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FINAL REPORT VOLUME 1 OF 3 FIREFIGHTER TRAINING AREA AND LIGHTER  
AMPHIBIOUS RESUPPLY CARGO (LARC) 60 MAINTENANCE AREA FORT STORY VA  
11/1/1994  
INTERNATIONAL TECHNOLOGICAL CORPORATION

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Project No. 519029  
November 1994

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**Final Report - Volume I of III**

**Fire Training Area No. 4 and LARC Area  
Fort Story, Virginia**

Contract No. DACW45-90-D-9002  
Delivery Order No. 55

Prepared for:  
U.S. Army Corps of Engineers  
Rapid Response Group  
Omaha, Nebraska



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**FINAL REPORT  
FIRE TRAINING AREA NO. 4 AND LARC AREA  
FORT STORY, VIRGINIA**

**CONTRACT NO. DACW45-90-D-9002  
DELIVERY ORDER NO. 55  
IT PROJECT NO. 519029**

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**AUGUST 1994**

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## **1.0 Executive Summary**

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This final report has been prepared by IT Corporation (IT) for the U.S. Army Corps of Engineers (USACE), Omaha District, and presents a summary of the remediation activities which have taken place at the Fire Training Area No. 4 and at the Lighter Amphibious Resupply Cargo (LARC) Area at the Fort Story Military Reservation in Fort Story, Virginia. This project was performed in response to Rapid Response Contract No. DACW45-90-D-9002 and Delivery Order No. 55. Project Activities were performed during the period of April, 1993 through May, 1994 and consisted of the following tasks:

- Prepare the site for remedial activity including the construction of an equipment decontamination pad.
- Remove and containerize the Fire Training Pit (FTP) materials, including water, concrete, and debris
- Excavate the contaminated soils beneath the concrete pad down to the water table and transport to the LARC area for treatment
- Remove a monitoring well at the edge of the FTP
- Backfilling of the FTP excavation including the installation of a gravel recovery trench
- Disposal of approximately 110 tons of soil previously stockpiled adjacent to the LARC area which had been generated during an underground storage tank (UST) removal action.
- Design and install an in-situ bioremediation program for the treatment of total petroleum hydrocarbons (TPH) contaminated soils at the LARC Area.
- Bioremediate the soils within the Larc Area a target level of 50 parts per million (ppm) TPH.
- Conduct a comprehensive sampling and analytical program to confirm the result of the bioremediation effort.
- Transportation and disposal of all wastes generated during the removal of the FTP and the treatment of the soils within the LARC Area.

The remainder of Chapter 1.0 of this report discusses a brief background of the sites to be addressed during this Delivery Order. Chapter 2.0 summarizes the field activities which took

place at each site and the current condition in which each was left. Chapter 3.0 provides the conclusion to this document.

### **1.1 Site Background**

Fort Story is located near Virginia Beach, Virginia on the Cape Henry Peninsula and the Atlantic Ocean. The Fire Training Area No. 4 is located in the southwestern section of Fort Story, along Hospital Road and adjacent to the fuel farm. Prior to 1980, the area was utilized for fire training exercises which consisted of extinguishing JP-4 aviation fuel which was released directly on the surface soils. The releases were extinguished by a mixture of firefighting foam and water. In 1980, the concrete fire pit was constructed to be utilized for the training exercises. Approximately once per month the pit was filled with several inches of water and a mixture of JP-4 fuel, contaminated fuels, and hydraulic fluid. The mixture was set on fire and extinguished using fire fighting foam. Once the fire was extinguished, the residues were left for natural evaporation.

The LARC Maintenance Area is located off Atlantic Avenue and Lingayan Gulf Road and is adjacent to Buildings 1088 and 1089. The Larc Area is the maintenance and wash rack area for the Lighter Amphibious Resupply Vehicles. The wash rack area is approximately 200 feet by 400 feet and has been used to park the LARC vehicles during maintenance periods.

## **2.0 Project Summary**

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### **2.1 Advance Sampling**

Prior to the on-site remedial activities commencing, an advance sampling trip was conducted on January 21, 1993. A sample of the FTP water was collected and analyzed for semivolatiles, total metals, volatile organics, pesticides/polychlorinated biphenyls (PCBs), flashpoint, and total cyanide. The purpose of this sampling effort was to determine the parameters of concern in order to dispose of the water. The FTP water exhibited non-detect levels for most parameters tested, however elevated levels of calcium, iron, magnesium, sodium and potassium were detected.

Three soil samples were collected in the vicinity surrounding SB-117 in the LARC area and analyzed for toxicity characteristic leaching procedure (TCLP) lead. The results of this

analysis showed concentrations of 0.765, 0.138, and 2.54 ppm for these samples. This analysis was requested to ensure that hazardous levels of lead did not exist at the site and would not present a problem during soil treatment.

On April 3, 1993, one composite soil sample was collected from the existing stockpile of soil which required disposal and was analyzed for volatile organics, TCLP metals, reactive cyanide, reactive sulfide, pH, ignitability, paint filter test, TCLP volatile compounds, TCLP semivolatile compounds and PCB's. The purpose of this sampling effort was to determine the contaminants present in order to arrange disposal of these soils.

The detected parameters observed for these samples are detailed in Table 3. The Certificates of Analysis are included in Appendix H.

## ***2.2 Site Preparation***

The initial site preparation activities included the receiving of five 30 cubic yard rolloffs for concrete debris and the acceptance of the heavy equipment which was required for the demolition of the FTP. Due to the short duration anticipated for the removal of the FTP, a fully functional support zone was not prepared.

## ***2.3 Fire Training Pit (FTP) Removal***

The concrete FTP was approximately 40 feet by 40 feet with a 20-foot square gravel pit on the interior (Figure 1). The interior pit was estimated to be 4 feet deep with approximately 2 feet of 2-inch gravel at the surface of the pit. The thickness of the concrete varied from approximately 18 inches at the edge to 8 inches at the interior. In addition to the gravel, old tree branches and debris was present within the pit.

### ***2.3.1 Removal of FTP Water and Gravel***

The FTP contained water which was determine to be non-hazardous through the advance sampling effort. This water required disposal prior to removal of the gravel, concrete, and underlying soils. In order to begin pumping the water, several tree branches and debris was removed from the pit. The debris was staged adjacent to the work area to be disposed of at a later date. A vacuum truck from PetroChem, Inc. was utilized to remove the water and dispose of it off site.

The gravel within the pit was removed and placed on the concrete apron. The gravel was then pressure washed using a high pressure washer to remove any remaining fuel or petroleum contamination. The wash water was collected with a vac truck by Petrochem and disposed of off site. The gravel was placed in a rolloff container for proper off-site disposal.

The gravel was sent to the BFI, Inc. municipal landfill in Chesapeake, Virginia. The decision was made to dispose of this gravel off site, along with the concrete debris, to ensure proper disposal so as to not intermix this gravel with the clean washed stone which was later to be placed in the pit.

The concrete apron and pit walls were pressure washed in a similar manner prior to beginning demolition. A total of approximately 6,800 gallons of water was removed from the fire pit during the remedial action.

### ***2.3.2 Demolition of the FTP Concrete***

The concrete fire pit was demolished using a 580 Case backhoe equipped with a hoe ram. The concrete was broken into manageable pieces and loaded into rolloffs for off-site disposal. A total of five rolloffs were loaded with concrete from the FTP.

### ***2.3.3 Removal of the TPH-Contaminated Soils***

After removal of the concrete apron, the underlying soils were excavated and temporarily stockpiled. Three holding cells measuring approximately 40 feet by 40 feet were constructed on the east, north and west side of the fire training pit. These cells were lined with double 6 mil polyethylene and bermed to contain the soils. During the excavation of the staging cells, several electrical parts and metal ammunition boxes were exposed from beneath the surface. This debris was staged for later disposal. Approximately 550 tons of soil was excavated from the FTP and placed in the cells to be transported later to the LARC area for treatment. The excavation measured approximately 43 feet by 43 feet by 6 feet deep upon completion. The limits of soil excavation were originally to extend 5 feet beyond the edge of the concrete, but were limited to 3 feet based on visual observation of the contamination limits.

### **2.3.4 Sampling and Analytical Testing**

#### **2.3.4.1 Field Screening**

After the completion of the contaminated soil removal from the FTP, field screening of the remaining soils was conducted. A HNU/Hanby field test kit was utilized to check for the presence of TPH contamination. The specifications for these field kits indicate detection limits of 1 ppm. A total of 12 tests were run within the excavation of the pit and the results ranged between 10 to 1,000 ppm TPH. The high result was found in the southwest corner of the excavation.

