordinate 52750	Ground Elev. Est. 340'	Latitude (decimal degrees)
TESTING & SAMPLING			
Test Start Date 10/5/92	Test Comp Date 10/5/92	Total Penetration Depth 117 ft.	Interpreted Water Table Level Ground Water Samples Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample
Target Depth 180'			
Cone Penetrometer Company Applied Research Associate (ARA)	Cone Operator Doug McIntosh	Oversight Company Ebasco Environ.	Oversight (last name, first initial) Sterling, D
Drilling & Sampling Comments at 117 ft. the hydraulic pressure topped out at 2200 psi. Tip pressure was only 1700psi. but total resistance was greater than push pressure.			
LOGGING			
Log Type ☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity Other Logs (list)			
ABANDONMENT			
Date Abandoned 10/5/92	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume .163 gal / ft. 19 gal.	Actual Grout Volume 25 gal.
Report Prepared By D. Sterling			Date Report Prepared 10/5/92

CONE PENETROMETER FIELD REPORT

TEST HOLE NUMBER (AAA.NNN.AA)

02

CP

GENERAL

Project Name

Phase V Cone Penetrometer Area A/m Southern Sector

Project Manager (last name, first initial)

VAN PELT, R.

Department

WSRC-ERD

Type of Cone Penetrometer Test

PIEZOCONE/HYDROCONE

County

Aiken, S.C.

Location Description

In Pine Tree - 300yd. off access road

SRS North Grid Coordinate

103875

SRS East Grid Coordinate

52750(?)

Ground Elev.

Est. 310'

Longitude (decimal degrees)

Latitude (decimal degrees)

TESTING & SAMPLING

Test Start Date

10/6/92

Test Comp Date

10/6/92

Total Penetration Depth

92 ft.

Interpreted Water Table Level

Ground Water Samples Taken?

☐ YES ☒ NO

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Target Depth 180'

Cone Penetrometer Company

ARA

Cone Operator

Doug McIntosh

Oversight Company

Ebasco Environ.

Oversight (last name, first initial)

Sterling D

Drilling & Sampling Comments - the layer hit @ 92' F_t does not act like a small ~~one~~ obstruction - however the ^{agreement} ~~contact~~ between EED + WSRC was for up to three times per point. Tip Pressure ~ 20,000 psi at refusal.

LOGGING

Log Type

☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity

Other Logs (list)

ABANDONMENT

Date Abandoned

10/6/92

Method of Abandonment

☐ Tremie Pipe ☒ CP Rod-Grouting Method

Theoretical Grout Volume

15 gal.

Actual Grout Volume

15 gal.

Report Prepared By

David Sterling

Date Report Prepared

10/6/92

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAA.NNN.AA)	
		02B	CP
GENERAL			
Project Name Phase V Cone Penetrometer A/m Area Southern Sector			
Project Manager (last name, first initial) VAN PELT, R.		Department WSRC-ERD	
Type of Cone Penetrometer Test PIEZOCONE / HYDROCON		County AIKEN, S.C.	
SRS North Grid Coordinate 103875	SRS East Grid Coordinate 52250	Ground Elev. Est. 310'	Longitude (decimal degrees) Latitude (decimal degrees)
TESTING & SAMPLING			
Test Start Date 10/08/92	Test Comp Date 10/8/92	Total Penetration Depth 108 ft.	Interpreted Water Table Level Ground Water Samples Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample
Target Depth 180			
Cone Penetrometer Company AAA		Cone Operator D. McIntosh	Oversight Company EED Oversight (last name, first initial) Sterling D.
Drilling & Sampling Comments - attempted to cycle when refusal was first encountered at 92 ft. were able to push through at 110 cycling for 15 minutes did not progress the tip any - the layer seemed to be cobbles - sleeve pressure was high and could indicate tip pushing off center - possibly break the cone. (8.62205)			
LOGGING			
Log Type ☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity Other Logs (list)			
ABANDONMENT			
Date Abandoned 10/8/92	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume 163 gal. ft³ 126 gal.	Actual Grout Volume 22 gal.
Report Prepared by D. civil & Sterling			Date Report Prepared 10/8/92

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAA.NNN.AA)	
			04
GENERAL			
Project Name Phase V Cone Penetration A/M Area Southern Sector			
Project Manager (last name, first initial) VAN PELT, R.		Department WSRC-ERD	
Type of Cone Penetrometer Test PIEZOCONE/HYDROKONE	County Aiken, S.C.	Location Description	
SRS North Grid Coordinate 100250	SRS East Grid Coordinate 51500	Ground Elev. EST. 205'	Longitude (decimal degrees) Latitude (decimal degrees)
TESTING & SAMPLING			
Test Start Date 9:30 10/16/92	Test Comp Date 1:30 10/16/92	Total Penetration Depth 133.5	Interpreted Water Table Level Ground Water Samples Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample
Target Depth 180'			
Cone Penetrometer Company ARA	Cone Operator D. McIntosh	Oversight Company Ebasco Environ.	Oversight (last name, first initial) Sterling, D
Drilling & Sampling Comments: push was fairly easy until 133.5'; at this point the tip pressure jumped instantly to 23,000 psi. Cycling for 10 minutes did not produce any progress - hole was terminated. Moving to another location.			
LOGGING			
Log Type ☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☐ Resistivity Other Logs (list)			
ABANDONMENT			
Date Abandoned 10/16/92	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume for 4" rods 0.126 gal./ft. Total 168 gal.	Actual Grout Volume 30 gal.
Report Prepared By David L. Sterling			Date Report Prepared Oct. 16 1992

SRS CONE PENETROMETER FIELD REPORT					TEST HOLE NUMBER (AAA.NNNAA)	
						05
GENERAL						
Project Name Phase V Cone Penetrometer A/M AREA SOUTHERN SECTOR						
Project Manager (last name, first initial) VAN PELT, R.				Department WSRC-ERD		
Type of Cone Penetrometer Test PIEZOCONE / HYDROCON		County AIKEN S.C.	Location Description off Road 2 1 mile back in the woods			
SRS North Grid Coordinate 99250		SRS East Grid Coordinate 53250	Ground Elev. EST. 223'	Longitude (decimal degrees)		Latitude (decimal degrees)
TESTING & SAMPLING						
Test Start Date 10/9/92		Test Comp. Date 10/9/92	Total Penetration Depth 108	Interpreted Water Table Level		Ground Water Samples Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type		Depth to Sample	Cone Penetrometer Test Type		Depth to Sample	Cone Penetrometer Test Type
Target Depth 180						
Cone Penetrometer Company ARA		Cone Operator D. McIntosh		Oversight Company Ebasco Environ.		Oversight (last name, first initial) Sterling D
Drilling & Sampling Comments - Had to cycle from 88' to 108' at times the tip pressure was up to 30,000 psi used water pumping to keep the grout line free however eventually it failed and the grout line plugged anyway. At 108' cycling did not progress the rod any further (attempted cycling at 108' for 15 min.)						
LOGGING						
Log Type ☒ Sieve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity Other Logs (list)						
ABANDONMENT						
Date Abandoned 10/9/92		Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method		Theoretical Grout Volume .163 gal/ft. 17.6 gal		Actual Grout Volume 19 gal
Report Prepared By (David R. Sterling)					Date Report Prepared 10/9/92	

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAA.NNN.AA)	
			06
GENERAL			
Project Name Phase V Cone Penetration A/M Area Southern Sector			
Project Manager (last name, first initial) VAN PELT, R.		Department WSRC-ERD	
Type of Cone Penetrometer Test PIEZOCONE/HYDROPHONE	County AIKEN S.C.	Location Description 1 MILE SSE OF A-01A OUTFALL	
SRS North Grid Coordinate 98.000	SRS East Grid Coordinate 52125	Ground Elev. EST. 230'	Longitude (decimal degrees) Latitude (decimal degrees)
TESTING & SAMPLING			
Test Start Date 10/20/92	Test Comp Date 10/20/92	Total Penetration Depth 115.8 ft.	Interpreted Water Table Level Ground Water Samples Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type Target Depth 180'	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample
Cone Penetrometer Company ARA	Cone Operator D. McIntosh	Oversight Company Ebasco Environ.	Oversight (last name, first initial) Sterling D
Drilling & Sampling Comments			
LOGGING			
Log Type ☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity			
Other Logs (list)			
ABANDONMENT			
Date Abandoned	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume 126 gal/ft. 14.6 gal.	Actual Grout Volume 20 gal.
Report Prepared By David H. Sterling		Date Report Prepared 10/20/92	

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAA.NNNAA)	
		06B	CP
GENERAL			
Project Name Phase V Cone Penetration A/m Area Southern Sector			
Project Manager (last name, first initial) VAN PELT, R.		Department WSRC-ERD	
Type of Cone Penetrometer Test PIEZOCONE/HYDROCONE		County AIKEN, S.C.	Location Description 25' feet off set of the original hole
SRS North Grid Coordinate 98.000	SRS East Grid Coordinate 52,125	Ground Elev. Est. 230'	Longitude (decimal degrees) Latitude (decimal degrees)
TESTING & SAMPLING			
Test Start Date 10/21/92	Test Comp Date 10/21/92	Total Penetration Depth ~~118~~ 119.2	Interpreted Water Table Level Ground Water Samples Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample
PIEZOCONE/HYDROCONE			
Cone Penetrometer Company ARA		Cone Operator D. McIntosh	Oversight Company Ebasco Environ. ERD Oversight (last name, first initial) Sterling D.
Drilling & Sampling Comments - First difficult layer encountered at 93 ft. - Tip 25,000psi cycling worked - continue to cycle and move slowly down. occasional seeing softer zones at 118.5 cycling was not producing any advancement continue to cycle as instructed by WSRC - rod broke after 10 min of cycling			
LOGGING			
Log Type ☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity Other Logs (list)			
ABANDONMENT			
Date Abandoned 10/21/92	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume 15 gals	Actual Grout Volume 90' of rod still in the hole 10 gals Date Report Prepared
Report Prepared By David J. Hestery			

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAA,NNN,AA)	
		CPT #6	CP
GENERAL			
Project Name PHASE II CONE PENETROMETER INVESTIGATION A/M AREA SOUTHERN SECTOR			
Project Manager (last name, first initial) VAN PELT, R.		Department WM/ERD	
Type of Cone Penetrometer Test PIEZOCONE/HYDROCON		County AIKEN S.C.	Location Description APPROX 80 YARDS SE OF MSB-33 WELL CLUSTER MOVED FROM ORIGINAL LOCATION - INACCESSIBLE
SRS North Grid Coordinate N98000	SRS East Grid Coordinate E52125	Ground Elev. EST. 230'	Longitude (decimal degrees) Latitude (decimal degrees)
TESTING & SAMPLING			
Test Start Date 3/9/93	Test Comp Date 3/10/93	Total Penetration Depth 72' - REFUSAL	Interpreted Water Table Level EST. LOWER CONCRETE AT 170' Ground Water Samples Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type PIEZOCONE/HYDROCON	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample
Cone Penetrometer Company A.R.A.	Cone Operator WAYNE RUSSELL	Oversight Company EBASCO ENVIRONMENTAL	Oversight (last name, first initial) RAABE, B.
Drilling & Sampling Comments HIT REFUSAL AT 72' - 23,000 # MAX. TIP PRESSURE, 1800 # ON HYDRAULICS THIS IS SAME REFUSAL LAYER AS NEARBY CPT #7			
LOGGING			
Log Type ☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity Other Logs (list)			
ABANDONMENT			
Date Abandoned 3/10/93	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume 0.126 GAL/FT ² 9 GAL	Actual Grout Volume 19 GAL
Report Prepared By BRUCE A. RAABE			Date Report Prepared 3/10/93

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAA,NNN,AA)	
			07
GENERAL			
Project Name Phase V Cone Penetration A/m Area Southern Sector			
Project Manager (last name, first initial) Van PELT, R.		Department WSRC-ERD	
Type of Cone Penetrometer Test Piezocone/Hydrocone		County AIKEN, S.C.	Location Description
SRS North Grid Coordinate 97000	SRS East Grid Coordinate 51,500	Ground Elev. EST. 255'	Longitude (decimal degrees) Latitude (decimal degrees)
TESTING & SAMPLING			
Test Start Date 9:15 a.m. 10/22/92	Test Comp Date 9:55 a.m. 10/22/92	Total Penetration Depth 72 ft.	Interpreted Water Table Level Ground Water Samples Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type Target Depth 180'	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample
Cone Penetrometer Company ARA		Cone Operator D. McIntosh	Oversight Company EED Oversight (last name, first initial) Sterling D
Drilling & Sampling Comments - push was relatively easy until 72 ft. Tip pressure jumped from 600psi to 20,000 psi. Cycling increased the tip pressure to 30,000 psi. Testing terminated before breaking another rod.			
LOGGING			
Log Type ☐ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☐ Resistivity Other Logs (list)			
ABANDONMENT			
Date Abandoned 10/22/92	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume 9.0 gal.	Actual Grout Volume 10.5 gal.
Report Prepared By David L Sterling		Date Report Prepared 10/22/92	

SRS CONE PENETROMETER FIELD REPORT

TEST HOLE NUMBER (AAA,NNN,AA)

07A-D

CP

GENERAL

Project Name

Phase V Cone Penetration A/M Area Southern Sector

Project Manager (last name, first initial)

VAN PELT, R.

Department

WSRC-ERD

Type of Cone Penetrometer Test

PIERCEONE / HYDROONE

County

AIKEN, S.C.

Location Description

SRS North Grid Coordinate

97000

SRS East Grid Coordinate

51,500

Ground Elev.

EST. 255'

Longitude (decimal degrees)

Latitude (decimal degrees)

TESTING & SAMPLING

Test Start Date

12/15/92

Test Comp Date

12/17/92

Total Penetration Depth

90 ft.

Interpreted Water Table Level

Ground Water Samples Taken?

☐ YES ☒ NO

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

CPT - 74 ft.

Driller Drill 74-90 ft.

Cone Penetrometer Company

ARA

Cone Operator

Wayne Russell

Oversight Company

Ebasco Environmental

Oversight (last name, first initial)

Sterling D

Drilling & Sampling Comments Cone was pushed to 74 ft. then the same hole was drilled out with a 1.7" drilllex drill.

LOGGING

Log Type

☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity

Other Logs (list)

ABANDONMENT

Date Abandoned

12/17/92

Method of Abandonment

☐ Tremie Pipe ☒ CP Rod-Grouting MethodTheoretical Grout Volume based on 2.0" hole after drilling - 163 gal/ft.
14.67 gal.

Actual Grout Volume

26 gal.

Report Prepared by

David H. Hurling

Date Report Prepared

12/18/92

CONE PENETROMETER FIELD REPORT

TEST HOLE NUMBER (AAA,NNN,AA)

07B

CP

GENERAL

Project Name

Phase V Cone Penetration A/M Area Southern Sector

Project Manager (last name, first initial)

VAN PELT, R.

Department

WSRC-ERD

Type of Cone Penetrometer Test

PIEZOCONE / HYDROCON

County

AIKEN, S.C.

Location Description

SRS North Grid Coordinate

97,000

SRS East Grid Coordinate

51,500

Ground Elev.

EST. 255'

Longitude (decimal degrees)

Latitude (decimal degrees)

TESTING & SAMPLING

Test Start Date 11:45

10/22/92

Test Comp Date 1:00

10/22/92

Total Penetration Depth

72

Interpreted Water Table Level

Ground Water Samples Taken?

☐ YES ☒ NO

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Target 180'

Cone Penetrometer Company

ARA

Cone Operator

D. McIntosh

Oversight Company

EED

Oversight (last name, first initial)

Sterling

Drilling & Sampling Comments hard layer at 72 &+ again cycled for 30 minutes, at with no advancement

LOGGING

Log Type

☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☐ Pressure (psi) ☒ Resistivity

Other Logs (list)

ABANDONMENT

Date Abandoned

10/22/92

Method of Abandonment

☐ Tremie Pipe☒ CP Rod-Grouting Method

Theoretical Grout Volume

9.0

Actual Grout Volume

16.0 gal

Report Prepared By

Dorinda Sterling

Date Report Prepared

10/22/92

CONE PENETROMETER FIELD REPORT

TEST HOLE NUMBER (AAA.NNN.AA)

07C-1

CP

GENERAL

Project Name

Phase V Cone Penetration A/M Area Southern Sector

Project Manager (last name, first initial)

VAN PELT, R.

Department

WSRC-ERD

Type of Cone Penetrometer Test

PIEZOCONE/HYDROCONC

County

AIKEN, S.C.

Location Description

SRS North Grid Coordinate

97,000

SRS East Grid Coordinate

51,500

Ground Elev.

Est. 255'

Longitude (decimal degrees)

Latitude (decimal degrees)

TESTING & SAMPLING

Test Start Date

1/5/93

Test Comp Date

1/6/93

Total Penetration Depth

90' ft.

Interpreted Water Table Level

Ground Water Samples Taken?

☐ YES ☒ NO

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

PIEZOCONE/HYDROCONC

Cone Penetrometer Company

ARA

Cone Operator

Wayne Russel

Oversight Company

Ebasco Environmental

Oversight (last name, first initial)

Sterling D.

Drilling & Sampling Comments

Hole was drilled to 90 ft. with rotary mud bit Driller System

LOGGING

Log Type

☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity

Other Logs (list)

ABANDONMENT

Date Abandoned

1/8/93

Method of Abandonment

☐ Tremie Pipe☒ CP Rod-Grouting Method

Theoretical Grout Volume

15 gallons

Actual Grout Volume

49 gallons

Report Prepared By

David H. Sterling

Date Report Prepared

01/8/93

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAA.NNN.AA)	
		07C2	CP
GENERAL			
Project Name Phase V Cone Penetration A/M Area Southern Sector			
Project Manager (last name, first initial) VAN PELT, R.		Department WSRC-ERD	
Type of Cone Penetrometer Test PIEZOCONE/HYDROCONE		Location Description AIKEN, S.C.	
SRS North Grid Coordinate 97.000	SRS East Grid Coordinate 51.500	Ground Elev. EST. 255'	Longitude (decimal degrees)
Latitude (decimal degrees)			
TESTING & SAMPLING			
Test Start Date 1/6/93	Test Comp Date 1/7/93	Total Penetration Depth 74 ft.	Interpreted Water Table Level
			Ground Water Samples Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type PIEZOCONE/HYDROCONE	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample
Cone Penetrometer Company ARA		Cone Operator WAYNE RUSSELL	Oversight Company EBASCO ENVIRONMENTAL
		Oversight (last name, first initial) STERLING, D.	
Drilling & Sampling Comments Cone was pushed to 74 then attempt was made to drill the hole only drilled out to 33'			
LOGGING			
Log Type ☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity			
Other Logs (list)			
ABANDONMENT			
Date Abandoned 01/07/93	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume 163 gal ft. 12 gallons	Actual Grout Volume 18 gallons
Report Prepared By David H. Hilly			Date Report Prepared 01/08/93

CONE PENETROMETER FIELD REPORT

TEST HOLE NUMBER (AAA.NNNAA)

08

CP

GENERAL

Project Name

Phase V Cone Penetration A/M Area Southern Sector

Project Manager (last name, first initial)

VAN PELT, R.