#### **2.3.4.2 Confirmation Sampling**

Four confirmation samples within the FTP were collected prior to backfilling. A sample was collected from each sidewall of the excavation and sent off site for analysis. Due to the fact that groundwater was encountered during excavation, no confirmation samples were collected on the base of the excavated area. The samples were analyzed for TPH, metals, volatile organics and semivolatiles. The detected parameters for these samples are detailed in Table 4. The Certificates of Analysis for these confirmation samples are found in Appendix H.

#### **2.3.4.3 Additional Sampling**

Due to the discovery during the excavation of the FTP of some old electrical parts, three soil samples were collected and sent to a local laboratory, Solutions Laboratory in Chesapeake, Virginia, to be analyzed for PCBs. The analysis showed no presence of PCBs and no special handling of the soils was required. The Certificates of Analysis for these samples are included in Appendix H.

### **2.3.5 Backfilling and Regrading**

After the collection of the confirmation samples, the excavated area was backfilled using 3/4-inch stone per the project scope. The purpose of this was to provide a recovery trench in which to recover any free product which may show up in the future. A total of 547 tons of stone was placed as backfill in the excavated pit. The area surrounding the FTP was regraded to its original condition. The stockpiled soils were covered with 6 mil polyethylene and secured.

### **2.3.6 Additional Excavation**

After receipt of the confirmation results, it was discovered that additional contamination may be present outside the limits of the original excavation. Six additional soil samples were collected and analyzed for TPH at Solutions Laboratory in Chesapeake, Virginia. Figure 1 shows the location where these samples (A-F) were collected and the corresponding results. Based on the results of this sampling effort, the decision was made to excavate additional material along the east edge of the pit and transport this soil to the LARC area for treatment. An area approximately 40 feet long by 5 feet wide was removed. This area was then backfilled with gravel in a similar manner as before. No additional confirmation samples were collected and no further action was undertaken at the FTP site. The certificates of analysis for these samples are included in Appendix H.

### **2.3.7 Site Teardown and Equipment Decontamination**

The soils stockpiled in the holding cells were transported to the LARC area utilizing tri-axle dump trucks. Once the soil was removed, the polyethylene liner within the cells were removed and placed in a rolloff for disposal. The earthen berms were leveled and graded to match the surrounding contours. No revegetation of this area was required.

All equipment utilized during the FTP demolition was cleaned prior to removal from the site. The buckets and tracks were cleaned of the heavy soils utilizing shovels and brushes. All equipment was then inspected by the USACE on-site representative and the IT site supervisor prior to release.

### **2.4 UST Soil Disposal**

The stockpiled soils which were generated during a previous UST removal project were disposed of as part of this Delivery Order. These soils were staged adjacent to the LARC area to the north of the wash rack. Through information provided by the base to USACE, the soils were thought to be considered F-listed wastes based on the contents of the tanks which were previously removed. However, no analytical results were obtained to substantiate this assumption. Therefore, complete profiling of the soil was necessary to arrange for proper disposal.

One composite sample (Sample No. SPC-01) was collected from the stockpile and analyzed for volatile organic compounds, TCLP volatiles, TCLP semivolatiles, benzene, toluene,

ethylbenzene, and xylene (BTEX), PCBs, reactive cyanide, reactive sulfide, pH, ignitability, and paint filter test. The results of this analytical were utilized to arrange disposal of these soils. Table 5 details the detected parameters of this sample.

The soils were manifested, loaded and hauled to Laidlaw Environmental Services Inc. in Pinewood, South Carolina. A total of 110.74 tons of soil was disposed of on October 21 and 27, 1993.

The Certificates of Analysis are included in Appendix H of this report and the profiles and manifests are included in Appendix D.

## **2.5 LARC Area Bioremediation**

### **2.5.1 Site Preparation**

The initial activities conducted in preparation of the bioremediation activities included the installation of the site support facilities, the installation of construction fencing to isolate the site, the installation of several wells, the erection of a large pool to contain the inoculants required for the project, and to mobilize all the necessary heavy equipment and pumps required.

#### **2.5.1.1 Well Installation and Pump Test**

In order to conduct an analysis of the groundwater characteristics in the area of concern, six wells were installed within the boundaries of the LARC area. Five 2-inch monitoring wells were installed and one 4-inch well was installed. These wells were utilized to obtain the necessary data required in order to design a pumping system for the project.

The optimum number of recovery wells and pumping rates needed to be determined to provide hydraulic isolation of the site. This would ensure that the biological treatment which was conducted on the site would be maintained within the boundaries of the LARC area.

The Shallow Aquifer Analysis report which details this investigation is included as Appendix G of this report.

### **2.5.1.2 Pool Installation**

A portable holding pool was erected on the site in order to contain the inoculants which were specifically bred for this bioremediation effort. The area required to place the pool was leveled with a bulldozer prior to erection. The 40-foot by 100-foot pool consisted of a steel frame and a plastic liner which was erected in several days. The pool was about four feet deep and could contain approximately 120,000 gallons of water.

An air supply system consisting of perforated piping and pumps was installed in the pool in order to provide oxygen to the inoculants which would be placed in the pool.

### **2.5.2 Bioremediation of LARC Area Soils**

The initial work at the site consisted of the transfer of approximately 38,000 gallons of the biological inoculant from the Solutions Laboratory where it was prepared to the on-site pool. The concentrated solution was transferred utilizing tanker trucks and pumped into the pool. Additional water was also placed into the pool from Monitoring Well No. 5. This solution would be utilized as the primary biological treatment for the site.

Excavators, bulldozers, pumps, generators and light plants were mobilized to the site to be used in the treatment process.

The original remediation program was to consist of hydraulic isolation of the site and to create a cone of depression. The solution containing the microorganisms and inoculants would be placed over the site and would migrate to the depressed groundwater. This would then be pumped out through an oil-water separator to remove the oil. The water would then be placed in holding tanks to adjust the pH, aeration, and nutrient and microorganism enrichment. The water would then be placed back onto the site for another cycle of capturing, consuming and moving the contaminants within the site. Another important part of the remediation process is the physical movement of the soils to break up pockets of heavy contamination and to completely expose the soils to the inoculated solution.

During the initial investigation of the site, several pits were excavated to locate pockets of heavy contamination and to examine the soil characteristics of the site. During this investigation, the pits exhibited very unstable conditions and the appearance of "running" sand in the base of the excavation. Due to this condition, Solutions Environmental technical staff

thought this condition would not provide sufficient holding time for the inoculant to sufficiently work on the soils. The decision was made to erect the pool to use as the inoculating and mixing tank in order to accomplish thorough contact of the soils.

Prior to placement of the soils in the pool, the debris present was required to be removed. This was initially attempted to be done manually and with the equipment but the quantity of debris was excessive. Two large steel screens (with 3/4-inch and 1-1/2-inch openings) and containers were fabricated and delivered to the site. The soil was placed through the screens to remove the debris. The debris was segregated on the site for later disposal. These screens were utilized for only the initial soil processing phase.

The soil from the initial screening operation was placed in the pool with the inoculation solution. This mixture was then mixed and aerated using a slurry pump. After sufficient agitation and holding time, the slurry was pumped from the pool into holding pits. This scenario was followed for the first few batches of soil to be treated. As the work progressed, the mixing and pumping of the soil in the pool became very difficult due to the debris passing the screening operation and the heavy slurry which was produced. Another change in the process was attempted.

The decision was made to excavate pits throughout the LARC area and use them as the mixing ponds. The pool would be used to contain the inoculant, and a series of trenches would be dug to transport the solution to the various pits. The contaminated soils would be placed in the pits and would mixed using the excavator and the slurry pumps. The slurry would then be pumped from the pit to a stockpile area to drain. The clean soil was transported to another stockpile to be analyzed prior to being placed in an excavated area.

A total of six pits were excavated for the treatment of the soil. Pit #2 was lined with a high density polyethylene (HDPE) liner and used to handle the heavily contaminated soils. As the soils were processed in the pits, the oils and floating greases would float to the surface. This oil was then removed using a local oil recycling company vacuum truck and transported off site for proper disposal. A total of 2,800 gallons of oil, grease and oily water was disposed of in this manner. The sludge which accumulated in pit #2 was also collected and disposed by a local waste oil recycler. A total of 5,800 gallons of sludge was removed from the site during the remediation of the site.

### **2.5.3 Problems Encountered**

Several problems arose during the bioremediation of the LARC area. A major problem was the presence of the debris found beneath the surface. This debris consisted of railroad ties, coal particles, roadbed materials, ballast stone, metal piping, concrete slab sections and other miscellaneous materials. The handling and separation of this material from the soils required additional steps which added to the cost and duration of the bioremediation effort.

The other major problem encountered was the presence of a considerable amount of heavily contaminated soil which was not anticipated. This soil contained heavy oils and grease compounds which were very difficult to treat with the process designed.