Department

WSRC-ERD

Type of Cone Penetrometer Test

PIEZOCONE / HYDROCON

County

Aiken S.C.

Location Description

along the access road

SRS North Grid Coordinate

95520

SRS East Grid Coordinate

52125

Ground Elev.

EST. 230'

Longitude (decimal degrees)

Latitude (decimal degrees)

TESTING & SAMPLING

Test Start Date 1:00pm

10/15/92

Test Comp Date 7:00pm

10/15/92

Total Penetration Depth

135.5

Interpreted Water Table Level

Ground Water Samples Taken?

☐ YES ☒ NO

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Target Depth 180'

Cone Penetrometer Company

ARA

Cone Operator

D. McIntosh

Oversight Company

Ebasco Environ.

Oversight (last, name, first initial)

Sterling D

Drilling & Sampling Comments: Began continuous cycling at 120' - progress is slow; distance from 133' to 135.5' required 15 minutes of cycling. Terminated hole as it was late in the day, still had to remove cone and go back down the hole to grout

LOGGING

Log Type

☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity

Other Logs (list)

ABANDONMENT

Date Abandoned

10/15/92

Method of Abandonment

☐ Tremie Pipe ☒ CP Rod-Grouting MethodTheoretical Grout Volume 0.126 gal/ft²

17 gal

Actual Grout Volume Density 9.5 gal. H₂O / gal. lbs.

Cement Volume 28 gal.

Report Prepared By

David J. Sterling

Date Report Prepared

10/15/92

CONE PENETROMETER FIELD REPORT

TEST HOLE NUMBER (AAA)BBB(CCC)

CP-10

CP

GENERAL

Project Name

PHASE II CONE PENETRATION A/M AREA SOUTHERN SECTOR

Project Manager (last name, first initial)

VAN PELT, R

Department

WM / ERD

Type of Cone Penetrometer Test

PIEZOCONE / HYDROCON

County

AIKEN, S.C.

Location Description

SRS North Grid Coordinate

99000

SRS East Grid Coordinate

46500

Ground Elev.

EST. 328'

Longitude (decimal degrees)

Latitude (decimal degrees)

Test Start Date

1/14/93

Test Stop Date

1/15/93

Total Penetration Depth

143 FT.

Interpreted Water Table Level

Ground Water Sample Taken?

☒ YES ☐ NO

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

PIEZOCONE / HYDROCON

Cone Penetrometer Company

ARA

Cone Operator

WAYNE RUSSEL

Overnight Company

EED (EBASCO ENVIRONMENTAL)

Overnight (last name, first initial)

STERLING, D.

Drilling & Sampling Comments

Log Type

☒ Stems (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity

Other Logs (list)

ABANDONMENT

Date Abandoned

1/15/93

Method of Abandonment

☐ Tremie Pipe☒ CP Rod-Grouting Method

Theoretical Grout Volume

23 GALLONS

Actual Grout Volume

30 GALLONS

Report Prepared By

Way Mijer for David Sterling

Date Report Prepared

1/18/93

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAAJ00NAA) CPT #11 CP	
GENERAL			
Project Name PHASE II CONE PENETROMETER INVESTIGATION A/M AREA, SOUTHERN SECTOR			
Project Manager (last name, first initial) VAN PELT R		Department WM/ERD	
Type of Cone Penetrometer Test REZOCONE / HYDROCON		Location Description LOCATION MOVED BY R. VAN PELT	
GPS North Grid Coordinate N 103000	GPS East Grid Coordinate E 46250	Ground Elev. EST. 350'	Latitude (decimal degrees)
Test Start Date 3/10/93	Test Stop Date 3/10/93	Total Penetration Depth 170.1'	Interpreted Water Table Level UP. CONGAREE
Ground Water Sample Taken? ☒ YES ☐ NO			
Cone Penetrometer Test Type REZOCONE / HYDROCON	Depth to Sample 170.1	Cone Penetrometer Test Type	Depth to Sample
Cone Penetrometer Company A.R.A.	Cone Operator WAYNE RUSSELL	Overnight Company EBASCO ENVIRONMENTAL	Overnight (last name, first initial) RAABE, B.
Drilling & Sampling Comments COLLECTED 2 40 ML SAMPLES FROM 170.1' (UPPER CONGAREE)			
Log Type ☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity Other Logs (list)			
ADJUDICATION			
Date Abandoned 3/10/93	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume 0.126 GAL/FT 21.4 GAL.	Actual Grout Volume 45 GAL
Report Prepared By BRUCE A. RAABE			Date Report Prepared 3/10/93

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAJUNNAA)	
		CP-13	CP
GENERAL			
Project Name PHASE II CONE PENETRATION A/M AREA SOUTHERN SECTOR			
Project Manager (last name, first initial) VAN PELT, R.		Department WM/ERD	
Type of Cone Penetrometer Test PIESOCONE/HYDROCONC		County AIKEN, S.C.	
SRS North Grid Coordinate 102250	SRS East Grid Coordinate 43500	Ground Elev. EST. 366'	Longitude (decimal degrees) Latitude (decimal degrees)
Test Start Date 1/09/93	Test Comp Date 1/11/93	Total Penetration Depth 115.0 FT	Interpreted Water Table Level Ground Water Sample Taken? ☐ YES ☒ NO ATTEMPTED NO WATER FOUND
Cone Penetrometer Test Type PIESOCONE/HYDROCONC	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample
Cone Penetrometer Company ARA	Cone Operator WAYNE RUSSEL	Overnight Company EED (EBASCO ENVIRONMENTAL)	Overnight (last name, first initial) STERLING, D.
Drilling & Sampling Comments: BELOW WATER TABLE; HOWEVER, NO WATER COLLECTED IN SAMPLER AFTER 12-18 HRS. ARA MADE SEVERAL ATTEMPTS, BUT A HARD CLAY LENS PREVENTED SAMPLE COLLECTION			
Log Type: ☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity Other Logs (list)			
ABANDONMENT			
Date Abandoned 1/11/93	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume 19 GALLONS	Actual Grout Volume 28 GALLONS
Report Prepared By <i>Key Chief for David Sterling</i>			Date Report Prepared 1/11/93

CONE PENETROMETER FIELD REPORT

TEST HOLE NUMBER (AAJN001AA)

CP-132

CP

GENERAL

Project Name

PHASE II CONE PENETRATION A/M AREA SOUTHERN SECTOR

Project Manager (last name, first initial)

VAN PELT, R.

Department

WM / ERD

Type of Cone Penetrometer Test

PIEZOCONE / HYDROPHONE

County

AIKEN, S.C.

Location Description

SRS North Grid Coordinate

102250

SRS East Grid Coordinate

43500

Ground Elev.

EST. 365'

Longitude (decimal degrees)

Latitude (decimal degrees)

Test Start Date

1/12/93

Test Stop Date

1/13/93

Total Penetration Depth

152.8 FT.

Observed Water Table Level

132.5 FT.

Ground Water Sample Taken? ☐ YES ☒ NO ATTEMPTED NO WATER FOUND

Cone Penetrometer Test Type

PIEZOCONE / HYDROPHONE

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Company

ARA

Cone Operator

WAYNE RUSSEL

Overnight Company

EED (EBASCO ENVIRONMENTAL)

Overnight (last name, first initial)

STERLING, D.

Drilling & Sampling Comments

BELOW WATER TABLE; HOWEVER, NO WATER COLLECTED IN SAMPLER AFTER 12-18 HRS. ARA MADE SEVERAL ATTEMPTS, BUT A HARD CLAY LENS PREVENTED SAMPLE COLLECTION.

Log Type

☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity

Other Logs (list)

ABANDONMENT

Date Abandoned

1/13/93

Method of Abandonment

☐ Tremie Pipe ☒ CP Rod-Grouting Method

Theoretical Grout Volume

25 GALLONS

Actual Grout Volume

30 GALLONS

Report Prepared By

Typing for David Sterling

Date Report Prepared

1/13/93

CONE PENETROMETER FIELD REPORT

TEST HOLE NUMBER (AAA)000000

CP-13-3

CP

GENERAL

Project Name

PHASE I CONE PENETRATION A/M AREA SOUTHERN SECTOR

Project Manager (last name, first initial)

VAN PELT, R.

Department

WM/ERD

Type of Cone Penetrometer Test

PIEZOCONE/HYDROPHONE

County

AIKEN

Location Description

SRS North Grid Coordinate

102250

SRS East Grid Coordinate

43500

Ground Elev.

EST. 365'

Longitude (decimal degrees)

Latitude (decimal degrees)

Test Start Date

1/13/93

Test Stop Date

1/14/93

Total Penetration Depth

156.4 FT.

Interpreted Water Table Level

133 FT.

Ground Water Sample Taken? ATTEMPTED

☐ YES ☒ NO NO WATER FOUND

Cone Penetrometer Test Type

PIEZOCONE/HYDROPHONE

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Company

ARA

Cone Operator

WAYNE RUSSEL

Overight Company

EED (EBASCO ENVIRONMENTAL)

Overight (last name, first initial)

STERLING, D.

Drilling & Sampling Comments

BELOW WATER TABLE; HOWEVER, NO WATER COLLECTED IN SAMPLER AFTER 12-18 HRS.
ARA MADE SEVERAL ATTEMPTS, BUT A HARD CLAY LENS PREVENTED SAMPLE COLLECTION.

Log Type

☒ Sleeve (psi) ☒ Tip (psi) ☐ Ratio (%) ☒ Pressure (psi) ☒ Resistivity

Other Logs (list)

ABANDONMENT

Date Abandoned

1/14/93

Method of Abandonment

☐ Tremie Pipe ☒ CP Rod-Grouting Method

Theoretical Grout Volume

25.5 GALLONS

Actual Grout Volume

31 GALLONS

Report Prepared By

Wayne Russel for David Sterling

Date Report Prepared

1/18/93

CONE PENETROMETER FIELD REPORT

TEST HOLE NUMBER (AAA.NNN.AA)

CPT #15

CP

GENERAL

Project Name

PHASE II CONE PENETROMETER INVESTIGATION A/M AREA, SOUTHERN SECTOR

Project Manager (last name, first initial)

VAN PELT, R.

Department

WM/ERD

Type of Cone Penetrometer Test

PIEZOCONE/HYDROCONE

County

AIKEN

Location Description

40 YARDS OFF GRAVEL ROAD IN LIVE OAK THICKET

SRS North Grid Coordinate

N102625

SRS East Grid Coordinate

E45500

Ground Elev.

EST. 395'

Longitude (decimal degrees)

Latitude (decimal degrees)

TESTING & SAMPLING

Test Start Date

2/11/93

Test Comp Date

2/12/93

Total Penetration Depth

175.45

Interpreted Water Table Level

UPPER CONGAREE @ 174'

Ground Water Samples Taken?

☒ YES ☐ NO

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

PIEZOCONE/HYDROCONE

175.027

Cone Penetrometer Company

A.R.A.

Cone Operator

WAYNE RUSSELL

Oversight Company

EBASCO ENVIRONMENTAL

Oversight (last name, first initial)

RAABE, B.

Drilling & Sampling Comments

SEDIMENTS APPEAR TO BE LESS COMPACTED (EASIER PUSHING) COMPARED TO CPT #16

LOGGING

Log Type

☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity

Other Logs (list)

ABANDONMENT

Date Abandoned

02/12/93

Method of Abandonment

☐ Tremie Pipe ☒ CP Rod-Grouting MethodTheoretical Grout Volume 0.126 cu/yd

22

Actual Grout Volume

45 GALLONS

Report Prepared By

BRUCE A. RAABE

Date Report Prepared

02/12/93

CONE PENETROMETER FIELD REPORT

TEST HOLE NUMBER (AAA.NNN.AA)

16

CP

GENERAL

Project Name

Phase V Cone Penetration A/M Area Southern Sector

Project Manager (last name, first initial)

VAN PELT R.

Department

WSRC-ERD

Type of Cone Penetrometer Test

PIEZOCONE/HYDROPHONE

County

Aiken, S.C.

Location Description

SRS North Grid Coordinate

9912.5

SRS East Grid Coordinate

5187.5

Ground Elev.

EST. 268'

Longitude (decimal degrees)

Latitude (decimal degrees)

TESTING & SAMPLING

Test Start Date

10/19/92

Test Comp Date

10/19/92

Total Penetration Depth

109'

Interpreted Water Table Level

Ground Water Samples Taken?

☐ YES ☒ NO

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Target Depth 180'

Cone Penetrometer Company

ARA

Cone Operator

D. McIntosh

Oversight Company

Ebasco Environ.

Oversight (last name, first initial)

Sterling D

Drilling & Sampling Comments @ ~50' the sleeve pressure began to give erratic readings - continued to push @ ~100' the push began to become difficult, periodic cycling was needed @ 109' refusal - will pull out of hole and offset for another hole. Sleeve pressure will be checked before next attempt.

LOGGING

Log Type

☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity

Other Logs (list)

ABANDONMENT

Date Abandoned

10/19/92

Method of Abandonment

☐ Tremie Pipe☒ CP Rod-Grouting Method

Theoretical Grout Volume

13.75 Gal.

Actual Grout Volume

18 gal

Report Prepared By

David P. Sterling

Date Report Prepared

10/19/92

SRS CONE PENETROMETER FIELD REPORT	TEST HOLE NUMBER (AAA.NNN.AA)	
	1GB	CP

GENERAL

Project Name Phase V Cone Penetration A/M Area Southern Sector				
Project Manager (last name, first initial) VAN PELT R.		Department WSRC-ERD		
Type of Cone Penetrometer Test PIEZOCONE / HYDROPHONE	County AIKEN S.C.	Location Description		
SRS North Grid Coordinate 99125	SRS East Grid Coordinate 51875	Ground Elev. EST. 268'	Longitude (decimal degrees)	Latitude (decimal degrees)

TESTING & SAMPLING

Test Start Date 10/19/92	Test Comp Date 10/19/92	Total Penetration Depth 105'	Interpreted Water Table Level	Ground Water Samples Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type Target Depth 180'	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample	Cone Penetrometer Test Type
Cone Penetrometer Company ARA	Cone Operator D. McIntosh	Oversight Company Ebasco Environ.	Oversight (last name, first initial) Sterling D	

Drilling & Sampling Comments

LOGGING

Log Type	☒ Sleeve (psi)	☒ Tip (psi)	☒ Ratio (%)	☒ Pressure (psi)	☒ Resistivity
Other Logs (Net)					

ABANDONMENT

Date Abandoned 10/19/92	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume 13.23 gal.	Actual Grout Volume 15 gal.
Report Prepared By David J. Sterling			Date Report Prepared 10/19/92

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAA.NNN/AA)	
			17
GENERAL			
Project Name Phase V Cone Penetration A/M Area Southern Sector			
Project Manager (last name, first initial) VAN PECT R.		Department WSRC-ERD	
Type of Cone Penetrometer Test PIEZOCONE / HYDROPHONE	County AIKEN, S.C.	Location Description	
SRS North Grid Coordinate 99775	SRS East Grid Coordinate 50475	Ground Elev. Est. 320'	Latitude (decimal degrees)
TESTING & SAMPLING			
Test Start Date 10/23/92	Test Comp Date 10/23/92	Total Penetration Depth 114'	Interpreted Water Table Level Ground Water Samples Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample
Target Depth 180'			
Cone Penetrometer Company ARA	Cone Operator P. McIntosh	Oversight Company Ebasco Environ.	Oversight (last name, first initial) Sterling D
Drilling & Sampling Comments			
LOGGING			
Log Type ☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity			
Other Logs (list)			
ABANDONMENT			
Date Abandoned 10/23/92	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume 14.5 gal.	Actual Grout Volume 23.5
Report Prepared By David C. Sterling			Date Report Prepared 10/23/92

CONE PENETROMETER FIELD REPORT

TEST HOLE NUMBER (AAA,NNN,AA)

17B

CP

GENERAL

Project Name

Phase V Cone Penetration A/M Area Southern Sector

Project Manager (last name, first initial)

Department

VAN PELT, R.

WSRC-ERD

Type of Cone Penetrometer Test

County

Location Description

PIEZOCONE/HYDROPHONE

AIKEN, S.C.

SRS North Grid Coordinate

SRS East Grid Coordinate

Ground Elev.

Longitude (decimal degrees)

Latitude (decimal degrees)

99775

50475

EST. 320'

TESTING & SAMPLING

Test Start Date

Test Comp Date

Total Penetration Depth

Interpreted Water Table Level

Ground Water Samples Taken?

10/23/92

10/23/92

127'

☐ YES ☒ NO

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Target Depth 180'

Cone Penetrometer Company

Cone Operator

Oversight Company

Oversight (last name, first initial)

ARA

D. McIntosh

Ebasco Environ.

Sterling, D.

Drilling & Sampling Comments: Began to encounter resistance at 80', cycling progress being made; at 93 ft. broke through resistance again at 107 ft., continued to push until 127' at which point tip pressure went to 18,000 psi & sleeve pressure was 2500 psi cycling for 30 minutes produced 0 advancement

LOGGING

Log Type

☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity

Other Logs (list)

ABANDONMENT

Date Abandoned

Method of Abandonment

Theoretical Grout Volume

Actual Grout Volume

10/23/92

☐ Tremie Pipe ☒ CP Rod-Grouting Method

16.0 gal

22 gal.

Report Prepared By

Date Report Prepared

David J. Sterling

10/23/92

CONE PENETROMETER FIELD REPORT

TEST HOLE NUMBER (AM/JNN/AA)

CH #18/ CP

GENERAL

Project Name

PHASE II CONE PENETROMETER INVESTIGATION A/M AREA, SOUTHERN SECTOR

Project Manager (last name, first initial)

VAN PELT, P.

Department

WM/ERD

Type of Cone Penetrometer Test

REZOLONE/HYDROPHONE

County

AIKEN, S.C.

Location Description

80 YARDS OFF DIRT ROAD, PARALLEL TO TRAIN TRACK

SRS North Grid Coordinate

N 96000

SRS East Grid Coordinate

E 50000

Ground Elev.

EST. 202'

Longitude (decimal degrees)

Latitude (decimal degrees)

TESTING & SAMPLING

Test Start Date

2/12/93

Test Comp Date

3/6/93

Total Penetration Depth

139' - REFUSAL
170' - DRILLEX

Interpreted Water Table Level

UTTER CONGAREE @ 170'

Ground Water Samples Taken?

☐ YES ☒ NO

Cone Penetrometer Test Type

REZOLONE/HYDROPHONE RODS WITH

DRILLEX® BIT

Depth to Sample

170'

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Company

A.R.A.

Cone Operator

JOHN CLARK ②
WAYNE RUSSELL ①

Oversight Company

EBASCO ENVIRONMENTAL

Oversight (last name, first initial)

RAABE, B.

Drilling & Sampling Comments

(2/16/93) BEGAN MEETING RESISTANCE AT 112' AND HIT REFUSAL AT 139' PRIOR TO SWITCHING TO DRILLEX (2/12/93)
(2/17/93) RAMP REPAIR FOR DRILLEX SYSTEM, 3/6/93 AREA GROUTED RODS, DRILLEX AND BIT INTO HOLE
2/14/93 " SAME AS ABOVE
2/14/93 LOST 110' OF RODS DOWN HOLE - ATTEMPT TO RECOVER

LOGGING

Log Type

☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity

Other Logs (Ref)

ABANDONMENT

Date Abandoned

3/6/93

Method of Abandonment

☐ Tremie Pipe ☒ CP Rod-Grouting MethodTheoretical Grout Volume 0.126 GAL/FT²

21.4

Actual Grout Volume

35

Report Prepared By

BRUCE A. RAABE

Date Report Prepared

3/9/93

CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAAMNNAA)	
		CPT # 18 1/2	CP
GENERAL			
Project Name PHASE II CONE PENETROMETER INVESTIGATION A/M AREA, SOUTHERN SECTOR			
Project Manager (last name, first initial) VAN PELT, R.		Department WM/ERD	
Type of Cone Penetrometer Test PIEZOCONE/HYDROCONE		County AIKEN, S.C.	Location Description 80 YDS. OFF DIRT ROAD, PARALLEL TO TRAIN TRACK
SRS North Grid Coordinate N 96000	SRS East Grid Coordinate E 50000	Ground Elev. EST. 282'	Longitude (decimal degrees) Latitude (decimal degrees)
TEST LOG - COMMENTS			
Test Start Date 3/8/93	Test Stop Date 3/9/93	Total Penetration Depth 129.6' - REFUSAL	Interpretated Water Table Level UPPER GW/GARRE @ 170' Ground Water Sample Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type PIEZOCONE/HYDROCONE	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample
Cone Penetrometer Company A.R.A.	Cone Operator WAYNE RUSSELL	Overnight Company EBASCO ENVIRONMENTAL	Overnight (last name, first initial) RAABE, B.
Drilling & Sampling Comments MOVED 20' UPGRADIENT FROM CPT #18-1 HIT REFUSAL AT 129.6', WITH 15,000# ON CONE TIP AND 1500# ON HYDRAULICS			
LOG DATA			
Log Type ☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity Other Logs (log)			
ABANDONMENT			
Date Abandoned 3/9/93	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume 0.126 GAL/FT ² 16.3 GAL	Actual Grout Volume 28 GALLONS
Report Prepared By Bruce A. Raabe			Date Report Prepared 3/9/93

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAA.NNN.AA)	
		CPT-20	CP
GENERAL			
Project Name PHASE II CONE PENETROMETER INVESTIGATION A/M AREA, SOUTHERN SECTOR			
Project Manager (last name, first initial) VAN PELT R.		Department WM/ERD	
Type of Cone Penetrometer Test PIEZOCONE / HYDROCON		County AIKEN, S.C.	Location Description
SRS North Grid Coordinate N 100000	SRS East Grid Coordinate E 48000	Ground Elev. EST. 350'	Longitude (decimal degrees) Latitude (decimal degrees)
TESTING & SAMPLING			
Test Start Date 3/11/93	Test Comp Date 3/11/93	Total Penetration Depth 163'	Interpreted Water Table Level UP. CONGAREE Ground Water Samples Taken? ☒ YES ☐ NO
Cone Penetrometer Test Type PIEZOCONE / HYDROCON	Depth to Sample 163'	Cone Penetrometer Test Type	Depth to Sample
Cone Penetrometer Company ARA	Cone Operator WAYNE RUSSELL	Oversight Company EBASCO ENVIRONMENTAL	Oversight (last name, first initial) RAABE, B.
Drilling & Sampling Comments COLLECTED 3 40 ML SAMPLES AT 163' REFUSAL ALSO OCCURRED AT 163'			
LOGGING			
Log Type ☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity			
Other Logs (list)			
ABANDONMENT			
Date Abandoned 3/11/93	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume 0.126 GAL/FT 20.5 GAL	Actual Grout Volume 42 GALLONS
Report Prepared By BRUCE A. RAABE			Date Report Prepared 3/11/93

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAA.NNN.NAA)	
		21	CP
GENERAL			
Project Name Phase V Cone Penetrometer A/m Area Southern Sector			
Project Manager (last name, first initial) VAN PELT, R.		Department WSRC-ERD	
Type of Cone Penetrometer Test PIEZOCONE / HYDRO-CONE		Location Description Heavy forested area - 1/2 - 3/4 mile from truck to road	
SRS North Grid Coordinate 104.000	SRS East Grid Coordinate 54.500	Ground Elev. EST. 291'	Latitude (decimal degrees)
TESTING & SAMPLING			
Test Start Date 10/6-12:40	Test Comp Date 10/6	Total Penetration Depth 74	Ground Water Samples Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type Target Depth 180'	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample
Cone Penetrometer Company ARA		Cone Operator D. McIntosh	Oversight (last name, first initial) Chasco
Drilling & Sampling Comments at 74 ft. tip pressure ~ 21,000 psi - hydraulic pressure 2600 psi. (was increased over original first holes pushed.)			
LOGGING			
Log Type ☒ Sleeve (psi) ☒ Tip (psi) ☐ Ratio (%) ☐ Pressure (psi) ☐ Resistivity			
Other Logs (list)			
ABANDONMENT			
Date Abandoned 10/6/92	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume - 183 gal/ft. 12 gal	Actual Grout Volume 10 gal.
Report Prepared By David J. Sterling			Date Report Prepared 10/6/92

SRS CONE PENETROMETER FIELD REPORT

TEST HOLE NUMBER (AAA,NNN,AA)

21-B CP

GENERAL

Project Name

Cone - A/M Southern Sector

Project Manager (last name, first initial)

VAN PELT, R.

Department

WSRC-ERD

Type of Cone Penetrometer Test

PIEZOCONE / HYDROPHONE

County

AIKEN, S.C.

Location Description

25 ft. North of CP-21, second hole at CP21

SRS North Grid Coordinate

104000

SRS East Grid Coordinate

54,500

Ground Elev.

EST. 291'

Longitude (decimal degrees)

Latitude (decimal degrees)

TESTING & SAMPLING

Test Start Date

10/8

Test Comp Date

10/8

Total Penetration Depth

74 ft.

Interpreted Water Table Level

Ground Water Samples Taken?

☐ YES ☒ NO

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Cone Penetrometer Test Type

Depth to Sample

Target Depth 180'

Cone Penetrometer Company

ARA

Cone Operator

D McIntosh

Oversight Company

EED

Oversight (last name, first initial)

Sterling D

Drilling & Sampling Comments

- Second attempt at this point - Hole moved 25 ft. north of first hole - at 54' began cycling to 58' - refusal reached at 74 ft. cycled 10 min. no progress - tip pressure at 23,000 psi. Sleeve 5,000 psi.

LOGGING

Log Type

☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☐ Resistivity

Other Logs (list)

ABANDONMENT

Date Abandoned

10/8/92

Method of Abandonment

☐ Tremie Pipe☒ CP Rod-Grouting Method

Theoretical Grout Volume 1.63 gal./10'

12 gal.

Actual Grout Volume

13 gal.

Report Prepared By

David L Sterling

Date Report Prepared

10/8/92

SRS CONE PENETROMETER FIELD REPORT		TEST HOLE NUMBER (AAA/NN/AA)	
		CPT. - 22	CP
GENERAL			
Project Name PHASE V CONE PENETROMETER INVESTIGATION A/M AREA, SOUTHERN SECTOR			
Project Manager (last name, first initial) VAN PELT, R.		Department WM/ERD	
Type of Cone Penetrometer Test PIEZOCONE / HYDROCON	County AIKEN, S.C.	Location Description	
SRS North Grid Coordinate N 102750	SRS East Grid Coordinate E 48500	Ground Elev. EST. 360'	Latitude (decimal degrees)
TESTING & SAMPLING			
Test Start Date 1/15/93	Test Comp Date 1/15/93	Total Penetration Depth 107' - REFUSAL	Interpreted Water Table Level Ground Water Samples Taken? ☐ YES ☒ NO
Cone Penetrometer Test Type	Depth to Sample	Cone Penetrometer Test Type	Depth to Sample
PIEZOCONE / HYDROCON			
Cone Penetrometer Company A.R.A.	Cone Operator WAYNE RUSSELL	Oversight Company EDASCO ENVIRONMENTAL	Oversight (last name, first initial) PFEILSTICKER, R.
Drilling & Sampling Comments PUSHED CPT TO REFUSAL AT 107' SET UP DRILEX - PUMP NOT WORKING			
LOGGING			
Log Type ☒ Sleeve (psi) ☒ Tip (psi) ☒ Ratio (%) ☒ Pressure (psi) ☒ Resistivity			
Other Logs (list)			
ABANDONMENT			
Date Abandoned 1/15/93	Method of Abandonment ☐ Tremie Pipe ☒ CP Rod-Grouting Method	Theoretical Grout Volume 0.126 GAL/FT³ 13.5	Actual Grout Volume 16
Report Prepared By BRUCE A. RAABE FOR RENEE PFEILSTICKER (VERBAL)			Date Report Prepared 3/23/93

APPENDIX D

FIELD CALIBRATIONS

**APPLIED
RESEARCH
ASSOCIATES, INC.**

Engineering and Applied Science

April 6, 1993

Mr. Bruce Raabe
EBASCO Services, Inc.
2528 Center West Parkway
Augusta, GA 30909

Dear Bruce:

Enclosed are the daily calibrations per your request. Applied Research Associates, Inc. does not typically include calibration plots in data reports. The enclosed plots are those recieved from the field and represent the majority of calibrations performed while testing in the A/M Area.

If you have any questions or comments, please don't hesitate to call.

Sincerely,

David A. Timian, PE
Senior Engineer

DAT/BEF:jml
Enclosure
C:DAT\Raabe:lr

Applied Research Associates, Inc.
Sleeve Calibration

10/05/92
13:58:33

Reference Device > RLC T3 04/08/93
 $m = 2.719E0$ (lbs / A-D)
 A-D channel 5 +/- 5v range
 gain x 200 filter @ 1 Hz
 Min. = 238. A-D, Max. = 1247. A-D

Measurement Dev. > Sleeve
 $m = 4.521E-1$ (lbs / A-D)
 A-D channel 1 +/- 5v range
 gain x 200 filter @ 1 Hz
 Min. = 14628. A-D, Max. = 20722. A-D

D

Applied Research Associates, Inc.
Tip Calibration

10/05/92
14:07:32

Reference Device > RLC T3 04/08/93

m = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 113. A-D, Max. = 1206. A-D

Measurement Dev. > Tip

m = 2.176E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 8101. A-D, Max. = 9469. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

10/05/92
14:12:13

Reference Device > RPT A74001 03/11/93

n = 3.830E-2 (psi / A-D)

A-D channel 6 +/- 5v range

gain x 20 filter @ 1 Hz

Min. = 59. A-D, Max. = 2572. A-D

Measurement Dev. > Pore Pressure

n = 2.971E-2 (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = -453. A-D, Max. = 2789. A-D

Applied Research Associates, Inc.
Sleeve Calibration

10/08/92
08:10:56

Reference Device > RLC T3 04/08/93

$a = 2.719E0$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 62. A-D, Max. = 1134. A-D

Measurement Dev. > Sleeve

$m = 4.590E-1$ (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 13338. A-D, Max. = 19692. A-D

D

Applied Research Associates, Inc.
Tip Calibration

10/06/92
08:29:28

Reference Device > RLC T3 04/08/93
m = 2.719E0 (lbs / A-D)
A-D channel 5 +/- 5v range
gain x 200 filter @ 1 Hz
Min. = 176. A-D, Max. = 934. A-D

Measurement Dev. > Tip
m = 2.199E0 (lbs / A-D)
A-D channel 7 +/- 5v range
gain x 200 filter @ 1 Hz
Min. = 8180. A-D, Max. = 9108. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

10/06/92
08:32:18

Reference Device > RPT A74001 03/11/93

$m = 3.830E-2$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 20 filter @ 1 Hz

Min. = 58. A-D, Max. = 2703. A-D

Measurement Dev. > Pore Pressure

$m = 2.997E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = -442. A-D, Max. = 2941. A-D

Applied Research Associates, Inc.
Sleeve Calibration

10/06/92
12:35:40

Reference Device > RLC T3 04/08/93

n = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 52. A-D, Max. = 1865. A-D

Measurement Dev. > Sleeve

n = 4.362E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 13267. A-D, Max. = 19600. A-D

D

Applied Research Associates, Inc.
Sleeve Calibration

10/06/92
12:36:18

Reference Device > RLC T3 04/08/93

$m = 2.719E0$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 52. A-D, Max. = 1065. A-D

D

Measurement Dev. > Sleeve

$m = 4.362E-1$ (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 13267. A-D, Max. = 19600. A-D

Applied Research Associates, Inc.
Tip Calibration

10/08/92
12:46:20

Reference Device > RLC T3 04/08/93

m = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 7. A-D, Max. = 1273. A-D

Measurement Dev. > Tip

m = 2.186E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 7922. A-D, Max. = 9496. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

10/06/92
12:49:00

Reference Device > RPT A74001 03/11/93

$m = 3.830E-2$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 20 filter @ 1 Hz

Min. = 23. A-D, Max. = 2640. A-D

Measurement Dev. > Pore Pressure

$m = 3.805E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = -512. A-D, Max. = 2827. A-D

Applied Research Associates, Inc.
Sleeve Calibration

10/08/92
08:18:09

Reference Device > RLC T3 04/08/93

m = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter Q 1 Hz

Min. = 144. A-D, Max. = 1135. A-D

D

Measurement Dev. > Sleeve

m = 4.622E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter Q 1 Hz

Min. = 14134. A-D, Max. = 19954. A-

Applied Research Associates, Inc.
Tip Calibration

10/08/92
08:30:32

Reference Device > RLC T3 04/08/93

m = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1749. A-D, Max. = 224. A-D

Measurement Dev. > Tip

m = 2.180E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 10048. A-D, Max. = 8152. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

10/08/92
08:36:56

Reference Device > RPT A74001 03/11/93

$m = 3.830E-2$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 20 filter @ 1 Hz

Min. = 112. A-D, Max. = 2742. A-D

Measurement Dev. > Pore Pressure

$m = 2.999E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2895. A-D, Max. = 6264. A-D

Applied Research Associates, Inc.
Sleeve Calibration

10/08/92
11:07:53

Reference Device > RLC T3 04/08/93

n = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1022. A-D, Max. = 44. A-D

Measurement Dev. > Sleeve

n = 4.369E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 19410. A-D, Max. = 13284. A-

D

Applied Research Associates, Inc.
Tip Calibration

10/08/92
11:22:17

Reference Device > RLC T3 04/08/93

m = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1759. A-D, Max. = 108. A-D

Measurement Dev. > Tip

m = 2.183E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 10046. A-D, Max. = 7994. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

10/08/92
11:25:18

RPT A74001 03/11/93 (psi)

Reference Device > RPT A74001 03/11/93

$m = 3.830E-2$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 20 filter @ 1 Hz

Min. = 57. A-D, Max. = 2505. A-D

Measurement Dev. > Pore Pressure

$m = 3.852E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 13245. A-D, Max. = 16324. A-

D

Applied Research Associates, Inc.
Sleeve Calibration

10/09/92
07:47:22

Reference Device > RLC T3 04/08/93

n = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 121. A-D, Max. = 1307. A-D

Measurement Dev. > Sleeve

n = 4.444E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 13649. A-D, Max. = 20954. A-D

D

Applied Research Associates, Inc.
Tip Calibration

10/09/92
07:57:54

Reference Device > RLC T3 04/08/93

n = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 33. A-D, Max. = 1500. A-D

Measurement Dev. > Tip

n = 2.188E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 7925. A-D, Max. = 9747. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

10/09/92
08:02:30

Reference Device > RPT A74001 03/11/93

$m = 3.830E-2$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 20 filter @ 1 Hz

Min. = 61. A-D, Max. = 2647. A-D

Measurement Dev. > Pore Pressure

$m = 3.849E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 13344. A-D, Max. = 16601. A-

D

Applied Research Associates, Inc.
Sleeve Calibration

10/15/92
11:54:34

Reference Device > RLC T3 04/08/93

m = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1626. A-D, Max. = 94. A-D

Measurement Dev. > Sleeve

m = 4.635E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 23274. A-D, Max. = 14370. A-D

D

Applied Research Associates, Inc.
Tip Calibration

10/15/92
12:28:39

Reference Device > RLC T3 04/08/93

m = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 366. A-D, Max. = 1486. A-D

Measurement Dev. > Tip

m = 2.102E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 9039. A-D, Max. = 10490. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

10/15/92
12:48:20

Reference Device > RPT A74001 03/11/93

$m = 3.830E-2$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 20 filter @ 1 Hz

Min. = 75. A-D, Max. = 2566. A-D

Measurement Dev. > Pore Pressure

$m = 3.002E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = -16247. A-D, Max. = -13056. A-

D

Applied Research Associates, Inc.
Sleeve Calibration

10/16/92
08:55:15

Reference Device > RLC T3 04/08/93

m = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 82. A-D, Max. = 1115. A-D