During the remediation effort, a 2-inch pipe was discovered in zone 6-D/E/F which was abandoned. During interim sampling in this area, kerosene was thought to be present in the soils. This was thought to have come from the previous maintenance operations at the site. Later confirmation sampling in this area determined that the kerosene was no longer present and was probably consumed by the microorganisms which were placed in this area. Further discussion of this sampling effort is included in Section 2.5.5.

A phone cable was found to intersect the LARC area in the eastern portion. This cable was carefully exposed to determine its exact location and then relocated by the Base utility company. This caused a slight delay in the activities planned for this area of the site.

### **2.5.4 Bioremediation Results**

The efforts of Solutions Environmental in the bioremediation of the LARC area resulted in a significant reduction in the contamination levels present. During the course of the work, Solutions collected and analyzed soil samples to check the progress of the bioremediation. Upon completion of the work, Solutions was required to collect 60 confirmation samples selected randomly. All of these interim and confirmation samples collected during the bioremediation work by Solutions Environmental were analyzed at Solutions Laboratory in Chesapeake, Virginia.

The scope of this project was to perform a source removal action to prevent further contamination of the groundwater. Since this was not intended to be a final remediation effort for the site, the State of Virginia would not provide input for the project or assist in

determining the target treatment levels. Hence, the USACE set a goal of 50 ppm TPH to evaluate the success of the bioremediation effort.

The results of Solutions sampling indicated that the majority of the site was below the target level of 50 ppm TPH. Of the 60 samples, only four samples were above the stipulated target level. The results are detailed in the Solutions letter to IT dated August 30, 1993 and included in Appendix A of this report.

During this confirmation effort, duplicate samples were collected and shipped to IT Analytical Services (ITAS) in Austin, Texas. The results obtained from these duplicate samples varied significantly from the results reported by Solutions Laboratory. Table 6 summarizes the results obtained from each lab for the duplicate samples. Of the results reported by ITAS, only two samples indicated that the target level of 50 ppm had been achieved. Solution's results showed that all of the samples were below the required action level.

This discrepancy in the analytical results presented a major problem with the verification of the actual contamination left at the site. The methods and procedures of Solutions Laboratory were questioned and reviewed. During the review process, the decision was made to collect additional samples and send to a third party lab for analysis. The lab chosen, EA Laboratories of Sparks, Maryland is a USACE Missouri River Division (MRD) approved laboratory. Three samples were collected from previously sampled locations and sent to EA Laboratories for analysis. The results of these analysis (Table 7) indicated that the ITAS results were more representative of the contamination levels remaining at the site.

### ***2.5.5 Confirmation Sampling***

In order to fully evaluate the extent of contamination which remained after the bioremediation effort was concluded, a full scale confirmation sampling effort was conducted. A total of 120 sample points were chosen, 30 points from each of four levels; the surface, 2-foot, 3-foot, and 4-foot levels. Each sample was analyzed for TPH using three methods; 418.1, method 8015 - diesel, and Method 8015 - gasoline. The results of these samples are detailed in Figures 3 to 14.

This sampling effort took place from March 22 through March 28, 1994, approximately seven months after the initial confirmation sampling by Solutions Environmental. During this

period between sampling events, the LARC area was utilized by the base for parking of the LARC vehicles.

The results of the confirmation samples show that the TPH contamination for the LARC area vary from nondetect to a high concentration of 4800 ppm. The results vary significantly based on the analytical method and the depth of the sample. Overall, the average TPH concentration of the site based on the confirmation samples is approximately 751 ppm using the 418.1 method and 229 ppm for the 8015 - diesel method. The 8015 - gasoline method showed non-detect readings for the entire site.

### **2.5.6 LARC Area Current Status**

Based on the results of the confirmation sampling, the TPH contamination levels of the LARC have been significantly reduced by the bioremediation effort. Although the results of the work did not meet the target action level of 50 ppm, the source of the contamination has been removed from the area. The fact that significant amounts of oil and grease were removed during the project, as well as the confirmation results which indicate that the lighter-end hydrocarbons are no longer present, show that the bioremediation effort was quite successful. The heavier hydrocarbon compounds which remain at the site (as indicated by the confirmation sampling) could be from the coal or grease constituents which were found during the bioremediation work.

The site has been regraded back to its original condition to be utilized by the Base. The overall visual appearance of the area is significantly improved as a result of this work.

### **2.5.7 Transportation and Disposal**

During the course of this project, several waste streams were generated that required off-site disposal. The wastes consisted of the following:

**Fire Training Pit.** The concrete and rock which was removed from the FTP was loaded into five rollofs (approximately 100 cubic yards) and transported to the BFI, Inc. landfill in Chesapeake, Virginia. In addition to the concrete, one rolloff containing the electrical parts, tree branches, and miscellaneous debris was disposed of at BFI.

The water which was removed from the FTP was disposed of by PetroChem, Inc. of Norfolk, Virginia. A total of approximately 6,800 gallons were removed and disposed of as oil contaminated water.

**UST Soils.** Approximately 110.74 tons of soils were profiled, manifested, and transported to the Laidlaw Environmental Services, Inc. facility in Pinewood, South Carolina.

**LARC Area.** During the bioremediation work, approximately 2,800 gallons of oil, grease, and oily water was disposed of by PetroChem, Inc. An additional 5,800 gallons of sludge was removed and disposed by C & M Waste Oil of Chesapeake, Virginia.

The manifests and disposal records for each of these waste streams are included in Appendix D of this report.

### ***3.0 Conclusions and Recommendations***

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The demolition of Fire Training pit No. 4, the disposal of the UST soils, and the bioremediation of the LARC area at Fort Story was conducted by IT from April 13, 1993 through March 28, 1994. The purpose of this project was to demolish the FTP including disposal of wastes and backfilling, the off-site disposal of soils generated during a previous UST removal project, and the bioremediation of the LARC area soils for TPH to reduce the levels of contamination present. To this end, the remedial activities included the following:

- Advanced sampling of the anticipated waste streams at the FTP and the UST soils. Also sampling of the LARC area to confirm lead levels were not considered to be hazardous.
- The preparation of the site for remedial activities by mobilizing the necessary equipment and personnel.
- Disposal of the water within the FTP, demolition and disposal of the concrete apron, excavation of soils and transportation to the LARC area, confirmation sampling and analysis, and backfilling of the site with gravel.
- Profiling, manifesting, loading and transporting of approximately 110.74 tons of the UST soils to an approved disposal facility.
- The bioremediation of approximately 15,000 cubic yards of soil at the LARC area utilizing inoculants, aeration and heavy equipment.

- The collection and analysis of confirmation samples at the LARC area to adequately characterize the current condition of the site.
- The regrading of the LARC area to preremedial conditions.

The intent of this project was to remove the sources of TPH contamination from the FTP and the LARC areas at Fort Story. The FTP concrete was demolished and hauled off-site for proper disposal while the soils from the FTP were excavated and hauled to the LARC area for treatment. The soils within the LARC area were treated using bioremediation techniques from the surface down to the groundwater table which was approximately four feet.

The bioremediation effort did not reduce the TPH concentrations in the soil to the 50 ppm target level, however, the contamination was significantly reduced. Several factors may have led to the higher readings after biological treatment including the presence of constituents which were not anticipated to be present. These included heavy grease and oil compounds, coal particles and possibly kerosene. As was demonstrated through the confirmation sampling, the lighter end compounds were remediated from the site and these are the constituents which would tend to move and spread contamination. Based on the intended use of the site and the fact that this area is relatively isolated from the general public, IT recommends that no further remediation take place at the site.

**TABLES**

**Table 1**  
**Project Points of Contact**  
**Fire Training Area No. 4**  
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CEMRO-CD-FC  
Building 527  
Fairchild Hall - 3rd Floor  
Offutt AFB, NE 68113  
(402) 291-4260  
(402) 291-8177-FAX

USACE - OMAHA

Mr. Ron Meier  
On-site Representative  
USACE - Fort Crook Area  
CEMRO-CD-FC  
Building 527  
Fairchild Hall - 3rd Floor  
Offutt AFB, NE 68113  
(402) 291-4260  
(402) 291-8177-FAX

FORT STORY

Mr. Gary Longmire  
DEH Office  
Building 727  
Fort Story, VA 23459-5000  
(804) 422-7344

DISPOSAL FACILITIES

Laidlaw Environmental Services, Inc.  
Route 1, Box 225  
Pinewood, S.C. 29125  
(803) 452-5003  
(803) 452-6762-FAX

BFI  
3821 Cook Blvd.  
Chesapeake, VA 23323  
(804) 487-2220

PetroChem, Inc.  
635 Maltby Ave.  
Norfolk, VA 23501  
(804) 627-8791

**Table 1**  
(continued)

**MAJOR SUBCONTRACTOR**

Mr. Al Davis  
Solutions Environmental  
Associates, Inc.  
814-B Greenbriar Blvd.  
Chesapeake, VA 23220  
(804) 420-0467