Measurement Dev. > Sleeve

m = 4.340E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 17011. A-D, Max. = 23444. A-

D

Applied Research Associates, Inc.
Tip Calibration

10/16/92
09:09:19

Reference Device > RLC T3 04/08/93

m = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1567. A-D, Max. = 288. A-D

Measurement Dev. > Tip

m = 2.877E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 10593. A-D, Max. = 8926. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

10/18/92
09:12:51

RPT A74001 03/11/93 (psi)

Reference Device > RPT A74001 03/11/93

$m = 3.830E-2$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 20 filter @ 1 Hz

Min. = 79. A-D, Max. = 2752. A-D

Measurement Dev. > Pore Pressure

$m = 3.819E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = -16228. A-D, Max. = -12829. A-

D

Applied Research Associates, Inc.
Sleeve Calibration

10/20/92
07:42:28

Reference Device > RLC T3 04/08/93
 $m = 2.719E0$ (lbs / A-D)
 A-D channel 5 +/- 5v range
 gain x 200 filter @ 1 Hz
 Min. = . A-D, Max. = 1209. A-D

Measurement Dev. > Sleeve
 $m = 4.691E-1$ (lbs / A-D)
 A-D channel 1 +/- 5v range
 gain x 200 filter @ 1 Hz
 Min. = -2698. A-D, Max. = 4287. A-D

Applied Research Associates, Inc.
Tip Calibration

10/20/92
08:02:08

Reference Device > RLC T3 04/08/93

$m = 2.719E0$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1549. A-D, Max. = 1135. A-D

Measurement Dev. > Tip

$m = 2.890E0$ (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 10355. A-D, Max. = 9810. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

10/20/92
08:06:23

Reference Device > RPT A74001 03/11/93

n = 3.830E-2 (psi / A-D)

A-D channel 6 +/- 5v range

gain x 20 filter @ 1 Hz

Min. = 67. A-D, Max. = 2689. A-D

Measurement Dev. > Pore Pressure

n = 2.859E-2 (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = -16272. A-D, Max. = -12755. A-

D

Applied Research Associates, Inc.
Sleeve Calibration

10/21/92
07:35:48

Reference Device > RLC T3 04/08/93

m = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 179. A-D, Max. = 1083. A-D

Measurement Dev. > Sleeve

m = 4.640E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = -1674. A-D, Max. = 3632. A-D

Applied Research Associates, Inc.
Tip Calibration

10/21/92
07:55:20

Reference Device > RLC T3 04/08/93

$m = 2.719E0$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 172. A-D, Max. = 1290. A-D

Measurement Dev. > Tip

$m = 2.085E0$ (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 8609. A-D, Max. = 10069. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

10/21/92
08:03:14

RPT A74001 03/11/93 (psi)

Reference Device > RPT A74001 03/11/93

$m = 3.830E-2$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 20 filter 0 1 Hz

Min. = 46. A-D, Max. = 1903. A-D

Measurement Dev. > Pore Pressure

$m = 2.868E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter 0 1 Hz

Min. = -16302. A-D, Max. = -13778. A-D

D

Applied Research Associates, Inc.
Pore Pressure Calibration

10/22/92
08:22:47

RPT A74001 03/11/93 (psi)

Reference Device > RPT A74001 03/11/93

$m = 3.830E-2$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 20 filter @ 1 Hz

Min. = 51. A-D, Max. = 2617. A-D

Measurement Dev. > Pore Pressure

$m = 3.184E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = -15984. A-D, Max. = -12982. A-

D

Applied Research Associates, Inc.
Sleeve Calibration

10/23/92
07:47:15

Reference Device > RLC T3 04/08/93

$n = 2.719E0$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 258. A-D, Max. = 1572. A-D

Measurement Dev. > Sleeve

$n = 4.558E-1$ (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 13890. A-D, Max. = 21751. A-D

D

Applied Research Associates, Inc.
Tip Calibration

10/23/92
08:10:51

Reference Device > RLC T3 04/08/93

m = 2.719E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 21. A-D, Max. = 133. A-D

Measurement Dev. > Tip

m = 2.039E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 11202. A-D, Max. = 11341. A-

D

Applied Research Associates, Inc.
Pore Pressure Calibration

10/23/82
08:17:05

RPT A74001 03/11/93 (psi)

Reference Device > RPT A74001 03/11/93

$m = 3.830E-2$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 20 filter @ 1 Hz

Min. = 101. A-D, Max. = 2528. A-D

Measurement Dev. > Pore Pressure

$m = 3.154E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = -15853. A-D, Max. = -12899. A-

D

Applied Research Associates, Inc.
Sleeve Calibration

12/14/92
14:28:53

Reference Device > RLC T1 13/02/93

m = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 24. A-D, Max. = 337. A-D

Measurement Dev. > Sleeve

m = 2.812E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 11917. A-D, Max. = 17662. A-

D

Applied Research Associates, Inc.
Sleeve Calibration

12/14/92
14:29:59

Reference Device > RLC T1 13/02/93

n = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 24. A-D, Max. = 337. A-D

D

Measurement Dev. > Sleeve

n = 2.812E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 11917. A-D, Max. = 17662. A-

Applied Research Associates, Inc.
Depth Calibration

12/14/92
14:36:19

Reference Device > Ruler

Measurement Dev. > Depth
n = 3.888E-4 (ft / A-D)
A-D channel 8 +/- 5v range
gain x 1 filter @ 1 Hz
Min. = 2814. A-D, Max. = 11728. A-D

Applied Research Associates, Inc.
Tip Calibration

12/14/92
14:46:44

Reference Device > RLC T1 13/02/93

m = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 152. A-D, Max. = 687. A-D

Measurement Dev. > Tip

m = 2.153E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 10315. A-D, Max. = 11635. A-

D

Applied Research Associates, Inc.
Pore Pressure Calibration

12/14/92
14:54:20

Reference Device > RPT A75041 10/01/93

$m = 3.811E-3$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2026. A-D, Max. = 17667. A-D

Measurement Dev. > Pore Pressure

$m = 3.619E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1089. A-D, Max. = 2736. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

12/14/92
14:54:20

Reference Device > RPT A75041 10/01/93

$m = 3.811E-3$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2026. A-D, Max. = 17667. A-D

Measurement Dev. > Pore Pressure

$m = 3.619E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1089. A-D, Max. = 2736. A-D

Applied Research Associates, Inc.
Sleeve Calibration

12/16/92
05:54:39

Reference Device > RLC T1 13/02/93

m = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 92. A-D, Max. = 18. A-D

Measurement Dev. > Sleeve

m = 2.422E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 13316. A-D, Max. = 11736. A-D

D

Applied Research Associates, Inc.
Sleeve Calibration

12/16/92
05:58:57

Reference Device > RLC T1 13/02/93

n = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 98. A-D, Max. = 32. A-D

Measurement Dev. > Sleeve

n = 2.378E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 13428. A-D, Max. = 11955. A-

D

Applied Research Associates, Inc.
Sleeve Calibration

12/16/92
08:07:46

Reference Device > RLC T1 13/02/93

m = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = . A-D, Max. = 94. A-D

Measurement Dev. > Sleeve

m = 3.153E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 11486. A-D, Max. = 13102. A-

D

Applied Research Associates, Inc.
Sleeve Calibration

12/16/92
08:09:48

Reference Device > RLC T1 13/02/93

n = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 13. A-D, Max. = 132. A-D

Measurement Dev. > Sleeve

n = 3.410E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 11783. A-D, Max. = 13631. A-D

D

Applied Research Associates, Inc.
Sleeve Calibration

12/16/92
08:15:11

Reference Device > RLC T1 13/02/93

m = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 8. A-D, Max. = 93. A-D

Measurement Dev. > Sleeve

m = 2.915E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 11608. A-D, Max. = 13151. A-D

D

Applied Research Associates, Inc.
Tip Calibration

12/16/92
08:28:38

Reference Device > RLC T1 13/02/93

m = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 214. A-D, Max. = 659. A-D

Measurement Dev. > Tip

m = 2.001E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 10457. A-D, Max. = 11640. A-D

D

Applied Research Associates, Inc.
Pore Pressure Calibration

12/16/92
08:32:32

RPT A75041 10/01/93 (psi)

Reference Device > RPT A75041 10/01/93

$m = 3.811E-3$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1447. A-D, Max. = 11457. A-D

Measurement Dev. > Pore Pressure

$m = 3.648E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1410. A-D, Max. = 2458. A-D

Applied Research Associates, Inc.
Sleeve Calibration

12/17/92
09:14:35

Reference Device > RLC T1 13/02/93

m = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 9. A-D, Max. = 92. A-D

Measurement Dev. > Sleeve

m = 5.111E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 11457. A-D, Max. = 12240. A-

D

Applied Research Associates, Inc.
Tip Calibration

12/17/92
09:32:50

Reference Device > RLC T1 13/02/93

m = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 42. A-D, Max. = 606. A-D

Measurement Dev. > Tip

m = 2.367E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 9872. A-D, Max. = 11133. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

12/17/92
09:36:30

Reference Device > RPT A75041 10/01/93

m = 3.811E-3 (psi / A-D)

A-D channel 6 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 999. A-D, Max. = 12362. A-D

Measurement Dev. > Pore Pressure

m = 3.668E-2 (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1476. A-D, Max. = 2659. A-D

Applied Research Associates, Inc.
Depth Calibration

01/05/93
11:40:30

Reference Device > Ruler

Measurement Dev. > Depth
m = 3.088E-4 (ft / A-D)
A-D channel 8 +/- 5v range
gain x 1 filter @ 1 Hz
Min. = 2014. A-D, Max. = 11726. A-D

Applied Research Associates, Inc.
Sleeve Calibration

02/12/93
12:09:04

Reference Device > RLC68572 1/21/94

$m = 4.543E-1$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 628. A-D, Max. = 5517. A-D

Measurement Dev. > Sleeve

$m = 5.660E-1$ (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = -4442. A-D, Max. = -497. A-D

Applied Research Associates, Inc.
Sleeve Calibration

01/05/93
12:09:53

Reference Device > RLC T1 02/13/93

m = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 87. A-D, Max. = 17. A-D

Measurement Dev. > Sleeve

m = 5.727E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 10658. A-D, Max. = 9984. A-D

Applied Research Associates, Inc.
Sleeve Calibration

01/05/93
12:11:55

Reference Device > RLC T1 02/13/93

m = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 6. A-D, Max. = 66. A-D

Measurement Dev. > Sleeve

m = 5.539E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 9884. A-D, Max. = 10440. A-D

Applied Research Associates, Inc.
Sleeve Calibration

01/05/93
12:14:03

Reference Device > RLC T1 02/13/93

$m = 5.299E0$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 86. A-D, Max. = 10. A-D

Measurement Dev. > Sleeve

$m = 5.896E-1$ (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 10646. A-D, Max. = 9957. A-D

Applied Research Associates, Inc.
Sleeve Calibration

01/05/93
12:16:37

Reference Device > RLC T1 02/13/93

$m = 5.299E0$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 59. A-D, Max. = 3. A-D

Measurement Dev. > Sleeve

$m = 5.618E-1$ (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 10400. A-D, Max. = 9885. A-D

Applied Research Associates, Inc.
Sleeve Calibration

01/05/93
12:19:22

Reference Device > RLC T1 02/13/93

n = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 89. A-D, Max. = 6. A-D

Measurement Dev. > Sleeve

n = 5.897E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 10666. A-D, Max. = 9909. A-D

used this one to run test!

Applied Research Associates, Inc.
Sleeve Calibration

01/05/93
12:22:06

Reference Device > RLC T1 02/13/93

n = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 34. A-D, Max. = 105. A-D

Measurement Dev. > Sleeve

n = 5.582E-1 (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 10151. A-D, Max. = 10827. A-D

D

Applied Research Associates, Inc.
Tip Calibration

01/05/93
12:35:09

Reference Device > RLC T1 02/13/93

m = 5.299E0 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 118. A-D, Max. = 636. A-D

Measurement Dev. > Tip

m = 2.423E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 8761. A-D, Max. = 9894. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

01/05/93
15:53:44

Reference Device > RPT A75041 10/01/93

$m = 3.811E-3$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1624. A-D, Max. = 16399. A-D

Measurement Dev. > Pore Pressure

$m = 3.223E-2$ (psi / A-D)

A-D channel 2 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1114. A-D, Max. = 2871. A-D

Applied Research Associates, Inc.
Depth Calibration

02/12/93
12:16:51

Reference Device > Ruler

Measurement Dev. > Depth
 $m = 3.075E-4$ (ft / A-D)
A-D channel 8 +/- 5v range
gain x 1 filter @ 1 Hz
Min. = 1912. A-D, Max. = 11663. A-D

Applied Research Associates, Inc.
Tip Calibration

02/12/93
12:34:08

Reference Device > RLC68572 1/21/94

$m = 4.543E-1$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2664. A-D, Max. = 16815. A-D

Measurement Dev. > Tip

$m = 2.534E0$ (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = -3451. A-D, Max. = -912. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

02/12/93
12:38:39

Reference Device > RPT A39394 1/21/94

$m = 4.690E-3$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2381. A-D, Max. = 22578. A-D

Measurement Dev. > Pore Pressure

$m = 4.106E-2$ (psi / A-D)

A-D channel 3 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2183. A-D, Max. = 4490. A-D

Applied Research Associates, Inc.
Sleeve Calibration

02/18/93
16:27:47

Reference Device > RLC68572 1/21/94

$m = 4.543E-1$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2284. A-D, Max. = 5581. A-D

Measurement Dev. > Sleeve

$m = 5.692E-1$ (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = -3129. A-D, Max. = -494. A-D

Applied Research Associates, Inc.
Tip Calibration

02/18/93
16:39:25

Reference Device > RLC68572 1/21/94

$m = 4.543E-1$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1446. A-D, Max. = 16846. A-D

Measurement Dev. > Tip

$m = 2.468E0$ (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = -3656. A-D, Max. = -814. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

02/18/93
16:48:06

Reference Device > RPT A39394 1/21/94

$m = 4.690E-3$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2353. A-D, Max. = 19491. A-D

Measurement Dev. > Pore Pressure

$m = 4.100E-2$ (psi / A-D)

A-D channel 3 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2148. A-D, Max. = 4112. A-D

Applied Research Associates, Inc.
Sleeve Calibration

03/08/93
14:14:47

Reference Device > RLC68569 1/21/94
 $m = 4.563E-1$ (lbs / A-D)
 A-D channel 5 +/- 5v range
 gain x 200 filter @ 1 Hz
 Min. = 1308. A-D, Max. = 5469. A-D

Measurement Dev. > Sleeve
 $m = 5.241E-1$ (lbs / A-D)
 A-D channel 1 +/- 5v range
 gain x 200 filter @ 1 Hz
 Min. = 3164. A-D, Max. = 6804. A-D

Applied Research Associates, Inc.
Depth Calibration

03/08/93
14:21:38

Reference Device > Ruler

Measurement Dev. > Depth

$m = 3.115E-4$ (ft / A-D)

A-D channel 8 +/- 5v range

gain x 1 filter @ 1 Hz

Min. = 1989. A-D, Max. = 11540. A-D

Applied Research Associates, Inc.
Tip Calibration

03/08/93
14:28:43

Reference Device > RLC68569 1/21/94

m = 4.563E-1 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2049. A-D, Max. = 17429. A-D

Measurement Dev. > Tip

m = 2.431E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 3785. A-D, Max. = 6670. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

03/08/93
14:32:36

Reference Device > RPT A39394 1/21/94

$m = 4.690E-3$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 676. A-D, Max. = 20098. A-D

Measurement Dev. > Pore Pressure

$m = 3.967E-2$ (psi / A-D)

A-D channel 3 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1826. A-D, Max. = 4124. A-D

Applied Research Associates, Inc.
Sleeve Calibration

03/09/93
14:28:17

Reference Device > RLC68569 1/21/94

$m = 4.563E-1$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 598. A-D, Max. = 5595. A-D

Measurement Dev. > Sleeve

$m = 5.347E-1$ (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2909. A-D, Max. = 7196. A-D

Applied Research Associates, Inc.
Tip Calibration

03/09/93
14:38:18

Reference Device > RLC68569 1/21/94

$m = 4.563E-1$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 3274. A-D, Max. = 17220. A-D

Measurement Dev. > Tip

$m = 2.470E0$ (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 3949. A-D, Max. = 6522. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

03/09/93
14:41:52

Reference Device > RPT A39394 1/21/94

$m = 4.690E-3$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1430. A-D, Max. = 18848. A-D

Measurement Dev. > Pore Pressure

$m = 4.042E-2$ (psi / A-D)

A-D channel 3 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1920. A-D, Max. = 3946. A-D

Applied Research Associates, Inc.
Sleeve Calibration

03/10/93
10:05:37

Reference Device > RLC68569 1/21/94

$m = 4.563E-1$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 337. A-D, Max. = 5466. A-D

Measurement Dev. > Sleeve

$m = 5.492E-1$ (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2611. A-D, Max. = 6892. A-D

Applied Research Associates, Inc.
Tip Calibration

03/10/93
10:17:19

Reference Device > RLC68569 1/21/94
 $m = 4.563E-1$ (lbs / A-D)
 A-D channel 5 +/- 5v range
 gain x 200 filter @ 1 Hz
 Min. = 3378. A-D, Max. = 17435. A-D

Measurement Dev. > Tip
 $m = 2.474E0$ (lbs / A-D)
 A-D channel 7 +/- 5v range
 gain x 200 filter @ 1 Hz
 Min. = 4053. A-D, Max. = 6646. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

03/10/93
10:20:31

Reference Device > RPT A39394 1/21/94

$m = 4.690E-3$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2144. A-D, Max. = 18759. A-D

Measurement Dev. > Pore Pressure

$m = 4.037E-2$ (psi / A-D)

A-D channel 3 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2166. A-D, Max. = 4097. A-D

Applied Research Associates, Inc.
Sleeve Calibration

03/11/93
07:46:45

Reference Device > RLC68569 1/21/94

$m = 4.563E-1$ (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 249. A-D, Max. = 5656. A-D

Measurement Dev. > Sleeve

$m = 5.611E-1$ (lbs / A-D)

A-D channel 1 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2569. A-D, Max. = 6961. A-D

Applied Research Associates, Inc.
Tip Calibration

03/11/93
08:04:32

Reference Device > RLC68569 1/21/94

m = 4.563E-1 (lbs / A-D)

A-D channel 5 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 3129. A-D, Max. = 17089. A-D

Measurement Dev. > Tip

m = 2.511E0 (lbs / A-D)

A-D channel 7 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 4023. A-D, Max. = 6561. A-D

Applied Research Associates, Inc.
Pore Pressure Calibration

03/11/93
08:07:44

Reference Device > RPT A39394 1/21/94

$m = 4.690E-3$ (psi / A-D)

A-D channel 6 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 1716. A-D, Max. = 18607. A-D

Measurement Dev. > Pore Pressure

$m = 4.040E-2$ (psi / A-D)

A-D channel 3 +/- 5v range

gain x 200 filter @ 1 Hz

Min. = 2138. A-D, Max. = 4102. A-D

APPENDIX E

HEALTH AND SAFETY DAILY ACTIVITIES

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 10/05/92
LOCATION: A/M AREA SOUTHERN SECTION CPT-1
TASK No.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
8:30	Arrive on site
13:30	Safety meeting
14:20	Started push #CPT-1 A/M Area
15:10	Stopped push at 117. No readings above background
16:27	All rods out. No reading above background
	Leave site.

INSTRUMENTATION USED: OVA and CGI

CALIBRATION TIME: 13:50

H&S SIGNATURE: *Allen Gallogly* DATE: 10/5/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 10/06/92
LOCATION: A/M AREA CPT-2, CPT-21
TASK No.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:10	Arrive on Site
8:40	Started push #CPT-2
9:24	Stopped push at 92 ft. No readings above background
10:50	All rods out
11:11	Moving to CPT-21
13:00	Started push CPT-21
16:30	All rods out. No readings above background
17.39	Grout problems
18:30	Leave site.

INSTRUMENTATION USED: OVA and CGI
_____
_____

CALIBRATION TIME: 7:20, 12:15
_____
_____

H&S SIGNATURE: *Allen Gallogly* DATE: 10/6/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 10/07/92
LOCATION: A/M AREA CPT-1
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
13:00	Arrive on site
14:30	ARA arrives on site
15:30	Started to send rods back down CPT-21
16:46	CPT-21 grouted up
17:00	Leave site.

INSTRUMENTATION USED: OVA and CGI

CALIBRATION TIME:

H&S SIGNATURE: *Allen Gallogly* DATE: 10/7/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 10/08/92
LOCATION: A/M AREA CPT-21B, CPT-2B, CPT-5A
TASK No.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:10	Arrive on site
9:00	Started to push. (CPT 21-B)
10:20	All rods out. No readings above background
11:00	Moved over to CPT-2B
12:37	Started push
13:45	Stopped at 110 ft. No reading above background
14:45	Done grouting
15:10	Started to move to CPT-5A
17:00	Leave site.

INSTRUMENTATION USED: OVA and CGI

CALIBRATION TIME: 7:30, 12:06

H&S SIGNATURE: *Allen Gallogly* DATE: 10/8/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 10/09/92
LOCATION: A/M AREA CPT-5A
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:10	Arrive on site
8:10	Started to push CPT-5A
8:49	Stopped at 85.53 ft. No reading above background
11:30	Lost grout sleeve
14:00	A rod snapped off
17:00	Leave site.

INSTRUMENTATION USED: OVA and CGI

CALIBRATION TIME: 7:20

H&S SIGNATURE: *Allen Gallogly* DATE: 10/9/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 10/12/92
LOCATION: A/M AREA CPT-5
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
10:15	Arrive on site. ARA is on site trying to get rods out of CPT-5A
11:58	All rods out
13:30	Grouted up hole CPT-5
16:30	Leave site

INSTRUMENTATION USED: OVA and CGI
_____
_____

CALIBRATION TIME: _____
_____
_____

H&S SIGNATURE: *Allen Gallogly* DATE: 10/12/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 10/13/92
LOCATION: A/M AREA CPT-1
TASK No.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
15:00	Arrive on site. Stopped to see if ARA was going to work. They were receiving a load of rods from their home office. They were not on site so we went looking for the next holes.
17:30	Leave site.

INSTRUMENTATION USED: OVA and CGI
_____
_____

CALIBRATION TIME: _____
_____
_____

H&S SIGNATURE: *Allen Gallogly* DATE: 10/13/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 10/15/92
LOCATION: A/M AREA CPT-5, CPT-8
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:30	Arrive on site
10:10	Moved to CPT-8
12:40	Health and Safety meeting
13:00	Started push
16:50	All rods out. No readings above background
16:55	Having trouble with grout rods
17:30	Started down with the grout rods
19:10	All rods out and one (1) grouted
19:15	Leave site.

INSTRUMENTATION USED: OVA and CGI

CALIBRATION TIME: 10:00

H&S SIGNATURE: *Allen Gallogly* DATE: 10/15/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 10/16/92
LOCATION: A/M AREA CPT-4, CPT-16
TASK No.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:10	Arrive on site
7:30	Moved to CPT-4
8:18	Arrive at CPT-4
9:30	Started to push CPT-4
11:21	All rods out. No readings above background
11:29	Started to get grout rods set up
13:30	Moved to CPT-16
15:40	Had to get a part for pressure worker
16:00	Leave site.

INSTRUMENTATION USED: OVA and CGI
_____
_____

CALIBRATION TIME: 8:30
_____
_____

H&S SIGNATURE: *Allen Gallogly* DATE: 10/16/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 10/19/92
LOCATION: A/M AREA CPT-16
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:15	Arrive on site
8:00	Started to push
11:00	All rods out. No readings above background
11:20	Moved to CPT-16B
11:40	Started to push 16B
13:20	Started to push grout rods
15:30	All rods out. No readings above background
16:50	Clean up site and top off holes
17:10	Leave site.

INSTRUMENTATION USED: OVA and CGI

CALIBRATION TIME: 7:40

H&S SIGNATURE: *Allen Gallogly* DATE: 10/19/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 10/20/92
LOCATION: A/M AREA CPT-6
TASK No.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:15	Arrive on site
8:20	Started to push CPT-6
11:30	All rods out. No readings above background
11:45	Sent rods down for the grout
13:49	All rods out
14:00	Had water in cone electronics. Had to dry and fix it
15:00	Leave site.

INSTRUMENTATION USED: OVA and CGI

CALIBRATION TIME: 7:30 OVA

H&S SIGNATURE: *Allen Gallogly* DATE: 10/20/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 10/21/92
LOCATION: A/M AREA CPT-6B
TASK No.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:15	Arrive on site
7:30	Health and Safety Meeting
8:20	Started to push
10:00	Pull rods out. No readings above background
12:50	Grouting done
13:30	Leave site.

INSTRUMENTATION USED: OVA and CGI
_____
_____

CALIBRATION TIME: 7:45 OVA
_____
_____

H&S SIGNATURE: *Allen Gallogly* DATE: 10/21/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 10/22/92
LOCATION: A/M AREA CPT-7
TASK No.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
8:30	Arrive on site
9:15	Started to push CPT-7
9:55	Will pull out rods and move. No readings above background
10:30	Push rods are out
10:35	Started down with grout rods.
11:20	All rods out
11:30	Moving to CPT-7B
11:50	Started to push
14:30	All rods out. No readings above background
16:00	Leave site.

INSTRUMENTATION USED: OVA and CGI

CALIBRATION TIME: 8:35 OVA

H&S SIGNATURE: DATE: 10/22/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 12/14/92
LOCATION: A/M AREA SOUTHERN SECTOR
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
12:30	ARA and Ebasco meet at well house
14:00	Working on electrical systems on ARA Truck
16:30	Leave site.

INSTRUMENTATION USED: OVA NOT USED ON 12-14-93

CALIBRATION TIME: _____

H&S SIGNATURE: Allen Gallogly DATE: 12/14/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 12/15/92
LOCATION: A/M AREA CPT-7
TASK No.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:20	Arrive on site
8:00	ARA arrived at punch hole #6
9:00	Health and Safety Meeting
9:15	Started to push CPT-7 A-D
10:25	All rods out. No readings above background
12:50	Started to drill
15:30	Pulled all rods out. No readings above background
16:30	Leave site.

INSTRUMENTATION USED: OVA and CGI
_____
_____

CALIBRATION TIME: 8:10 OVA
_____
_____

H&S SIGNATURE: *Allen Gallogly* DATE: 12/15/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 12/16/92
LOCATION: A/M AREA SOUTHERN SECTOR CPT-7
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:25	Arrive on site
8:40	Health and Safety Meeting
9:34	Started push
12:30	Had problems with rods. No readings above background
15:30	Rods still in ground
17:00	Started to remove rods
18:00	All rods out
18:10	Leave site

INSTRUMENTATION USED: OVA and CGI

CALIBRATION TIME: 7:30

H&S SIGNATURE: *Allen Gallogly* DATE: 12/16/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 12/17/92
LOCATION: A/M AREA SOUTHERN SECTOR CPT-7
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:10	Arrive on site
9:00	Had problems with cone
11:30	Started pushing with cone rods
12:20	Started to take out rods
13:10	Started down with grout rods
14:50	Grout rods out. No readings above the background level.
16:25	Started to drill
16:40	Stopped the drilling at 4 ft. The soil around the hole kept washing away.

INSTRUMENTATION USED: OVA and CGI
_____
_____

CALIBRATION TIME: 13:00
_____
_____

H&S SIGNATURE: *Allen Gallogly* DATE: 12/17/92

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 01/05/93
LOCATION: A/M AREA SOUTHERN SECTOR CPT-7
TASK No.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:10	Arrive on site, B-Area meet up with ARA
10:35	Health and Safety Meeting
11:34	Started push
13:30	Tony Dunbar (WSRC) came onsite to sample
16:03	Drilled down to 80 ft. No OVA readings above bk.
16:42	All drill rods out
17:45	Leave site

INSTRUMENTATION USED: OVA
_____
_____

CALIBRATION TIME: 10:45
_____
_____

H&S SIGNATURE: *Allen Gallogly* DATE: 1/5/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 01/06/93
LOCATION: A/M AREA SOUTHERN SECTOR CPT-7
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:30	Arrive on site
9:15	SRS Personnel visits
10:30	Pushed rods to 73 ft. No readings above bk.
11:10	Calibrated OVA
15:10	Started to drill the same hole w/drill bit. Had problems
16:30	All rods out.
17:30	Leave site

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 11:10

H&S SIGNATURE: *Allen Gallogly* DATE: 1/6/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 01/07/93
LOCATION: A/M AREA SOUTHERN SECTOR
TASK No.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:10	Arrive on site
8:00	ARA on site
9:30	Fixing equipment
11:45	Started down with grout rods
13:30	Started to grout
15:30	Problems with the grout pump.
16:45	Leave site

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 8:14

H&S SIGNATURE: Allen Gallogly DATE: 1/7/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 01/08/93
LOCATION: A/M AREA SOUTHERN SECTOR
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:30	Arrive on site
8:00	ARA on site
8:20	ARA truck stuck in mud.
11:45	Truck is out. Will try to grout up the open hole.
13:17	Started to mix grout
14:30	Took about 50 gallons of grout
16:30	Clean up site. Moved some equipment to next location.
17:00	Leave site

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 7:35

H&S SIGNATURE: Allen Gallogly

DATE: 1/8/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 01/09/93
LOCATION: A/M AREA SOUTHERN SECTOR CPT-13
TASK No.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
8:00	Arrive on site
10:00	Started to push
11:16	Stopped at 115 ft.. Could not find water at 100 ft.
11:20	Started to take rods out
13:30	Sampling rods down to 100 ft. No water. Had to leave rods in the ground.
14:45	Stopped work
14:15	Leave site.

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 8:55

H&S SIGNATURE: *Allen Gallogly* DATE: 1/9/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 01/11/93
LOCATION: A/M AREA SOUTHERN SECTOR
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:30	Arrive on site
8:30	Tried to take water sample. No water.
8:35	Started to pull sample rods. No readings above Bk.
9:30	Started down the same hole with cone rods.
10:00	Broke cone rod
11:45	All rods out
13:15	Started down with grout rods
14:45	Started to grout
16:00	ARA calibrated cone
17:00	Leave site.

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 8:00

H&S SIGNATURE: *Allen Gallogly* DATE: 1/11/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 01/12/93
LOCATION: A/M AREA SOUTHERN SECTOR
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:30	Arrive on site
8:30	Started down with cone rods
10:00	Down to 152 ft. Stopped to take out cone rods and put in sample rods. No readings above Bk.
14:00	Pulling sample rods
15:00	Started down with sampling rods. Tried to take a sample. No water. Will let rods sit at 136' to see if water seeps in.
16:30	Leave site

INSTRUMENTATION USED: OVA
_____
_____

CALIBRATION TIME: 8:00
_____
_____

H&S SIGNATURE: *Allen Gallogly*

DATE: 1/12/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 01/13/93
LOCATION: A/M AREA SOUTHERN SECTOR
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:30	Arrive on site
9:00	Pulled rods up 12" to check for water. No water.
9:40	Started to grout up hole #13.
12:35	Started to push the 3rd hole at 17(c) with cone rods.
13:50	Pulled out rods. Took a sample. No readings above BK
16:00	Tried to take sample. Came up dry.
17:00	Leave site

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 8:00

H&S SIGNATURE: Allen Gallogly

DATE: 1/13/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 01/14/93
LOCATION: A/M AREA SOUTHERN SECTOR
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:30	Arrive on site
11:00	Started to move to CPT-10
12:50	Started down hole CPT-10
14:00	Pushed to 150 ft.
15:30	All rods out. Starting down with grout rods.(Sample rods)
16:00	No readings above Bk. No water in hole. Will leave rods in overnight.
16:30	Leave site.

INSTRUMENTATION USED: OVA
_____
_____

CALIBRATION TIME: 8:00
_____
_____

H&S SIGNATURE: *Allen Gallogly* DATE: 1/14/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 01/15/93
LOCATION: A/M AREA SOUTHERN SECTOR CPT-10
TASK No.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:30	Arrive on site
8:38	Starting to grout up CPT-10
10:00	CPT-10 is grouted
10:58	Moved to M Basin
11:20	Started to push a dummy rod
13:45	All grout rods out. No OVA readings above Bk.
14:30	Had OVA readings of 18 to 30 ppm in the hole under truck. No readings in the BZ above 1.5 ppm. Advised ARA personnel to stay clear of the area under the truck or respirators will be needed.
15:00	Had problems with pump
16:30	Leave site

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 9:45

H&S SIGNATURE: *Allen Gallogly* DATE: 1/15/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 01/23/93
LOCATION: A/M AREA SOUTHERN SECTOR
TASK NO.: 051
H&S OFFICER: ALLEN GALLOGLY

ACTIVITY:

TIME	
7:30	Arrive on site
7:50	Started to push grout rods
8:45	Pushed to about 100 ft. Could go no deeper. No readings above BK.
9:10	Started to pull grout rods. No readings above BK
10:50	Had problems with grout going down rods.
11:50	All rods out. Hole has grouted up.
12:07	Cleaning up site
12:30	Leave site

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 7:40

H&S SIGNATURE: Allen Gallogly DATE: 1/23/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 02/16/93
LOCATION: A/M AREA SOUTHERN SECTOR
TASK No.: 051
H&S OFFICER: JOHN WALKER

ACTIVITY:

TIME	
9:00	Arrive on site
9:30	Set up exclusion zone and calibrated OVA. Pump failure

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 9:30

H&S SIGNATURE: *John Walker* DATE: 2/16/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 02/18/93
LOCATION: A/M AREA SOUTHERN SECTION
TASK NO.: 051
H&S OFFICER: JOHN WALKER

ACTIVITY:

TIME	
7:00	Arrive on site
8:08	Began drilling.
13:30	Continued cone penetration approximately 88.654 ft.
15:15	Stopped drilling at 152.96 ft. OVA-No significant reading
19:15	Pulling out cones. Refusal at 115 ft.
19:30	Leave site.

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 7:30

H&S SIGNATURE: *John Walker*

DATE: 2/18/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 02/19/93
LOCATION: A/M AREA
TASK No.: 051
H&S OFFICER: MIKE CRUZ

ACTIVITY:

TIME	
8:00	Arrive on Site
8:05	ARA begins pulling rods
9:40	ARA begins pushing OVA. No significant OVA readings
13:00	Drop approximately 100 ft of rod down hole. Try to remove
18:12	Leave site without having success. Will return tomorrow to try again.

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 8:01

H&S SIGNATURE: Allen Kelly DATE: 2/14/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 02/20/93
LOCATION: A/M AREA
TASK No.: 051
H&S OFFICER: MIKE CRUZ

ACTIVITY:

TIME	
9:30	Arrive on site.
10:00	Recovery attempt begins OVA. OVA above BK-No significant readings
14:30	Will attempt other measures to retrieve cone on Monday.

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 9:30

H&S SIGNATURE: *Mike Cruz* DATE: 2/20/93

EBASCO ENVIRONMENTAL

HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 03/08/93

LOCATION: A/M AREA

TASK No.: 051

H&S OFFICER: JOHN WALKER

ACTIVITY:

TIME	
9:30	Arrive on site
14:30	Calibration
15:20	ARA begins pushing rods
16:45	Post calibration
17:30	Leave site

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 14:30, 16:45

H&S SIGNATURE: *John Walker* DATE: 3/8/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 03/09/93
LOCATION: A/M AREA
TASK No.: 051
H&S OFFICER: JOHN WALKER

ACTIVITY:

TIME	
7:10	Arrive on Site
8:40	Started push #CPT-2
9:24	Stopped push at 92 ft. No readings above background
10:50	All rods out
11:11	Moving to CPT-21
13:00	Started push CPT-21
16:30	All rods out. No readings above background
17.39	Grout problems
18:30	Leave site.