**LABORATORIES**

Ms. Carrie Smith  
IT Analytical Services  
5103 Old William Penn Highway  
Export, PA 15632  
(412) 731-8006  
(412) 327-7231-FAX

Ms. Carla Butler  
IT Analytical Services  
5307 Industrial Oaks Boulevard,  
Suite 160  
Austin, TX 78735  
(512) 892-6684  
(512) 6652-FAX

EA Laboratories  
19 Loveton Circle  
Sparks, MD 21152  
(410) 771-4920  
(410) 771-4407-FAX

**Table 2**  
**Summary of Samples Collected and**  
**Parameters Analyzed**

Location	Quantity	Matrix	Parameters Analyzed
<b>Advance Samples</b>			
LARC Area	3	Soil	TCLP Lead
Fire Training Pit	1	Water	PCB/pesticides, BNA, cyanide, total metals, mercury, volatile organics, semivolatile organics
Stockpile Composite	1	Soil	General chemistry: reactive cyanide, reactive sulfide, pH, ignitability, paint filter liquids test, TCLP metals, volatile organic compounds, TCLP volatile compounds, TCLP semivolatile compounds, selected volatile organic compounds: benzene, toluene, ethylbenzene, total xylenes, PCB.
<b>Project Samples</b>			
Fire Training Pit	4	Soil/Sand	TPH, volatile organic compounds, semivolatile organic compounds, total metals.
Kerosene related	21	Sand/Soil	TPH-D
LARC Area Confirmation Samples	135	Soil	TPH, TPH-D, TPH-G

**Table 3**  
**Summary of Detected Parameters for Advanced Sampling**

<b>Description</b>	<b>Sample ID</b>	<b>Laboratory ID</b>	<b>Analyte Detected</b>	<b>Concentration</b>
Fire Training Pit	519029-W001	Q30109901	Arsenic	58.7 µg/L
	519029-W001	Q30109901	Barium	50.3 µg/L
	519029-W001	Q30109901	Calcium	7,000 µg/L
	519029-W001	Q30109901	Iron	1,480 µg/L
	519029-W001	Q30109901	Magnesium	823 µg/L
	519029-W001	Q30109901	Manganese	12.3 µg/L
	519029-W001	Q30109901	Potassium	5,560 µg/L
	519029-W001	Q30109901	Sodium	4,590 µg/L
	519029-W001	Q30109901	Heptachlor	0.03 µg/L
LARC Area Soil Sample	519029-5001	Q30109701	TCLP Lead	0.765 µg/L
	519029-5002	Q30109702	TCLP Lead	0.138 µg/L
	519029-5003	Q30403503	TCLP Lead	2,54 µg/L
Stockpiled Soils Soil Sample	SPC-01	Q30403501	TCLP Cadmium	0.006 mg/L
	SPC-01	Q30403501	TCLP Lead	0.15 mg/L
	SPC-01	Q30403401	Toluene	18 µg/L
	SPC-01	Q30403401	Methylene chloride	73 µg/L
		Q30403401 (Reanalysis)	Methylene chloride	46 µg/L

**Table 4**  
**Summary of Detected Parameters for Confirmation Samples for Fire Training Pit**

Description	Sample ID	Laboratory ID	Analyte Detected	Concentration
	S01	Q30416701	Total Barium	7.7 mg/L
	S01	Q30416701	Total Chromium	2.2 mg/L
	S01	Q30416701	Total Lead	10.9 mg/L
	S01	Q30416701	TPH (418.1)	31 mg/L
	S01	Q304-192-01	TPH (8015)	85 mg/L
	S02	Q30416702	Xylenes (total)	2600 µg/L
	S02	Q30416702	Napthalene	1600 µg/L
	S02	Q30416702	2-Methylnapthalene	5700 µg/L
	S02	Q30416702	Fluorene	1200 µg/L
	S02	Q30416702	Phenanthrene	2300 µg/L
	S02	Q30416702	Anthracene	2300 µg/L
	S02	Q30416702	Total Barium	5.6 mg/L
	S02	Q30416702	Total Chromium	1.7 mg/L
	S02	Q30416702	Total Lead	22.5 mg/L
	S02	Q30416702	TPH (418.1)	4000 mg/L
	S02	B3-04-192-02	TPH (8015)	1300 mg/L
	S03	Q30416703	Total Barium	3.0 mg/L
	S03	Q30416703	Total Chromium	1.2 mg/L
	S04	Q30416704	Total Arsenic	1.1 mg/L
	S04	Q30416704	Total Barium	8.1 mg/L
	S04	Q30416704	Total Chromium	2.9 mg/L
	S04	Q30416704	Total Lead	30.0 mg/L
	S04	B3-04-192-04	TPH (8015)	66 mg/L
	S07	Q30416704	TPH (analyzed in triplicate) (418.1)	210//72/71 mg/L
	A	01A1	TPH (8015)	< 2.85 mg/kg
	B	02A1	TPH (8015)	< 2.85 mg/kg
	C	03A1	TPH (8015)	< 2.85 mg/kg
	D	04A1	TPH (8015)	< 2.85 mg/kg
	E	05A1	TPH (8015)	77.6 mg/kg
	F	06A1	TPH (8015)	3.16 mg/kg

**Table 5**  
**Summary of Detected Parameters for UST Stockpiled Soils**

Description	Sample ID	Laboratory ID	Analyte Detected	Concentration
UST Stockpiled Soils	SPC-01	Q30403401	pH	5.90/5.91
			Cadmium	0.006 mg/L
			Lead	0.15 mg/L
			Methylene Chloride	73 µg/kg
			Methylene Chloride	46 µg/kg <sup>a</sup>
			Toluene	18 µg/kg

<sup>a</sup> Reanalysis.

**Table 6  
Confirmation Sample Results Comparison**

Grid Location	Solutions Sample ID	Solutions Result mg/kg	ITAS Sample ID	ITAS Result/mg/kg	
20-A-24"	01A1	3.58	20-A-24	ND 310	TPH-G TPH-D
19-E-48"	02A1	1.52	19-E-48	ND ND	TPH-G TPH-D
16-B-48"	03A1	<0.10	531-16-B-48	ND 780	TPH-D TPH-G
15-F-12"	04A1	<0.10	238-15-F-12	ND 240	TPH-G TPH-D
15-A-36"	05A1	31.9	393-15-A-36	ND 690	TPH-G TPH-D
14-A-48"	06A1	<0.10	518-14-A-48	ND 750	TPH-G TPH-D
13-E-12"	07A1	<0.10	223-13-E-12	ND 170	TPH-G TPH-D
238	08A1	37.6	238	ND 150	TPH-G TPH-D
18-D-5	09A1	<0.10	18-D-5	ND 150	TPH-G TPH-D
1-A-S	01A1	<0.10	1-A-S0101	ND 45	TPH-G TPH-D
3-F-S	02A1	<0.10	3F-S12402	ND 400	TPH-G TPH-D
4-A-S	03A1	<0.10	4-A-S0403	ND 120	TPN-G TPH-D
8-D-12"	04A1	<0.10	8-D-1220304	ND 65	TPH-G TPH-D
9-E-36"	05A1	3.99	9-E-3647105	ND 790	TPH-G TPH-D
11-B-24"	06A1	12.7	11-13-24-284	ND 380	TPH-G TPH-D