INSTRUMENTATION USED: OVA and CGI

CALIBRATION TIME: 7:20, 12:15

H&S SIGNATURE: *John Walker* DATE: 3/9/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 03/10/93
LOCATION: A/M AREA
TASK NO.: 051
H&S OFFICER: JOHN WALKER

ACTIVITY:

TIME	
7:30	Arrive on site
8:08	PID not working. HSM will bring OVA later.
9:30	Move to next site. Hole #21
12:30	OVA reading. No significant reading
14:20	Complete sampling effort
14:30	Begin grouting borehole
18:00	Completed grouting. Leave site

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 11:42, 14:30

H&S SIGNATURE: *John Walker* DATE: 3/10/93

EBASCO ENVIRONMENTAL
HEALTH AND SAFETY: DAILY ACTIVITY REPORT

DATE: 03/11/93
LOCATION: A/M AREA
TASK NO.: 051
H&S OFFICER: JOHN WALKER

ACTIVITY:

TIME	
7:00	Arrive on site
8:00	ARA begins calibrating
10:24	Hit refusal at 162.2 ft
10:45	Pulling cones-no significant reading
11:36	Cones out of borehole
14:05	Sampling borehole
14:30	Begin grouting
15:54	Completed pulling rods
16:30	Leave site

INSTRUMENTATION USED: OVA

CALIBRATION TIME: 7:00, 15:47

H&S SIGNATURE: *John Walker* DATE: 3/11/93

APPENDIX F
LABORATORY RESULTS

Analytical Development Section
Savannah River Technology Center

SRT-ADS-93-0153
February 12, 1993
Page 1 of 12

To: Bob VanPelt, ER, Fax 4-6922/23

From: John Young, Analytical Services Group 5-3565

SUBJECT: ANALYTICAL RESULTS FOR CONE PENETROMETER (4)

The Analytical Development Section has completed analysis of samples from your 2/12/93 submission of samples to determine the A/M area contaminated groundwater plume boundary. The samples were obtained using a cone penetrometer sampling tool, adapted for deep sampling.

In summary, no target compound organic contamination was detected in the samples, and no other tentatively identified compounds could be isolated.

The specific reports are attached as listed:

Page	Description
2 -	Instrument tune report for bromofluorobenzene
3 -	Tune report data summary
4 -	NIST standard check report
5 -	Blank water analysis
6 -	Blank water analysis (repeat)
7 -	Blank water analysis (repeat)
8 -	SSVTB2CP
9 -	SSVC15CP
10 -	SSVC15CP (Duplicate)
11 -	SSVCP15CP
12 -	SSVCP15CP (w/NIST Spike)

f2

5A
Volatile Organic Instrument Performance Check
p-Bromofluorobenzene (BFB)

Lab Name: Savannah River Laboratory - ADS VOA Compliance Lab B159

Lab file ID: C:\CHEMPC\DATA\P2_12D.D BFB Injection Date: 12 Feb 93

Instrmnt ID: HP5890/5971 unit#1 BFB Injection Time: 10:55 am

GC Column : VOCOL 30m*0.53mm*3µm Heated purge : no

ION ABUNDANCE CRITERIA					
mass chrg	relative to	RCRA SW-846 meth8260A low - hi	CLP SOW 3-90 low - hi	relative abundance	Pass? y:n
50	95	15 - 40	8 - 40	16.4	yes
75	95	30 - 60	30 - 66	38.5	yes
95	N/A	100 - 100	83 - 100	100.0	yes
96	95	5 - 9	5 - 9	6.2	yes
173	174	0 - 2	0 - 2	0.0	yes
174	95	50 - 100	50 - 120	68.0	yes
175	174	5 - 9	4 - 9	6.8	yes
176	174	95 - 101	93 - 101	100.0	yes
177	176	5 - 9	5 - 9	6.1	yes

This check applies to the following samples, MS, MSD, Blanks and Standards

	ADS Sample No	File ID	Date Analyzed	Time Analyzed
01	3-3422	P2-12 F	12 Feb 93	11:36
02	3-3420	P2-12 F	12 Feb 93	13:11
03	3-3420 (Dp)	P2-12 G	12 Feb 93	13:47
04	3-3421	P2-12 H	12 Feb 93	15:02
05	3-3421 (Spk)	P2-12 I	12 Feb 93	15:39
06			12 Feb 93	
07			12 Feb 93	
08			12 Feb 93	
09			12 Feb 93	
10			12 Feb 93	
11			12 Feb 93	
12			12 Feb 93	
13			12 Feb 93	
14			12 Feb 93	
15			12 Feb 93	
16			12 Feb 93	
17			12 Feb 93	
18			12 Feb 93	
19			12 Feb 93	
20			12 Feb 93	

NIST 1586-1 std P2-12 A

8:20 Run before blank

Handwritten signature 2/12/93

Operator: prw
Date Acquired: 12 Feb 93 10:55 am
Method File: BIODG10.M
Sample Name: Blank
Misc Info: 5ml H2O w/8µl IS/Surr
ALS vial: 1

p 5

Jay 2/12/93

Biodegradation products

Calibration Last Updated: Tue Oct 20 14:52:20 1992
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P2_12A.D 12 Feb 93 8:20 am
Method: BIODEG10.M by prw
Sample Name: NIST 1586-1 Standard
Misc Info: 5µl std. w/ISS
Dilution factor = 1

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 1 µg/L	(u) 1
2	Chloroethane	NA	< 1 µg/L	(u) 1
3	1,1-Dichloroethene (D029)	NA	< 1 µg/L	(u) 1
4	Dichloromethane	1.33	1.2 µg/L	1
5	trans-1,2-Dichloroethene	NA	< 1 µg/L	(u) 1
6	1,1-Dichloroethane	NA	< 1 µg/L	(u) 1
7	cis-1,2-Dichloroethene	NA	< 1 µg/L	(u) 1
8	Chloroform (D022)	NA	< 1 µg/L	(u) 1
9	1,1,1-Trichloroethane	NA	< 1 µg/L	(u) 1
10	Carbon tetrachloride (D019)	2.81	100.9 µg/L	1
11	1,2-Dichloroethane (D028)	NA	< 1 µg/L	(u) 1
12	Benzene	3.02	85.0 µg/L	1
13	1,4-Difluorobenzene (IS)	3.50	50.0 ppb-a	0
14	Trichloroethene (D040)	NA	< 1 µg/L	(u) 1
15	Toluene-d8 (Surrogate)	6.57	25.6 ppb-a	2
16	Toluene	NA	< 1 µg/L	(u) 2
17	1,1,2-Trichloroethane	NA	< 1 µg/L	(u) 2
18	Tetrachloroethene (D039)	NA	< 1 µg/L	(u) 2
19	Chlorobenzene-d5 (IS)	10.88	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 1 µg/L	(u) 2
21	4-Bromofluorobenzene (Surrogate)	13.52	22.2 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 1 µg/L	(u) 2

END OF REPORT

(u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).

Jay 2/12/93

Biodegradation products

Calibration Last Updated: Tue Oct 20 14:52:20 1992
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P2_12B.D 12 Feb 93 9:35 am
Method: BIODEG10.M by prw
Sample Name: Blank
Misc Info: 5ml H2O w/8µl IS/Surr
Dilution factor = 0.4

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 0 µg/L	(u) 1
2	Chloroethane	NA	< 0 µg/L	(u) 1
3	1,1-Dichloroethene (D029)	NA	< 0 µg/L	(u) 1
4	Dichloromethane	NA	< 0 µg/L	(u) 1
5	trans-1,2-Dichloroethene	NA	< 0 µg/L	(u) 1
6	1,1-Dichloroethane	NA	< 0 µg/L	(u) 1
7	cis-1,2-Dichloroethene	NA	< 0 µg/L	(u) 1
8	Chloroform (D022)	NA	< 0 µg/L	(u) 1
9	1,1,1-Trichloroethane	NA	< 0 µg/L	(u) 1
10	Carbon tetrachloride (D019)	2.86	1.6 µg/L	1
11	1,2-Dichloroethane (D028)	NA	< 0 µg/L	(u) 1
12	Benzene	3.05	2.4 µg/L	1
13	1,4-Difluorobenzene (IS)	3.55	50.0 ppb-a	0
14	Trichloroethene (D040)	NA	< 0 µg/L	(u) 1
15	Toluene-d8 (Surrogate)	6.64	25.2 ppb-a	2
16	Toluene	NA	< 0 µg/L	(u) 2
17	1,1,2-Trichloroethane	NA	< 0 µg/L	(u) 2
18	Tetrachloroethene (D039)	NA	< 0 µg/L	(u) 2
19	Chlorobenzene-d5 (IS)	10.91	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 0 µg/L	(u) 2
21	4-Bromofluorobenzene (Surrogate)	13.54	22.1 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 0 µg/L	(u) 2

END OF REPORT

(u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).

J. Yang 2/12/93

p6

Biodegradation products

Calibration Last Updated: Tue Oct 20 14:52:20 1992
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P2_12C.D 12 Feb 93 10:15 am
Method: BIODEG10.M by prw
Sample Name: Blank
Misc Info: 5ml H2O w/8µl IS/Surr
Dilution factor = 0.4

Pk # Compound	Ret Time	Amount	Peak Type
1 Vinyl chloride (D027)	NA	< 0 µg/L (u)	1
2 Chloroethane	NA	< 0 µg/L (u)	1
3 1,1-Dichloroethene (D029)	NA	< 0 µg/L (u)	1
4 Dichloromethane	NA	< 0 µg/L (u)	1
5 trans-1,2-Dichloroethene	NA	< 0 µg/L (u)	1
6 1,1-Dichloroethane	NA	< 0 µg/L (u)	1
7 cis-1,2-Dichloroethene	NA	< 0 µg/L (u)	1
8 Chloroform (D022)	NA	< 0 µg/L (u)	1
9 1,1,1-Trichloroethane	NA	< 0 µg/L (u)	1
10 Carbon tetrachloride (D019)	NA	< 0 µg/L (u)	1
11 1,2-Dichloroethane (D028)	NA	< 0 µg/L (u)	1
12 Benzene	3.04	0.7 µg/L	1
13 1,4-Difluorobenzene (IS)	3.53	50.0 ppb-a	0
14 Trichloroethene (D040)	NA	< 0 µg/L (u)	1
15 Toluene-d8 (Surrogate)	6.60	24.8 ppb-a	2
16 Toluene	NA	< 0 µg/L (u)	2
17 1,1,2-Trichloroethane	NA	< 0 µg/L (u)	2
18 Tetrachloroethene (D039)	NA	< 0 µg/L (u)	2
19 Chlorobenzene-d5 (IS)	10.89	50.0 ppb-a	0
20 1,1,1,2-Tetrachloroethane	NA	< 0 µg/L (u)	2
21 4-Bromofluorobenzene (Surrogate)	13.54	21.9 ppb-a	2
22 1,1,2,2-Tetrachloroethane	NA	< 0 µg/L (u)	2

END OF REPORT

(u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).

January 2/12/93

Biodegradation products

Calibration Last Updated: Tue Oct 20 14:52:20 1992
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P2_12D.D 12 Feb 93 10:55 am
Method: BIODEG10.M by prw
Sample Name: Blank
Misc Info: 5ml H2O w/8µl IS/Surr
Dilution factor = 0.4

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 0 µg/L (u)	1
2	Chloroethane	NA	< 0 µg/L (u)	1
3	1,1-Dichloroethene (D029)	NA	< 0 µg/L (u)	1
4	Dichloromethane	NA	< 0 µg/L (u)	1
5	trans-1,2-Dichloroethene	NA	< 0 µg/L (u)	1
6	1,1-Dichloroethane	NA	< 0 µg/L (u)	1
7	cis-1,2-Dichloroethene	NA	< 0 µg/L (u)	1
8	Chloroform (D022)	NA	< 0 µg/L (u)	1
9	1,1,1-Trichloroethane	NA	< 0 µg/L (u)	1
10	Carbon tetrachloride (D019)	NA	< 0 µg/L (u)	1
11	1,2-Dichloroethane (D028)	NA	< 0 µg/L (u)	1
12	Benzene	3.08	0.5 µg/L	1
13	1,4-Difluorobenzene (IS)	3.56	50.0 ppb-a	0
14	Trichloroethene (D040)	NA	< 0 µg/L (u)	1
15	Toluene-d8 (Surrogate)	6.63	24.9 ppb-a	2
16	Toluene	NA	< 0 µg/L (u)	2
17	1,1,2-Trichloroethane	NA	< 0 µg/L (u)	2
18	Tetrachloroethene (D039)	NA	< 0 µg/L (u)	2
19	Chlorobenzene-d5 (IS)	10.90	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 0 µg/L (u)	2
21	4-Bromofluorobenzene (Surrogate)	13.53	22.7 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 0 µg/L (u)	2

END OF REPORT

(u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).

J. J. J. 2/12/93

p8

Biodegradation products

Calibration Last Updated: Tue Oct 20 14:52:20 1992
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P2_12E.D 12 Feb 93 11:36 am
Method: BIOD10.M by prw
Sample Name: ADS 3-3422 SSVTB2CP
Misc Info: 5ml smp. w/ISS
Dilution factor = 1

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 1 µg/L	(u) 1
2	Chloroethane	NA	< 1 µg/L	(u) 1
3	1,1-Dichloroethene (D029)	NA	< 1 µg/L	(u) 1
4	Dichloromethane	NA	< 1 µg/L	(u) 1
5	trans-1,2-Dichloroethene	NA	< 1 µg/L	(u) 1
6	1,1-Dichloroethane	NA	< 1 µg/L	(u) 1
7	cis-1,2-Dichloroethene	NA	< 1 µg/L	(u) 1
8	Chloroform (D022)	NA	< 1 µg/L	(u) 1
9	1,1,1-Trichloroethane	NA	< 1 µg/L	(u) 1
10	Carbon tetrachloride (D019)	NA	< 1 µg/L	(u) 1
11	1,2-Dichloroethane (D028)	NA	< 1 µg/L	(u) 1
12	Benzene	3.07	0.4 µg/L	(j) 1
13	1,4-Difluorobenzene (IS)	3.57	50.0 ppb-a	0
14	Trichloroethene (D040)	NA	< 1 µg/L	(u) 1
15	Toluene-d8 (Surrogate)	6.64	24.8 ppb-a	2
16	Toluene	6.90	0.3 µg/L	(j) 2#
17	1,1,2-Trichloroethane	NA	< 1 µg/L	(u) 2
18	Tetrachloroethene (D039)	NA	< 1 µg/L	(u) 2
19	Chlorobenzene-d5 (IS)	10.91	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 1 µg/L	(u) 2
21	4-Bromofluorobenzene (Surrogate)	13.54	22.2 ppb-a	2#
22	1,1,2,2-Tetrachloroethane	NA	< 1 µg/L	(u) 2

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
- (j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 1 µg/L.

Jayay 2/12/93

Biodegradation products

Calibration Last Updated: Tue Oct 20 14:52:20 1992
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P2_12F.D 12 Feb 93 1:11 pm
Method: BIODEG10.M by prw
Sample Name: ADS 3-3420 SSVCL5CP
Misc Info: 5ml smp. w/ISS
Dilution factor = 1

ADS 3-3420

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 1 µg/L (u)	1
2	Chloroethane	NA	< 1 µg/L (u)	1
3	1,1-Dichloroethene (D029)	NA	< 1 µg/L (u)	1
4	Dichloromethane	NA	< 1 µg/L (u)	1
5	trans-1,2-Dichloroethene	NA	< 1 µg/L (u)	1
6	1,1-Dichloroethane	NA	< 1 µg/L (u)	1
7	cis-1,2-Dichloroethene	NA	< 1 µg/L (u)	1
8	Chloroform (D022)	NA	< 1 µg/L (u)	1
9	1,1,1-Trichloroethane	NA	< 1 µg/L (u)	1
10	Carbon tetrachloride (D019)	NA	< 1 µg/L (u)	1
11	1,2-Dichloroethane (D028)	NA	< 1 µg/L (u)	1
12	Benzene	3.05	0.5 µg/L (j)	1
13	1,4-Difluorobenzene (IS)	3.57	50.0 ppb-a	0
14	Trichloroethene (D040)	NA	< 1 µg/L (u)	1
15	Toluene-d8 (Surrogate)	6.64	25.1 ppb-a	2
16	Toluene	6.90	0.0 µg/L (j)	2#
17	1,1,2-Trichloroethane	NA	< 1 µg/L (u)	2
18	Tetrachloroethene (D039)	NA	< 1 µg/L (u)	2
19	Chlorobenzene-d5 (IS)	10.91	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 1 µg/L (u)	2
21	4-Bromofluorobenzene (Surrogate)	13.54	22.3 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 1 µg/L (u)	2

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
- (j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 1 µg/L.

Jays 2/12/93

Biodegradation products

Calibration Last Updated: Tue Oct 20 14:52:20 1992
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P2_12G.D 12 Feb 93 1:47 pm ADS 3-3420
Method: BIODG10.M by prw
Sample Name: ADS 3-3420 SSV15CP (Duplicate)
Misc Info: 5ml smp. w/ISS
Dilution factor = 1

Pk # Compound	Ret Time	Amount	Peak Type
1 Vinyl chloride (D027)	NA	< 1 µg/L	(u) 1
2 Chloroethane	NA	< 1 µg/L	(u) 1
3 1,1-Dichloroethene (D029)	NA	< 1 µg/L	(u) 1
4 Dichloromethane	NA	< 1 µg/L	(u) 1
5 trans-1,2-Dichloroethene	NA	< 1 µg/L	(u) 1
6 1,1-Dichloroethane	NA	< 1 µg/L	(u) 1
7 cis-1,2-Dichloroethene	NA	< 1 µg/L	(u) 1
8 Chloroform (D022)	NA	< 1 µg/L	(u) 1
9 1,1,1-Trichloroethane	NA	< 1 µg/L	(u) 1
10 Carbon tetrachloride (D019)	NA	< 1 µg/L	(u) 1
11 1,2-Dichloroethane (D028)	NA	< 1 µg/L	(u) 1
12 Benzene	3.11	0.2 µg/L	(j) 1
13 1,4-Difluorobenzene (IS)	3.59	50.0 ppb-a	0
14 Trichloroethene (D040)	NA	< 1 µg/L	(u) 1
15 Toluene-d8 (Surrogate)	6.66	22.8 ppb-a	2
16 Toluene	6.89	0.1 µg/L	(j) 2#
17 1,1,2-Trichloroethane	NA	< 1 µg/L	(u) 2
18 Tetrachloroethene (D039)	8.74	0.0 µg/L	(j) 2m
19 Chlorobenzene-d5 (IS)	10.93	50.0 ppb-a	0
20 1,1,1,2-Tetrachloroethane	NA	< 1 µg/L	(u) 2
21 4-Bromofluorobenzene (Surrogate)	13.56	22.3 ppb-a	2
22 1,1,2,2-Tetrachloroethane	NA	< 1 µg/L	(u) 2

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 1 µg/L.