**Table 7**  
**Summary of Confirmation Sample Results from EA Laboratories**

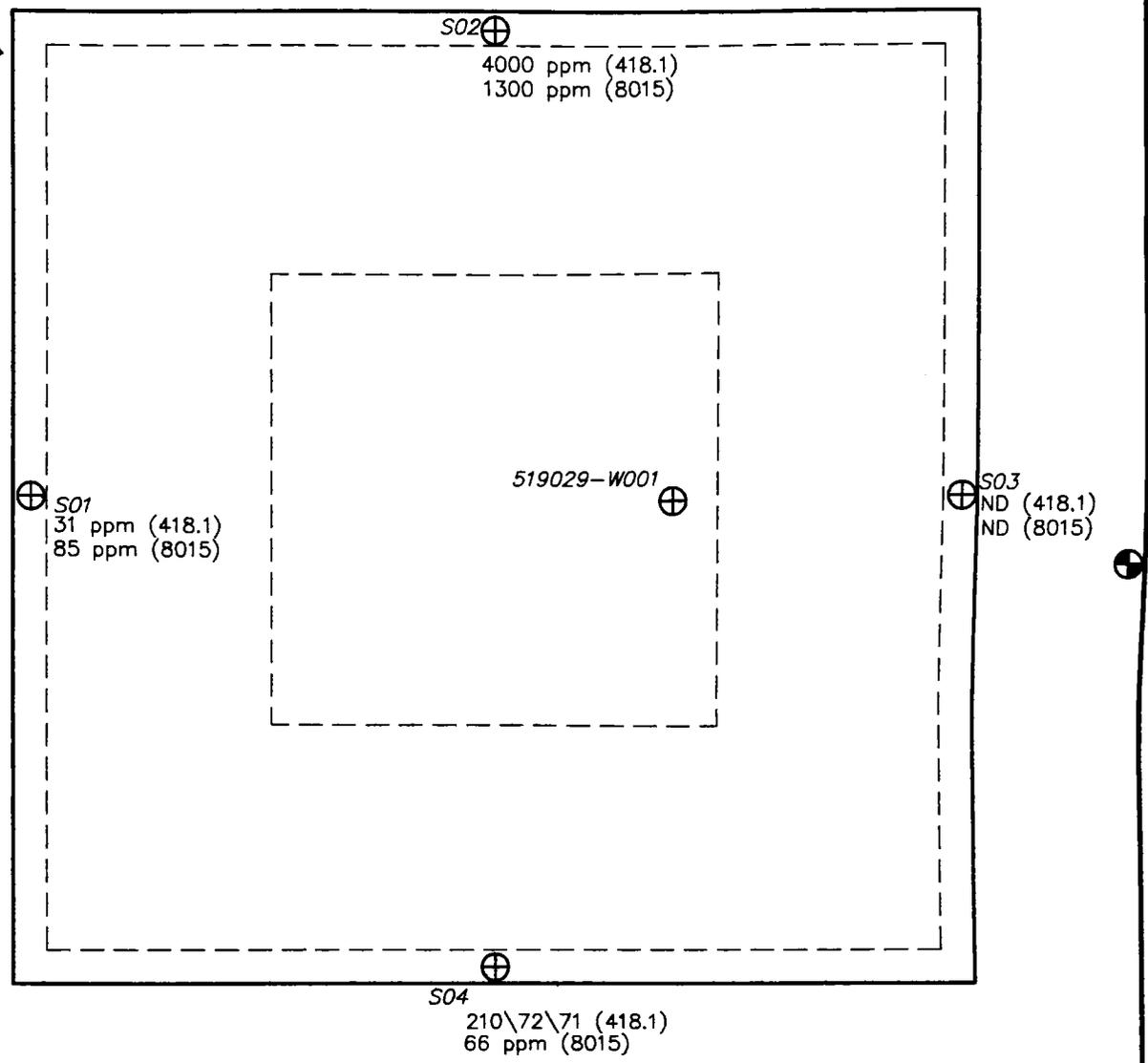
Description	Sample ID	Laboratory ID	Analyte Detected	Concentration
Soil Sample Low Level Extraction	E-15-477	13369	TPH as motor oil	3700 mg/kg
	E-7-469	13370	TPH as motor oil	760 mg/kg
	C-10-304	13371	TPH as motor oil	320 mg/kg
	C-10-304 DUP	13371 DUP	TPH as motor oil	290 mg/kg
Soil Sample High Level Extraction	E-15-477	13360	TPH a motor oil	950 mg/kg
	E-15-477 DUP	13369 DUP	TPH as motor oil	940 mg/kg
	E-7-469	13370	TPH as motor oil	390 mg/kg
	C-10-304	13371	TPH as motor oil	240 mg/kg

**FIGURES**

DRAWING NUMBER 519029-A2  
 CHECKED BY [Signature]  
 APPROVED BY [Signature]  
 NAM 19AUG94  
 DRAWN BY [Signature]



⊕<sup>F</sup> 3.16 (8015)                      ⊕<sup>C</sup> ND (5013)  
 ⊕<sup>E</sup> 77.6 (8015)                      ⊕<sup>B</sup> ND (8015)  
 ⊕<sup>D</sup> ND (8015)                        ⊕<sup>A</sup> ND (8015)



**FIRE TRAINING PIT EXCAVATION**

SCALE: 1/8" = 1'-0"

**LEGEND:**

- ⊕ SAMPLE POINT WITH TPH CONCENTRATIONS
- ⊙ MONITORING WELL
- BOUNDRY OF EXCAVATION (43' x 43')
- - - FORMER FIRE TRAINING PIT (40' x 40')

**FIGURE 1**  
**FIRE TRAINING PIT EXCAVATION**  
 FORT STORY  
 VIRGINIA BEACH, VIRGINIA  
 PREPARED FOR  
 U. S. CORPS OF ENGINEERS  
 OMAHA, NEBRASKA



11-01-84

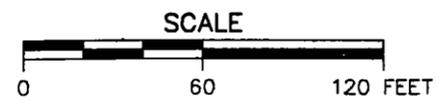
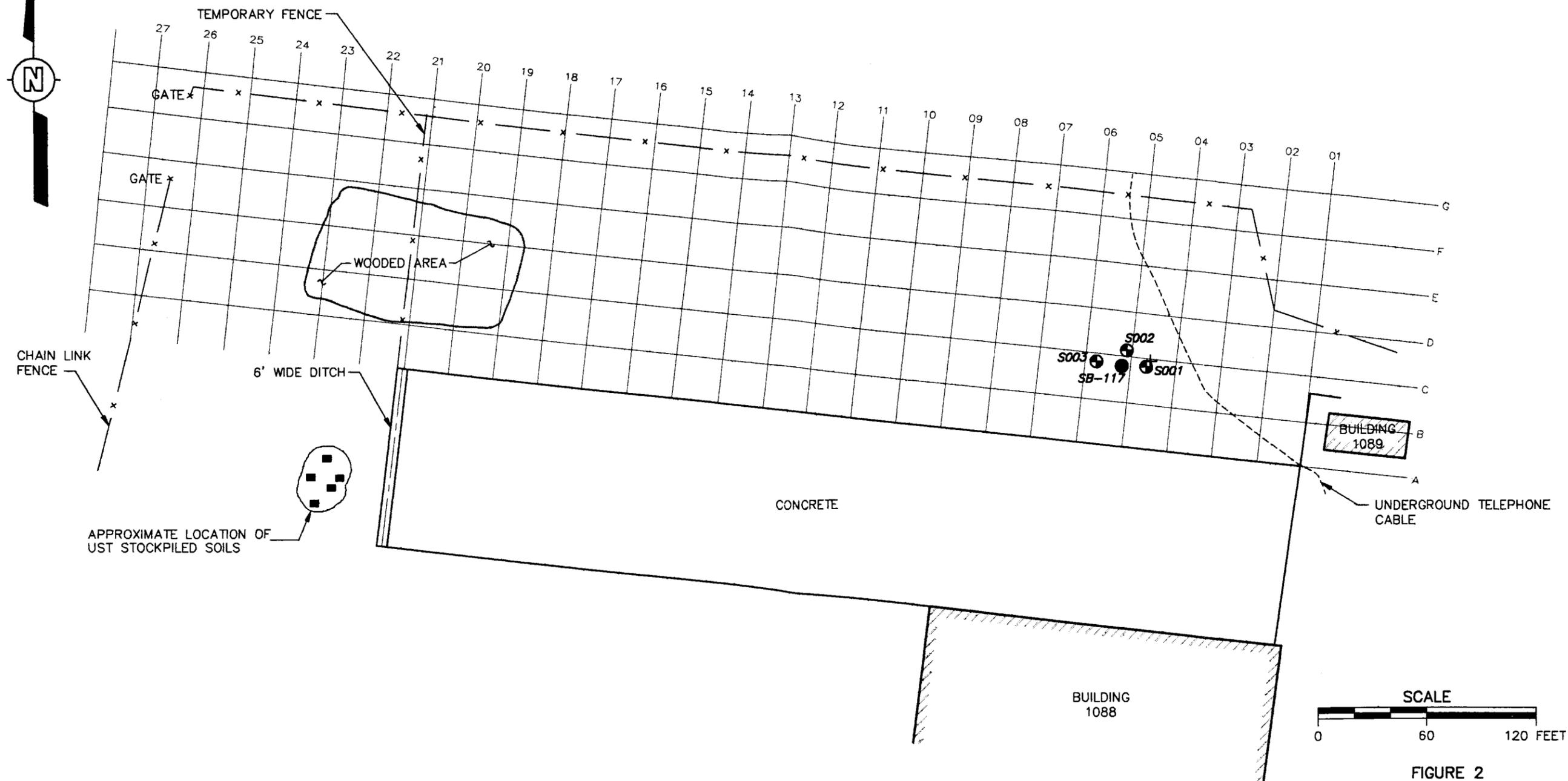
DRAWING NUMBER  
519029--B1

CHECKED BY  
7/2/94

APPROVED BY  
1/1/94

NAM  
19AUG94

DRAWN BY



**LEGEND:**

- SB-117 ● SOIL BORING (PREVIOUSLY PERFORMED BY JMM, INC.)
- S003 ● SAMPLE LOCATION.
- COLLECTION LOCATION FOR COMPOSITE SAMPLE SPC-01.