Jay 2/12/93

Biodegradation products

Calibration Last Updated: Tue Oct 20 14:52:20 1992
Internal Standard Report - Summary

p11

File: C:\CHEMPC\DATA\P2_12H.D 12 Feb 93 3:02 pm
Method: BIODEG10.M by prw
Sample Name: ADS 3-34221 SSVCP15CP
Misc Info: 5ml smp. w/ISS
Dilution factor = 1

ADS 3-3421

Pk # Compound	Ret Time	Amount	Peak Type
1 Vinyl chloride (D027)	NA	< 1 µg/L	(u) 1
2 Chloroethane	NA	< 1 µg/L	(u) 1
3 1,1-Dichloroethene (D029)	NA	< 1 µg/L	(u) 1
4 Dichloromethane	NA	< 1 µg/L	(u) 1
5 trans-1,2-Dichloroethene	NA	< 1 µg/L	(u) 1
6 1,1-Dichloroethane	NA	< 1 µg/L	(u) 1
7 cis-1,2-Dichloroethene	NA	< 1 µg/L	(u) 1
8 Chloroform (D022)	NA	< 1 µg/L	(u) 1
9 1,1,1-Trichloroethane	NA	< 1 µg/L	(u) 1
10 Carbon tetrachloride (D019)	NA	< 1 µg/L	(u) 1
11 1,2-Dichloroethane (D028)	NA	< 1 µg/L	(u) 1
12 Benzene	3.11	0.1 µg/L	(j) 1
13 1,4-Difluorobenzene (IS)	3.58	50.0 ppb-a	0
14 Trichloroethene (D040)	NA	< 1 µg/L	(u) 1
15 Toluene-d8 (Surrogate)	6.67	24.9 ppb-a	2
16 Toluene	6.88	0.2 µg/L	(j) 2#
17 1,1,2-Trichloroethane	NA	< 1 µg/L	(u) 2
18 Tetrachloroethene (D039)	NA	< 1 µg/L	(u) 2
19 Chlorobenzene-d5 (IS)	10.92	50.0 ppb-a	0
20 1,1,1,2-Tetrachloroethane	NA	< 1 µg/L	(u) 2
21 4-Bromofluorobenzene (Surrogate)	13.55	22.3 ppb-a	2
22 1,1,2,2-Tetrachloroethane	NA	< 1 µg/L	(u) 2

END OF REPORT

 # Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
- (j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 1 µg/L.

Jagay 2/12/93

Biodegradation products.

Calibration Last Updated: Tue Oct 20 14:52:20 1992
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P2_12I.D 12 Feb 93 3:39 pm

Method: BIODEG10.M by prw

Sample Name:

ADS 3-3421 SSVCP15CP (Spiked)

Misc Info:

5ml samp., 5µl spk w/ISS

Dilution factor = 1

ADS 3-3421 Spike

Pk # Compound	Ret Time	Amount	Peak Type
1 Vinyl chloride (D027)	NA	< 1 µg/L	(u) 1
2 Chloroethane	NA	< 1 µg/L	(u) 1
3 1,1-Dichloroethene (D029)	NA	< 1 µg/L	(u) 1
4 Dichloromethane	1.36	1.3 µg/L	1
5 trans-1,2-Dichloroethene	NA	< 1 µg/L	(u) 1
6 1,1-Dichloroethane	NA	< 1 µg/L	(u) 1
7 cis-1,2-Dichloroethene	NA	< 1 µg/L	(u) 1
8 Chloroform (D022)	2.30	0.2 µg/L	(j) 1#
9 1,1,1-Trichloroethane	NA	< 1 µg/L	(u) 1
10 Carbon tetrachloride (D019)	2.88	105.6 µg/L	1 106% Rec
11 1,2-Dichloroethane (D028)	NA	< 1 µg/L	(u) 1
12 Benzene	3.11	88.9 µg/L	1 89% Rec
13 1,4-Difluorobenzene (IS)	3.60	50.0 ppb-a	0
14 Trichloroethene (D040)	NA	< 1 µg/L	(u) 1
15 Toluene-d8 (Surrogate)	6.66	23.5 ppb-a	2
16 Toluene	6.90	0.2 µg/L	(j) 2#
17 1,1,2-Trichloroethane	NA	< 1 µg/L	(u) 2
18 Tetrachloroethene (D039)	NA	< 1 µg/L	(u) 2
19 Chlorobenzene-d5 (IS)	10.91	50.0 ppb-a	0
20 1,1,1,2-Tetrachloroethane	NA	< 1 µg/L	(u) 2
21 4-Bromofluorobenzene (Surrogate)	13.54	22.8 ppb-a	2
22 1,1,2,2-Tetrachloroethane	NA	< 1 µg/L	(u) 2

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 1 µg/L.

Jay 2/12/93

Biodegradation products

Calibration Last Updated: Tue Oct 20 14:52:20 1992

Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P1_15B.D 15 Jan 93 11:38 am

Method: BIODG10.M by prw

Sample Name:

SSVTBCP

Misc Info:

1ml sample

Dilution factor = 5

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 5 µg/L (u)	1
2	Chloroethane	NA	< 5 µg/L (u)	1
3	1,1-Dichloroethene (D029)	NA	< 5 µg/L (u)	1
4	Dichloromethane	1.40	4.3 µg/L (j)	1
5	trans-1,2-Dichloroethene	NA	< 5 µg/L (u)	1
6	1,1-Dichloroethane	NA	< 5 µg/L (u)	1
7	cis-1,2-Dichloroethene	NA	< 5 µg/L (u)	1
8	Chloroform (D022)	NA	< 5 µg/L (u)	1
9	1,1,1-Trichloroethane	NA	< 5 µg/L (u)	1
10	Carbon tetrachloride (D019)	NA	< 5 µg/L (u)	1
11	1,2-Dichloroethane (D028)	NA	< 5 µg/L (u)	1
12	Benzene	NA	< 5 µg/L (u)	1
13	1,4-Difluorobenzene (IS)	3.67	50.0 ppb-a	0
14	Trichloroethene (D040)	NA	< 5 µg/L (u)	1
15	Toluene-d8 (Surrogate)	6.78	25.1 ppb-a	2
16	Toluene	NA	< 5 µg/L (u)	2
17	1,1,2-Trichloroethane	NA	< 5 µg/L (u)	2
18	Tetrachloroethene (D039)	NA	< 5 µg/L (u)	2
19	Chlorobenzene-d5 (IS)	10.98	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 5 µg/L (u)	2
21	4-Bromofluorobenzene (Surrogate)	13.57	21.7 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 5 µg/L (u)	2

END OF REPORT

(u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).

(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 5 µg/L.

Biodegradation products

Calibration Last Updated: Tue Oct 20 14:52:20 1992
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P1_15C.D 15 Jan 93 1:15 pm
Method: BIOD10.M by prw
Sample Name: SSV10PCP
Misc Info: 1ml sample
Dilution factor = 5

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 5 µg/L	(u) 1
2	Chloroethane	NA	< 5 µg/L	(u) 1
3	1,1-Dichloroethene (D029)	1.19	0.9 µg/L	(j) 1#
4	Dichloromethane	NA	< 5 µg/L	(u) 1
5	trans-1,2-Dichloroethene	1.40	0.0 µg/L	(j) 1m
6	1,1-Dichloroethane	NA	< 5 µg/L	(u) 1
7	cis-1,2-Dichloroethene	NA	< 5 µg/L	(u) 1
8	Chloroform (D022)	NA	< 5 µg/L	(u) 1
9	1,1,1-Trichloroethane	NA	< 5 µg/L	(u) 1
10	Carbon tetrachloride (D019)	NA	< 5 µg/L	(u) 1
11	1,2-Dichloroethane (D028)	NA	< 5 µg/L	(u) 1
12	Benzene	NA	< 5 µg/L	(u) 1
13	1,4-Difluorobenzene (IS)	3.73	50.0 ppb-a	0
14	Trichloroethene (D040)	4.15	87.4 µg/L	1 -
15	Toluene-d8 (Surrogate)	6.82	25.1 ppb-a	2
16	Toluene	7.01	10.6 µg/L	2 -
17	1,1,2-Trichloroethane	NA	< 5 µg/L	(u) 2
18	Tetrachloroethene (D039)	8.88	51.2 µg/L	2
19	Chlorobenzene-d5 (IS)	10.97	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 5 µg/L	(u) 2
21	4-Bromofluorobenzene (Surrogate)	13.56	21.7 ppb-a	2
22	1,1,2,2-Tetrachloroethane	13.93	0.2 µg/L	(j) 2#

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 5 µg/L.

J. J. J.
1/15/93

Biodegradation products

Calibration Last Updated: Tue Oct 20 14:52:20 1992
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P1_15D.D 15 Jan 93 1:59 pm
Method: BIODG10.M by prw
Sample Name: SSV10DCP
Misc Info: 5ml sample
Dilution factor = 1

Pk # Compound	Ret Time	Amount	Peak Type
1 Vinyl chloride (D027)	NA	< 1 µg/L	(u) 1
2 Chloroethane	NA	< 1 µg/L	(u) 1
3 1,1-Dichloroethene (D029)	1.19	0.8 µg/L	(j) 1
4 Dichloromethane	NA	< 1 µg/L	(u) 1
5 trans-1,2-Dichloroethene	1.40	0.0 µg/L	(j) 1m
6 1,1-Dichloroethane	NA	< 1 µg/L	(u) 1
7 cis-1,2-Dichloroethene	2.21	1.0 µg/L	(j) 1
8 Chloroform (D022)	NA	< 1 µg/L	(u) 1
9 1,1,1-Trichloroethane	2.72	0.1 µg/L	(j) 1#
10 Carbon tetrachloride (D019)	NA	< 1 µg/L	(u) 1
11 1,2-Dichloroethane (D028)	NA	< 1 µg/L	(u) 1
12 Benzene	NA	< 1 µg/L	(u) 1
13 1,4-Difluorobenzene (IS)	3.70	50.0 ppb-a	0
14 Trichloroethene (D040)	4.12	58.1 µg/L	1
15 Toluene-d8 (Surrogate)	6.80	25.3 ppb-a	2
16 Toluene	7.01	5.3 µg/L	2
17 1,1,2-Trichloroethane	NA	< 1 µg/L	(u) 2
18 Tetrachloroethene (D039)	8.85	28.6 µg/L	2
19 Chlorobenzene-d5 (IS)	10.97	50.0 ppb-a	0
20 1,1,1,2-Tetrachloroethane	NA	< 1 µg/L	(u) 2
21 4-Bromofluorobenzene (Surrogate)	13.56	21.3 ppb-a	2
22 1,1,2,2-Tetrachloroethane	13.85	1.7 µg/L	2# -

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 1 µg/L.

Jan
1/15/93

**Savannah River Technology Center
Analytical Development Section**

SRT-ADS-93-0218

April 2, 1993

To: Bob VanPelt, ER, CCC-4

From: John Young, 773-A, 5-3565

Subject: A/M Southern Sector Plume Boundary Definition by
Cone Penetrometer Sampling Summary (U)

We have completed analysis of your samples from the project to generate supporting data for the placement (and minimization) of new monitoring wells for the A/M area groundwater program.

Volatile organic analyses were performed by Gas Chromatography - Mass Spectrometry (GC-MS), using the ADS version of EPA SW-846 method 8260A. Samples were concentrated using a OI Analytical model 4460A Dynamic Headspace concentrator (Purge and Trap), using a three stage (2,6-diphenylene oxide, silica gel and coconut charcoal) trap. Separation was performed with a Hewlett Packard 5890 series II gas chromatograph on a 30m x 0.53mm VOCOL fused silica capillary column with 3 μ m film thickness. Quantitation was performed with a Hewlett Packard model 5971 quadrupole mass spectrometer. A glass jet separator was inline prior to the inlet into the mass spectrometer. Internal standard and recovery surrogate compounds were added as specified in the Contract Laboratory Program for volatile organics (SOW 3-90). The mass spectrometer tuning was confirmed within 12 hours prior to each measurement using p-bromofluorobenzene. Tuning verification was performed against both RCRA SW-846 and CLP tuning requirements.

Attached are the final sample analyses that were performed for the samples that you obtained on March 10 and 11. Please note that several dilutions, duplicates and/or spike sample data is included in the package. If any additional clarification or interpretation is needed, please contact me at the above phone number.

attachments: Analytical data reports for SSV11 and SSV20 sample locations

CC Distribution:

C. E. Coffey, 773-A
D. B. Moore-Shedrow, 773-A
P. F. Cloessner, 773-A
J. C. Griffin, 773-A
M. A. Polochko, 773-A
P. R. Waller, 773-A
ADS Record File

Calibration Last Updated: Tue Mar 02 09:17:59 1993
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P3_19H.D 19 Mar 93 2:09 pm
Method: BIODEG10.M by prw
Sample Name: ADS 3-4659 SSV11CCP (repeat)
Misc Info: 10µl smp.
Dilution factor = 500

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 500 µg/L	(u) 1
2	Chloroethane	NA	< 500 µg/L	(u) 1
3	1,1-Dichloroethene (D029)	NA	< 500 µg/L	(u) 1
4	Dichloromethane	NA	< 500 µg/L	(u) 1
5	trans-1,2-Dichloroethene	NA	< 500 µg/L	(u) 1
6	1,1-Dichloroethane	NA	< 500 µg/L	(u) 1
7	cis-1,2-Dichloroethene	NA	< 500 µg/L	(u) 1
8	Chloroform (D022)	NA	< 500 µg/L	(u) 1
9	1,1,1-Trichloroethane	NA	< 500 µg/L	(u) 1
10	Carbon tetrachloride (D019)	NA	< 500 µg/L	(u) 1
11	1,2-Dichloroethane (D028)	NA	< 500 µg/L	(u) 1
12	Benzene	3.20	292.1 µg/L	(j) 1
13	1,4-Difluorobenzene (IS)	3.70	50.0 ppb-a	0
14	Trichloroethene (D040)	4.12	54631.0 µg/L	1
15	Toluene-d8 (Surrogate)	6.77	24.1 ppb-a	2
16	Toluene	NA	< 500 µg/L	(u) 2
17	1,1,2-Trichloroethane	NA	< 500 µg/L	(u) 2
18	Tetrachloroethene (D039)	8.83	1089.2 µg/L	2
19	Chlorobenzene-d5 (IS)	10.95	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 500 µg/L	(u) 2
21	4-Bromofluorobenzene (Surrogate)	13.56	20.8 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 500 µg/L	(u) 2

END OF REPORT

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 500 µg/L.

John C. ...
3/23/93

Calibration Last Updated: Tue Mar 02 09:17:59 1993
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P3_15E.D 15 Mar 93 1:51 pm
Method: BIODG10.M by prw
Sample Name: ADS 3-4660 SSV11PCP 3/10/93
Misc Info: 10µl smp.
Dilution factor = 500

Pk # Compound	Ret Time	Amount	Peak Type
1 Vinyl chloride (D027)	NA	< 500 µg/L	(u) 1
2 Chloroethane	NA	< 500 µg/L	(u) 1
3 1,1-Dichloroethene (D029)	NA	< 500 µg/L	(u) 1
4 Dichloromethane	NA	< 500 µg/L	(u) 1
5 trans-1,2-Dichloroethene	NA	< 500 µg/L	(u) 1
6 1,1-Dichloroethane	NA	< 500 µg/L	(u) 1
7 cis-1,2-Dichloroethene	NA	< 500 µg/L	(u) 1
8 Chloroform (D022)	NA	< 500 µg/L	(u) 1
9 1,1,1-Trichloroethane	NA	< 500 µg/L	(u) 1
10 Carbon tetrachloride (D019)	NA	< 500 µg/L	(u) 1
11 1,2-Dichloroethane (D028)	NA	< 500 µg/L	(u) 1
12 Benzene	NA	< 500 µg/L	(u) 1
13 1,4-Difluorobenzene (IS)	3.68	50.0 ppb-a	0
14 Trichloroethene (D040)	4.10	58660.0 µg/L	1
15 Toluene-d8 (Surrogate)	6.79	23.7 ppb-a	2
16 Toluene	7.00	16.1 µg/L	(j) 2#
17 1,1,2-Trichloroethane	NA	< 500 µg/L	(u) 2
18 Tetrachloroethene (D039)	8.85	1197.1 µg/L	2
19 Chlorobenzene-d5 (IS)	10.95	50.0 ppb-a	0
20 1,1,1,2-Tetrachloroethane	NA	< 500 µg/L	(u) 2
21 4-Bromofluorobenzene (Surrogate)	13.57	21.1 ppb-a	2
22 1,1,2,2-Tetrachloroethane	NA	< 500 µg/L	(u) 2

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 500 µg/L.

Jay
3/23/93

Biodegradation products

Calibration Last Updated: Tue Mar 02 09:17:59 1993
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P3_15F.D 15 Mar 93 3:20 pm
Method: BIODEG10.M by prw
Sample Name: ADS 3-4660 SSV11PCP 3/10/93 (spike)
Misc Info: 10µl smp.; 5µl spk.
Dilution factor = 500

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 500 µg/L	(u) 1
2	Chloroethane	NA	< 500 µg/L	(u) 1
3	1,1-Dichloroethane (D029)	NA	< 500 µg/L	(u) 1
4	Dichloromethane	1.40	627.7 µg/L	1
5	trans-1,2-Dichloroethene	NA	< 500 µg/L	(u) 1
6	1,1-Dichloroethane	NA	< 500 µg/L	(u) 1
7	cis-1,2-Dichloroethane	NA	< 500 µg/L	(u) 1
8	Chloroform (D022)	2.39	125.7 µg/L	(j) 1#
9	1,1,1-Trichloroethane	NA	< 500 µg/L	(u) 1
10	Carbon tetrachloride (D019)	2.95	50376.1 µg/L	1
11	1,2-Dichloroethane (D028)	NA	< 500 µg/L	(u) 1
12	Benzene	3.18	48952.1 µg/L	1
13	1,4-Difluorobenzene (IS)	3.70	50.0 ppb-a	0
14	Trichloroethene (D040)	4.12	46373.5 µg/L	1
15	Toluene-d8 (Surrogate)	6.79	23.7 ppb-a	2
16	Toluene	6.98	51.4 µg/L	(j) 2
17	1,1,2-Trichloroethane	NA	< 500 µg/L	(u) 2
18	Tetrachloroethene (D039)	8.85	997.3 µg/L	2
19	Chlorobenzene-d5 (IS)	10.97	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 500 µg/L	(u) 2
21	4-Bromofluorobenzene (Surrogate)	13.56	20.8 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 500 µg/L	(u) 2

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
- (j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 500 µg/L.