**FIGURE 2**  
**LARC AREA PLAN**  
FORT STORY  
VIRGINIA BEACH, VIRGINIA  
PREPARED FOR  
U.S. ARMY CORPS OF ENGINEERS  
OMAHA, NEBRASKA



11:30 AM

132298

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"Do Not Scale This Drawing"

Ms. Dorothy Small  
Fort Story Bioremediation Project/E-9317

The major advantage of the three (3) well scenario is that less groundwater pumping would be required to achieve the same results which may be very important considering all pumped water must stay on site. The location of the three (3) wells for this scenario should also be outside the planned treatment area making installation less complicated.

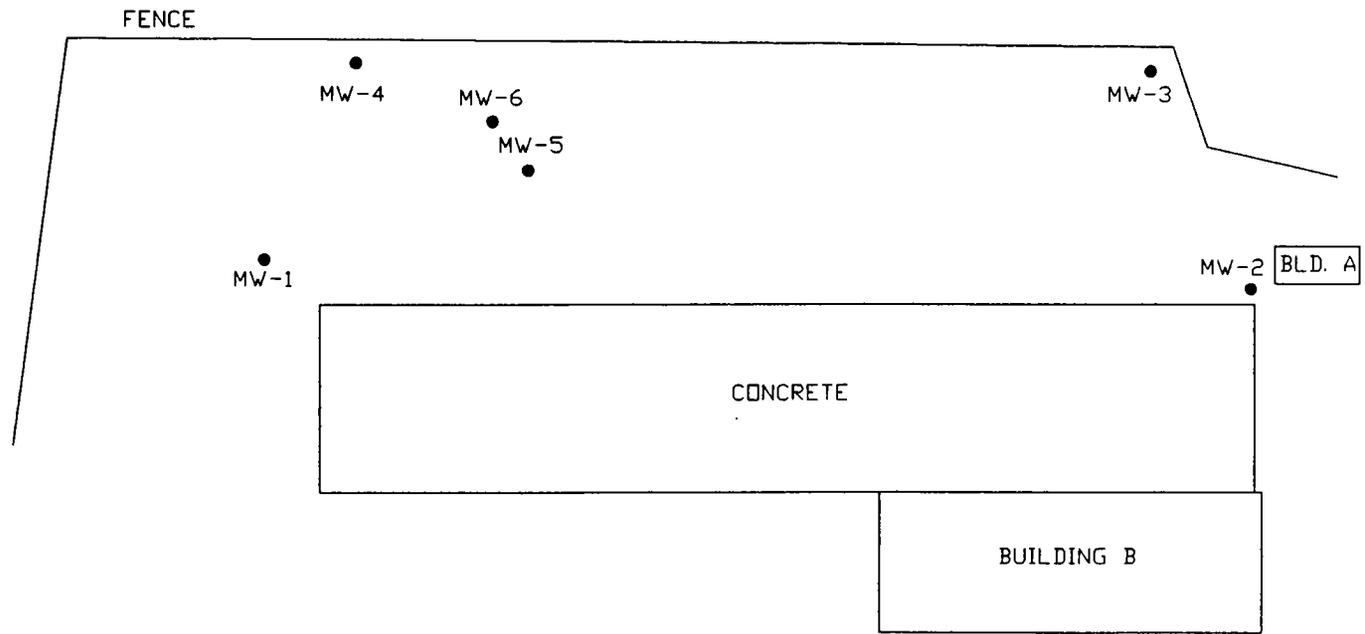
We are prepared to supervise the installation of the chosen recovery well system the week of May 17. If there are any changes in your work plan or if you have any questions pertaining to our recommendations please let me know.

Sincerely,



William J. Barker, P.G.  
Principal Hydrogeologist

WJB: jlc  
Attached.



CLIENT: SOLUTIONS ENVIRONMENTAL ASSOCIATES

PROJECT: FORT STORY

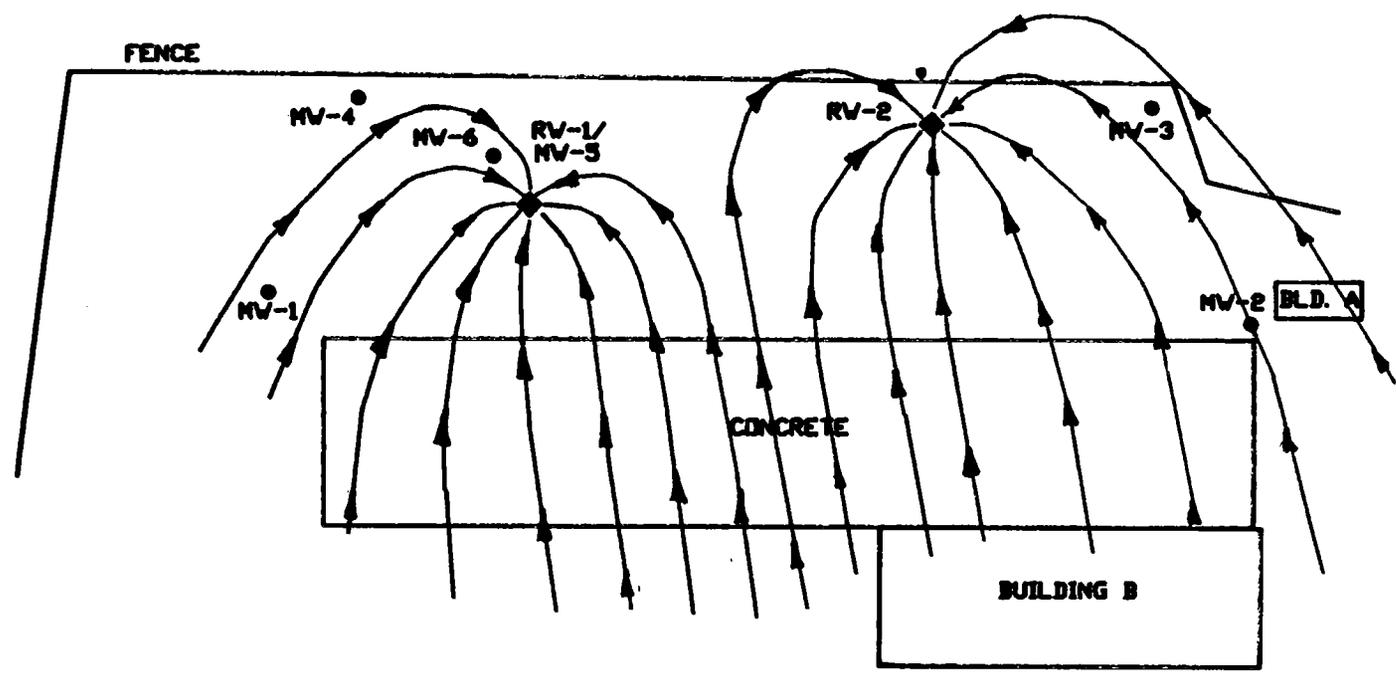
JOB#: E-9317

Title: SITE PLAN

Plate: 1

GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC



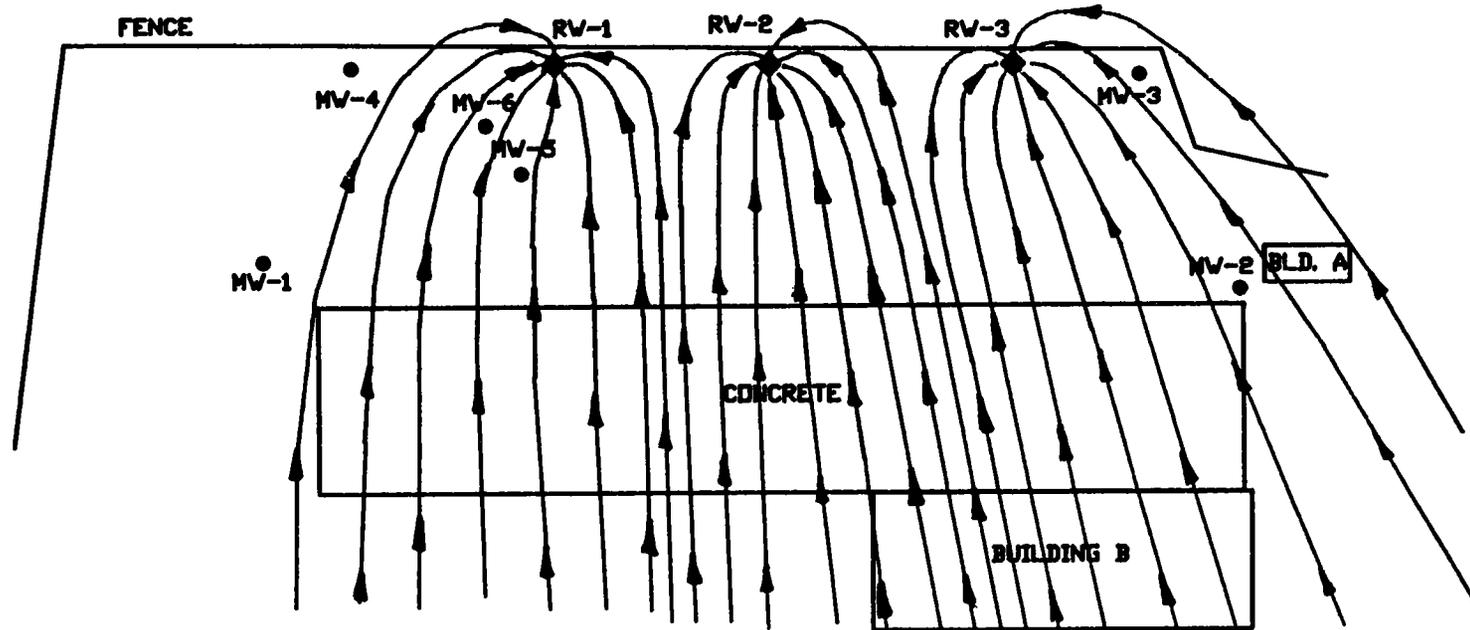


RV - Location of 4' diameter recovery well

Pathlines & Traveltimes (PAT) Capture Software

CLIENT: SOLUTIONS ENVIRONMENTAL ASSOCIATES	
PROJECT: FORT STORY BIOREMEDIATION SITE	JOB#: E-9317
Title: TWO WELL RECOVERY SYSTEM	Plate: 2
GEO TECHNICAL & ENVIRONMENTAL SERVICES, INC	





● RV - Recovery well locations

CLIENT: SOLUTIONS ENVIRONMENTAL ASSOCIATES

PROJECT: FORT STORY BIOREMEDIATION SITE

Title: THREE WELL RECOVERY SYSTEM

JOB#: E-9317

Plate: 3

GEO TECHNICAL & ENVIRONMENTAL SERVICES, INC



PATHLINES AND TRAVELTIMES

May 12, 1993

**THREE WELL OPTION AT 12.5 gpm EACH**

MODEL PARAMETERS

MODEL TYPE  
infinite

DIMENSION OF FLOW FIELD

x-minimum	[ m ]	0
x-maximum	[ m ]	300
y-minimum	[ m ]	0
y-maximum	[ m ]	250

AQUIFER PARAMETERS

hydraulic conductivity	[ m/s ]	.00061
effective porosity	[ - ]	.25
thickness of aquifer	[ m ]	8
hydraulic gradient	[ - ]	.002
direction of natural flow	[ 0-360 ]	280

TIME PARAMETERS

maximum time	[ d ]	200
time increment	[ d ]	1
time between markers	[ d ]	10

WELL DATA

limit radius around well	[ m ]	5
number of wells	[ 0-30 ]	3

X [ m ]	Y [ m ]	Q [ m <sup>3</sup> /s ]	
115	138	.00079	new well
150	138	.00079	new well
190	138	.00079	new well

LANDMARKS

number of landmarks	[ 0-5 ]	1
corners of landmark # 1	[ 1-10 ]	4

corner points of polygon # 1

X(1) [ m ]	75	Y(1) [ m ]	100
X(2) [ m ]	75	Y(2) [ m ]	143
X(3) [ m ]	214.3	Y(3) [ m ]	141.8
X(4) [ m ]	227.4	Y(4) [ m ]	100

**PATHLINES AND TRAVELTIMES**  
 May 12, 1993  
**TWO WELL OPTION AT 25 gpm EACH**

**MODEL PARAMETERS**

MODEL TYPE  
 infinite

DIMENSION OF FLOW FIELD

x-minimum	[ m ]	0
x-maximum	[ m ]	300
y-minimum	[ m ]	0
y-maximum	[ m ]	250

AQUIFER PARAMETERS

hydraulic conductivity	[ m/s ]	.00061
effective porosity	[ - ]	.25
thickness of aquifer	[ m ]	8
hydraulic gradient	[ - ]	.002
direction of natural flow	[ 0-360 ]	280

TIME PARAMETERS

maximum time	[ d ]	200
time increment	[ d ]	1
time between markers	[ d ]	10

WELL DATA

limit radius around well	[ m ]	5
number of wells	[ 0-30 ]	2

X [ m ]	Y [ m ]	Q [ m <sup>3</sup> /s ]	
119.4	121.6	.001575	existing MW-6
175	135	.001575	new well

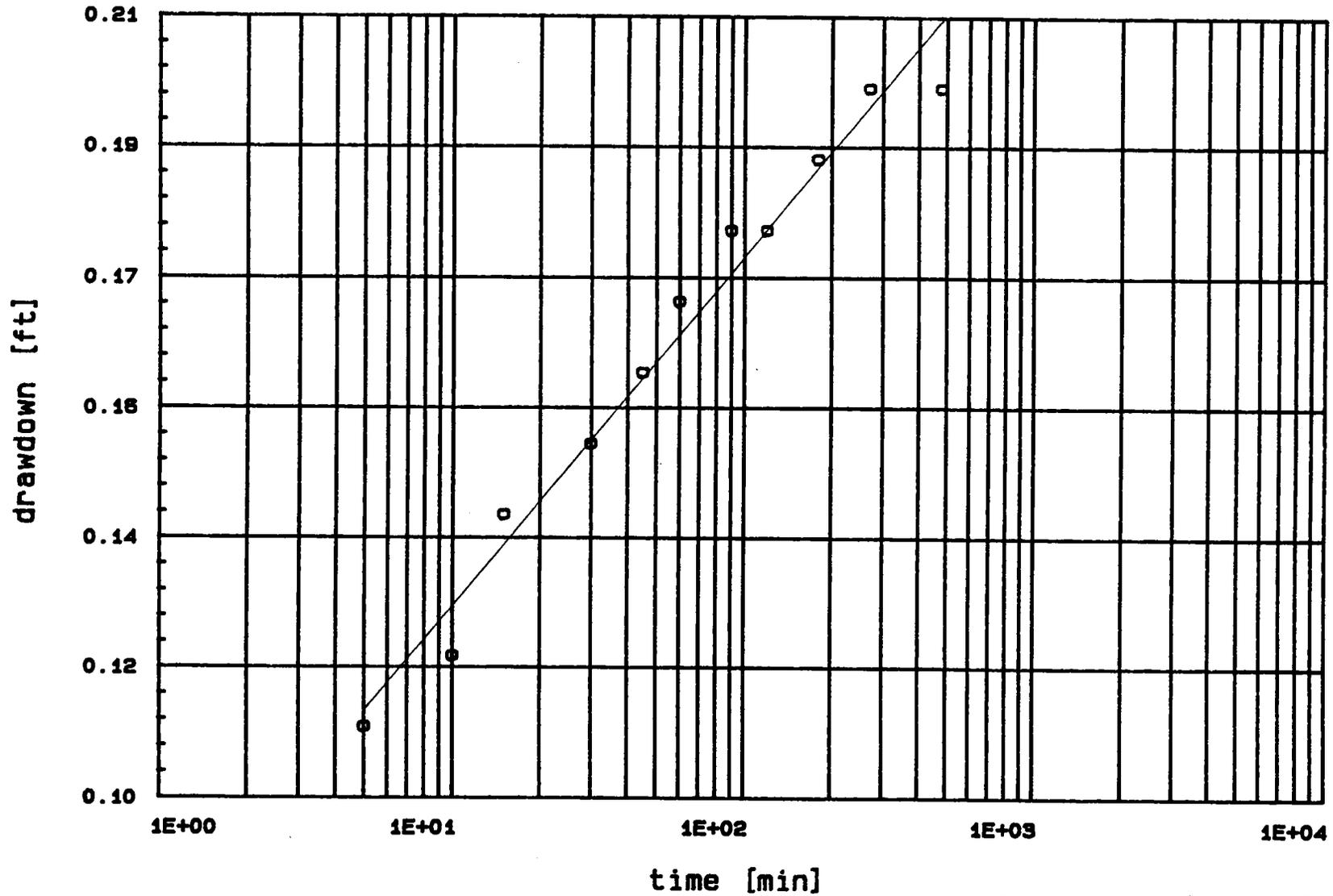
LANDMARKS

number of landmarks	[ 0-5 ]	1
corners of landmark # 1	[ 1-10 ]	4

corner points of polygon # 1

X (1) [ m ]	75	Y (1) [ m ]	100
X (2) [ m ]	75	Y (2) [ m ]	143
X (3) [ m ]	214.3	Y (3) [ m ]	141.8
X (4) [ m ]	227.4	Y (4) [ m ]	100