Spt Recovery

Carbon Tet. = 99.7%

Benzene = 122.3%

Jager
4/23/93

Biodegradation products

Calibration Last Updated: Tue Mar 02 09:17:59 1993
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P3_11D.D 11 Mar 93 11:15 am

Method: BIODEG10.M by prw

Sample Name:

SSVTB1CP

ADS 3-4661

Misc Info:

5ml smp. w/ISS

Dilution factor = 1

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 1 µg/L (u)	1
2	Chloroethane	NA	< 1 µg/L (u)	1
3	1,1-Dichloroethene (D028)	NA	< 1 µg/L (u)	1
4	Dichloromethane	1.40	2.5 µg/L	1
5	trans-1,2-Dichloroethene	NA	< 1 µg/L (u)	1
6	1,1-Dichloroethane	1.65	0.5 µg/L (j)	1#
7	cis-1,2-Dichloroethene	NA	< 1 µg/L (u)	1
8	Chloroform (D022)	2.46	0.1 µg/L (j)	1#
9	1,1,1-Trichloroethane	NA	< 1 µg/L (u)	1
10	Carbon tetrachloride (D019)	NA	< 1 µg/L (u)	1
11	1,2-Dichloroethane (D028)	NA	< 1 µg/L (u)	1
12	Benzene	3.21	0.5 µg/L (j)	1
13	1,4-Difluorobenzene (IS)	3.68	50.0 ppb-a	0
14	Trichloroethene (D040)	NA	< 1 µg/L (u)	1
15	Toluene-d8 (Surrogate)	6.76	25.5 ppb-a	2
16	Toluene	6.99	1.2 µg/L	2
17	1,1,2-Trichloroethane	NA	< 1 µg/L (u)	2
18	Tetrachloroethene (D039)	NA	< 1 µg/L (u)	2
19	Chlorobenzene-d5 (IS)	10.94	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 1 µg/L (u)	2
21	4-Bromofluorobenzene (Surrogate)	13.56	21.5 ppb-a	2
22	1,1,2,2-Tetrachloroethane	13.87	0.1 µg/L (j)	2#

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 1 µg/L.

Handwritten signature
3/2/93

Calibration Last Updated: Tue Mar 02 09:17:59 1993
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P3_11E.D 11 Mar 93 1:03 pm

Method: BIODEG10.M by prw

Sample Name:

SSVFB1CP AOS 3-4658

Misc Info:

5ml smp. w/ISS

Dilution factor = 1

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 1 µg/L (u)	1
2	Chloroethane	NA	< 1 µg/L (u)	1
3	1,1-Dichloroethene (D029)	NA	< 1 µg/L (u)	1
4	Dichloromethane	1.41	1.7 µg/L	1
5	trans-1,2-Dichloroethene	NA	< 1 µg/L (u)	1
6	1,1-Dichloroethane	1.51	0.2 µg/L (j)	1#
7	cis-1,2-Dichloroethene	2.20	1.6 µg/L	1
8	Chloroform (D022)	NA	< 1 µg/L (u)	1
9	1,1,1-Trichloroethane	NA	< 1 µg/L (u)	1
10	Carbon tetrachloride (D019)	NA	< 1 µg/L (u)	1
11	1,2-Dichloroethane (D028)	NA	< 1 µg/L (u)	1
12	Benzene	3.23	0.1 µg/L (j)	1
13	1,4-Difluorobenzene (IS)	3.67	50.0 ppb-a	0
14	Trichloroethene (D040)	4.09	507.6 µg/L (1)	1
15	Toluene-d8 (Surrogate)	6.76	25.4 ppb-a	2
16	Toluene	6.94	0.2 µg/L (j)	2#
17	1,1,2-Trichloroethane	NA	< 1 µg/L (u)	2
18	Tetrachloroethene (D039)	8.83	14.3 µg/L	2
19	Chlorobenzene-d5 (IS)	10.93	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 1 µg/L (u)	2
21	4-Bromofluorobenzene (Surrogate)	13.54	21.2 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 1 µg/L (u)	2

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 1 µg/L.

(1) Trichloroethene is over cal limit of 200µg/L

Analysis was not repeated after confirming
that this sample was contaminated rinsate
from field equipment

Jeffery
3/23/93

Biodegradation products

Calibration Last Updated: Tue Mar 02 09:17:59 1993
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P3_11F.D 11 Mar 93 1:53 pm
Method: BIODEG10.M by prw
Sample Name: SSV11CCP ADS 3-4659
Misc Info: 1ml smp.
Dilution factor = 5

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 5 µg/L (u)	1
2	Chloroethane	NA	< 5 µg/L (u)	1
3	1,1-Dichloroethene (D029)	1.13	1.7 µg/L (j)	1#
4	Dichloromethane	1.39	0.7 µg/L (j)	1#
5	trans-1,2-Dichloroethene	1.18	0.3 µg/L (j)	1#
6	1,1-Dichloroethane	1.69	1.0 µg/L (j)	1#
7	cis-1,2-Dichloroethene	2.19	148.2 µg/L	1
8	Chloroform (D022)	2.31	1.8 µg/L (j)	1#
9	1,1,1-Trichloroethane	2.17	3.1 µg/L (j)	1#
10	Carbon tetrachloride (D019)	NA	< 5 µg/L (u)	1
11	1,2-Dichloroethane (D028)	NA	< 5 µg/L (u)	1
12	Benzene	3.12	1.2 µg/L (j)	1
13	1,4-Difluorobenzene (IS)	3.63	50.0 ppb-a	0
14	Trichloroethene (D040)	4.08	~~26423.3 µg/L~~ (i)	1
15	Toluene-d8 (Surrogate)	6.70	25.3 ppb-a	2
16	Toluene	6.89	0.4 µg/L (j)	2#
17	1,1,2-Trichloroethane	NA	< 5 µg/L (u)	2
18	Tetrachloroethene (D039)	8.78	~~1430.1 µg/L~~ (i)	2
19	Chlorobenzene-d5 (IS)	10.90	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	10.30	0.5 µg/L (j)	2#
21	4-Bromofluorobenzene (Surrogate)	13.53	20.8 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 5 µg/L (u)	2

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 5 µg/L.

(i) Reject for major components, sample over (+100x) calibration limit, report from repeat analysis.

Jay
3/23/93

Biodegradation products

Calibration Last Updated: Tue Mar 02 09:17:59 1993
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P3_15C.D 15 Mar 93 11:22 am
Method: BIODG10.M by prw
Sample Name: ADS 3-4692 SSVFBCP 3/11/93
Misc Info: 1ml smp.
Dilution factor = 5

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 5 µg/L (u)	1
2	Chloroethane	NA	< 5 µg/L (u)	1
3	1,1-Dichloroethene (D029)	NA	< 5 µg/L (u)	1
4	Dichloromethane	1.41	1.8 µg/L (j)	1#
5	trans-1,2-Dichloroethene	NA	< 5 µg/L (u)	1
6	1,1-Dichloroethane	NA	< 5 µg/L (u)	1
7	cis-1,2-Dichloroethene	NA	< 5 µg/L (u)	1
8	Chloroform (D022)	NA	< 5 µg/L (u)	1
9	1,1,1-Trichloroethane	NA	< 5 µg/L (u)	1
10	Carbon tetrachloride (D019)	NA	< 5 µg/L (u)	1
11	1,2-Dichloroethane (D028)	NA	< 5 µg/L (u)	1
12	Benzene	NA	< 5 µg/L (u)	1
13	1,4-Difluorobenzene (IS)	3.69	50.0 ppb-a	0
14	Trichloroethene (D040)	NA	< 5 µg/L (u)	1
15	Toluene-d8 (Surrogate)	6.74	24.2 ppb-a	2
16	Toluene	7.03	0.2 µg/L (j)	2#
17	1,1,2-Trichloroethane	NA	< 5 µg/L (u)	2
18	Tetrachloroethene (D039)	NA	< 5 µg/L (u)	2
19	Chlorobenzene-d5 (IS)	10.95	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 5 µg/L (u)	2
21	4-Bromofluorobenzene (Surrogate)	13.56	21.4 ppb-a	2#
22	1,1,2,2-Tetrachloroethane	NA	< 5 µg/L (u)	2

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 5 µg/L.

Dichloromethane confirmed absent in lab blank.

Jeany
3/23/93

Biodegradation products

Calibration Last Updated: Tue Mar 02 09:17:59 1993
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P3_12F.D 12 Mar 93 2:40 pm
Method: BIODG10.M by prw
Sample Name: ADS 3-4693 SSV20CCP 3-11-93 (Duplicate)
Misc Info: 2.5ml smp.
Dilution factor = 2

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 2 µg/L	(u) 1
2	Chloroethane	NA	< 2 µg/L	(u) 1
3	1,1-Dichloroethene (D029)	NA	< 2 µg/L	(u) 1
4	Dichloromethane	NA	< 2 µg/L	(u) 1
5	trans-1,2-Dichloroethene	NA	< 2 µg/L	(u) 1
6	1,1-Dichloroethane	NA	< 2 µg/L	(u) 1
7	cis-1,2-Dichloroethene	2.17	1.9 µg/L	(j) 1
8	Chloroform (D022)	NA	< 2 µg/L	(u) 1
9	1,1,1-Trichloroethane	NA	< 2 µg/L	(u) 1
10	Carbon tetrachloride (D019)	NA	< 2 µg/L	(u) 1
11	1,2-Dichloroethane (D028)	NA	< 2 µg/L	(u) 1
12	Benzene	NA	< 2 µg/L	(u) 1
13	1,4-Difluorobenzene (IS)	3.62	50.0 ppb-a	0
14	Trichloroethene (D040)	4.03	170.8 µg/L	1
15	Toluene-d8 (Surrogate)	6.68	24.5 ppb-a	2
16	Toluene	6.91	0.2 µg/L	(j) 2#
17	1,1,2-Trichloroethane	NA	< 2 µg/L	(u) 2
18	Tetrachloroethene (D039)	8.78	111.9 µg/L	2
19	Chlorobenzene-d5 (IS)	10.92	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 2 µg/L	(u) 2
21	4-Bromofluorobenzene (Surrogate)	13.55	20.1 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 2 µg/L	(u) 2

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 2 µg/L.

John E. ...
3/2/93
Avg w/ duplicate
P3-12e

Calibration Last Updated: Tue Mar 02 09:17:59 1993
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P3_12E.D 12 Mar 93 1:54 pm
Method: BIODG10.M by prw
Sample Name: ADS 3-4693 SSV20CCP 3-11-93
Misc Info: 1ml smp.
Dilution factor = 5

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 5 µg/L (u)	1
2	Chloroethane	NA	< 5 µg/L (u)	1
3	1,1-Dichloroethene (D029)	NA	< 5 µg/L (u)	1
4	Dichloromethane	NA	< 5 µg/L (u)	1
5	trans-1,2-Dichloroethene	NA	< 5 µg/L (u)	1
6	1,1-Dichloroethane	NA	< 5 µg/L (u)	1
7	cis-1,2-Dichloroethene	2.18	2.0 µg/L (j)	1
8	Chloroform (D022)	NA	< 5 µg/L (u)	1
9	1,1,1-Trichloroethane	NA	< 5 µg/L (u)	1
10	Carbon tetrachloride (D019)	NA	< 5 µg/L (u)	1
11	1,2-Dichloroethane (D028)	NA	< 5 µg/L (u)	1
12	Benzene	NA	< 5 µg/L (u)	1
13	1,4-Difluorobenzene (IS)	3.63	50.0 ppb-a	0
14	Trichloroethene (D040)	4.03	219.7 µg/L	1
15	Toluene-d8 (Surrogate)	6.68	25.3 ppb-a	2
16	Toluene	NA	< 5 µg/L (u)	2
17	1,1,2-Trichloroethane	NA	< 5 µg/L (u)	2
18	Tetrachloroethene (D039)	8.78	142.0 µg/L	2
19	Chlorobenzene-d5 (IS)	10.92	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 5 µg/L (u)	2
21	4-Bromofluorobenzene (Surrogate)	13.53	20.1 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 5 µg/L (u)	2

END OF REPORT

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 5 µg/L.

J. C. W.
3/23/93

Average w/ duplicate
P3-12f

Calibration Last Updated: Tue Mar 02 09:17:59 1993
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P3_12H.D 12 Mar 93 4:08 pm
Method: BIODG10.M by prw
Sample Name: ADS 3-4694 SSV20PCP 3-11-93 (spike)
Misc Info: 2.5ml smp.; 5µl spk
Dilution factor = 2

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 2 µg/L	(u) 1
2	Chloroethane	NA	< 2 µg/L	(u) 1
3	1,1-Dichloroethene (D029)	NA	< 2 µg/L	(u) 1
4	Dichloromethane	1.38	2.8 µg/L	1
5	trans-1,2-Dichloroethene	NA	< 2 µg/L	(u) 1
6	1,1-Dichloroethane	NA	< 2 µg/L	(u) 1
7	cis-1,2-Dichloroethene	2.18	1.7 µg/L	(j) 1
8	Chloroform (D022)	2.32	0.9 µg/L	(j) 1#
9	1,1,1-Trichloroethane	NA	< 2 µg/L	(u) 1
10	Carbon tetrachloride (D019)	2.90	198.6 µg/L	1
11	1,2-Dichloroethane (D028)	NA	< 2 µg/L	(u) 1
12	Benzene	3.13	191.2 µg/L	1
13	1,4-Difluorobenzene (IS)	3.63	50.0 ppb-a	0
14	Trichloroethene (D040)	4.03	155.1 µg/L	1
15	Toluene-d8 (Surrogate)	6.68	24.3 ppb-a	2
16	Toluene	6.93	0.3 µg/L	(j) 2#
17	1,1,2-Trichloroethane	NA	< 2 µg/L	(u) 2
18	Tetrachloroethene (D039)	8.78	103.2 µg/L	2
19	Chlorobenzene-d5 (IS)	10.90	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 2 µg/L	(u) 2
21	4-Bromofluorobenzene (Surrogate)	13.53	20.3 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 2 µg/L	(u) 2

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
- (j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 2 µg/L.

Spk Recovery

Carbon tet = 98.3% ✓
Benzene = 119.5% ✓

John Guyer
3/23/93

Biodegradation products

Calibration Last Updated: Tue Mar 02 09:17:59 1993
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P3_12G.D 12 Mar 93 3:22 pm
Method: BIODEG10.M by prw
Sample Name: ADS 3-4694 SSV20PCP 3-11-93
Misc Info: 2.5ml smp.
Dilution factor = 2

Pk #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 2 µg/L (u)	1
2	Chloroethane	NA	< 2 µg/L (u)	1
3	1,1-Dichloroethene (D029)	NA	< 2 µg/L (u)	1
4	Dichloromethane	NA	< 2 µg/L (u)	1
5	trans-1,2-Dichloroethene	NA	< 2 µg/L (u)	1
6	1,1-Dichloroethane	NA	< 2 µg/L (u)	1
7	cis-1,2-Dichloroethene	2.19	2.4 µg/L	1
8	Chloroform (D022)	NA	< 2 µg/L (u)	1
9	1,1,1-Trichloroethane	NA	< 2 µg/L (u)	1
10	Carbon tetrachloride (D019)	NA	< 2 µg/L (u)	1
11	1,2-Dichloroethane (D028)	NA	< 2 µg/L (u)	1
12	Benzene	NA	< 2 µg/L (u)	1
13	1,4-Difluorobenzene (IS)	3.64	50.0 ppb-a	0
14	Trichloroethene (D040)	4.07	208.5 µg/L	1
15	Toluene-d8 (Surrogate)	6.70	24.7 ppb-a	2
16	Toluene	6.96	0.2 µg/L (j)	2#
17	1,1,2-Trichloroethane	NA	< 2 µg/L (u)	2
18	Tetrachloroethene (D039)	8.78	137.9 µg/L	2
19	Chlorobenzene-d5 (IS)	10.92	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 2 µg/L (u)	2
21	4-Bromofluorobenzene (Surrogate)	13.53	19.6 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 2 µg/L (u)	2

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 2 µg/L.

J. J. J.
3/23/93

Calibration Last Updated: Tue Mar 02 09:17:59 1993
Internal Standard Report - Summary

File: C:\CHEMPC\DATA\P3_12D.D 12 Mar 93 1:09 pm
Method: BIODG10.M by prw
Sample Name: ADS 3-4695 SSTB1CP 3/11/93
Misc Info: 5ml smp.
Dilution factor = 1

PK #	Compound	Ret Time	Amount	Peak Type
1	Vinyl chloride (D027)	NA	< 1 µg/L	(u) 1
2	Chloroethane	NA	< 1 µg/L	(u) 1
3	1,1-Dichloroethene (D029)	NA	< 1 µg/L	(u) 1
4	Dichloromethane	1.37	2.2 µg/L	1
5	trans-1,2-Dichloroethene	NA	< 1 µg/L	(u) 1
6	1,1-Dichloroethane	NA	< 1 µg/L	(u) 1
7	cis-1,2-Dichloroethene	NA	< 1 µg/L	(u) 1
8	Chloroform (D022)	NA	< 1 µg/L	(u) 1
9	1,1,1-Trichloroethane	NA	< 1 µg/L	(u) 1
10	Carbon tetrachloride (D019)	NA	< 1 µg/L	(u) 1
11	1,2-Dichloroethane (D028)	NA	< 1 µg/L	(u) 1
12	Benzene	3.10	0.4 µg/L	(j) 1
13	1,4-Difluorobenzene (IS)	3.63	50.0 ppb-a	0
14	Trichloroethene (D040)	NA	< 1 µg/L	(u) 1
15	Toluene-d8 (Surrogate)	6.70	25.1 ppb-a	2
16	Toluene	6.88	0.4 µg/L	(j) 2#
17	1,1,2-Trichloroethane	NA	< 1 µg/L	(u) 2
18	Tetrachloroethene (D039)	NA	< 1 µg/L	(u) 2
19	Chlorobenzene-d5 (IS)	10.92	50.0 ppb-a	0
20	1,1,1,2-Tetrachloroethane	NA	< 1 µg/L	(u) 2
21	4-Bromofluorobenzene (Surrogate)	13.53	20.1 ppb-a	2
22	1,1,2,2-Tetrachloroethane	NA	< 1 µg/L	(u) 2

END OF REPORT

Qualifiers Not Satisfied

- (u) Compound was not detected in the chromatographic data, result is less than the value preceding (u).
(j) Compound was detected in the chromatographic data, but result is less than the minimum reporting value, 1 µg/L.

Dichloromethane was confirmed absent in laboratory blank

Signature
3/23/93

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