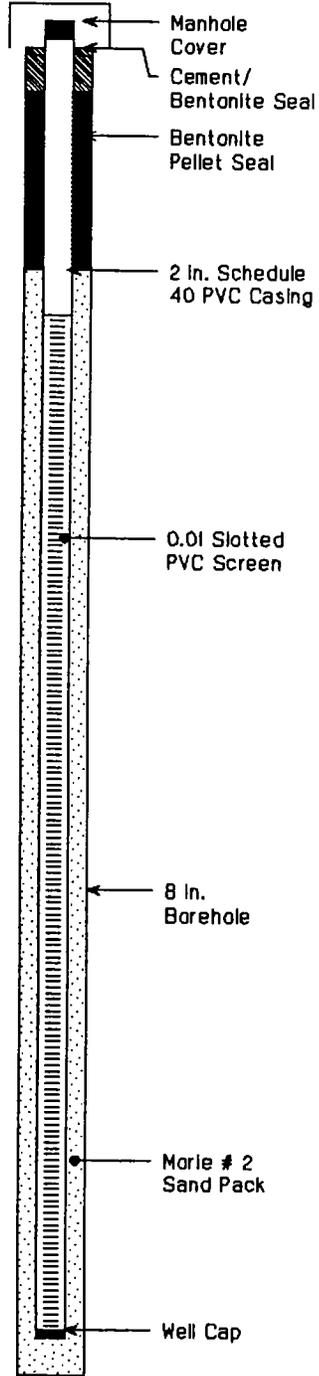
# Fort Story Pump Test OW-1



FILE: E9317OW1

T = 107384 [gpd/ft]  
S = .646E-03

WELL CONSTRUCTION



DEPTH (feet)	ELEVATION	BLOWS/FT.	PID (ppm)	SAMPLE NO.	SOIL CLASS	GRAPHIC LOG	MATERIALS DESCRIPTION
				1	SP	[Dotted pattern]	Tan to buff fine SAND, trace silt and organics, loose, dry to moist
	94.8	9		2	SP	[Dotted pattern]	Buff to orange brown, fine SAND, loose, to medium consistency, moist  Saturated below 3.7 FT.
5	92.9 92.8	12		3	SP	[Dotted pattern]	Buff to light grey, fine-medium SAND, loose to medium consistency
10							
15							
	81.2						BOTTOM OF HOLE AT: 15.4 FT.  Static water level at: 3.7 FT. (92.88)

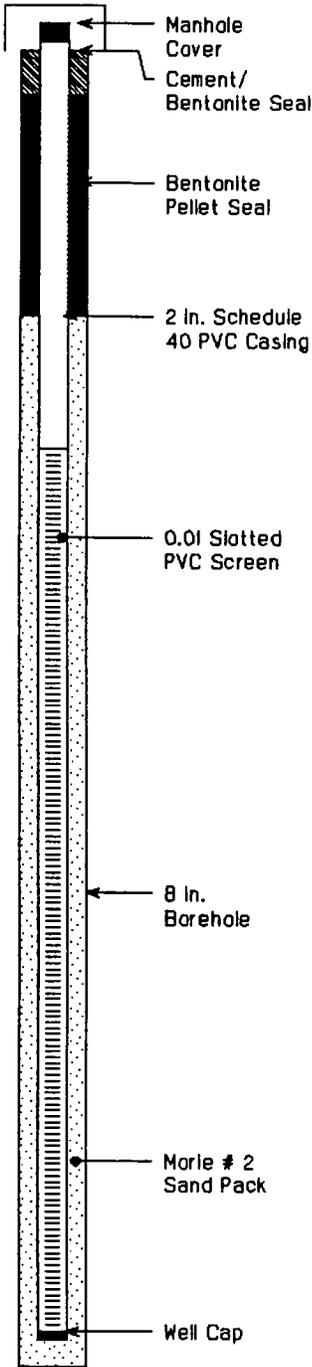


**GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.**

**LOG OF BORING MW-1...PROJ. E-9317**

CLIENT NAME	Solutions Environmental	LOCATION	Fort Story, Virginia
SURFACE ELEVATION	98.88 Feet	DRILLING METHOD	H. S. Augers
TOTAL DEPTH OF HOLE	15.4 Feet	GEOLOGIST	William J. Barker (4/28/93)

WELL CONSTRUCTION



DEPTH (feet)	ELEVATION	BLOWS/FT.	PID (ppm)	SAMPLE NO.	SOIL CLASS	GRAPHIC LOG	MATERIALS DESCRIPTION
				1	SP	[Dotted pattern]	Tan to brown fine-medium SAND, trace organics and debris, moist  (FILL)
	88.4	13		2	SP	[Horizontal lines]	Block coal mixed with brown fine-medium SAND, medium consistency  (FILL)
		20		3		[Horizontal lines]	
5	83.4	21		4	SP	[Dotted pattern]	Light grey with black fine sand trace silt and medium SAND, medium consistency, moist-very moist  Saturated below 8.3 FT.
	▽ 93.0						
10	88.4				SP	[Dotted pattern]	Light grey fine-medium SAND, loose to medium consistency, saturated
15	84.1						
							BOTTOM OF HOLE AT: 15.3 FT.  Static water level at: 8.35 FT. (83.08)



**GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.**

**LOG OF BORING MW-2...PROJ. E-9317**

CLIENT NAME	Solutions Environmental	LOCATION	Fort Story, Virginia
SURFACE ELEVATION	88.43 Feet	DRILLING METHOD	H. S. Augers
TOTAL DEPTH OF HOLE	15.3 Feet	GEOLOGIST	William J. Barker (4/28/83)

WELL CONSTRUCTION	DEPTH (feet)	ELEVATION	BLOWS/FT.	PID (ppm)	SAMPLE NO.	SOIL CLASS	GRAPHIC LOG	MATERIALS DESCRIPTION
Manhole Cover Cement/ Bentonite Seal		98.3	10		1	SP		Brown fine SAND with some organics
Bentonite Pellet Seal		98.0	10		2	GM		Stone fill
2 in. Schedule 40 PVC Casing		92.8						
0.01 Slotted PVC Screen	5	92.3	14		3	SP		Light grey to tan fine to medium SAND, loose to medium consistency
8 in. Borehole	10							Becomes fine-coarse sand below 10 FT.
Morle # 2 Sand Pack								
Well Cap	15							
		81.8						BOTTOM OF HOLE AT: 15.7 FT.
								Static water level at: 4.5 FT. (92.87)



**GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.**

**LOG OF BORING MW-3...PROJ. E-9317**

CLIENT NAME <u>Solutions Environmental</u>	LOCATION <u>Fort Story, Virginia</u>
SURFACE ELEVATION <u>97.37 Feet</u>	DRILLING METHOD <u>H. S. Augers</u>
TOTAL DEPTH OF HOLE <u>15.7 Feet</u>	GEOLOGIST <u>William J. Barker, (4/28/93)</u>

WELL CONSTRUCTION	DEPTH (feet)	ELEVATION	BLOWS/FT.	PID (ppm)	SAMPLE NO.	SOIL CLASS	GRAPHIC LOG	MATERIALS DESCRIPTION
	<p>93.8</p> <p>92.5</p> <p>5</p> <p>10</p> <p>15</p>	<p>93.8</p> <p>92.5</p> <p>91.8</p> <p>81.8</p>	<p>5</p> <p>28</p>	<p>1</p> <p>2</p>	<p>SP</p> <p>SP</p> <p>SP</p>		<p>Tan fine SAND, trace silt, dry to moist, loose</p> <p>Tan to orange-brown, fine-medium SAND, moist to very moist, medium dense</p> <p>Light grey, fine-medium SAND, little coarse sand, saturated</p> <p>BOTTOM OF HOLE AT: 15.0 FT.</p> <p>Static water level at: 4.3 FT. (92.57)</p>	



**GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.**

**LOG OF BORING MW-4...PROJ. E-9317**

CLIENT NAME	<u>Solutions Environmental</u>	LOCATION	<u>Fort Story, Virginia</u>
SURFACE ELEVATION	<u>98.87 Feet</u>	DRILLING METHOD	<u>Augers</u>
TOTAL DEPTH OF HOLE	<u>15.0 Feet</u>	GEOLOGIST	<u>William J. Barker (4/28/93)</u>

WELL CONSTRUCTION	DEPTH (feet)	ELEVATION	BLOWS/FT.	PID (ppm)	SAMPLE NO.	SOIL CLASS	GRAPHIC LOG	MATERIALS DESCRIPTION
	5	82.8	15		1	SP		Light to medium brown, fine SAND, little medium SAND, trace silt, moist-very moist, loose to medium consistency
	5	88.8	12	2	2	SP		Buff to light grey fine-medium SAND, medium consistency, saturated
	10	85.8				SP		Tan to light grey fine-medium SAND, little coarse SAND and trace fine gravel, loose to medium consistency, saturated
	15							BOTTOM OF HOLE AT: 25.0 FT.
	20						Static water level at: 3.3 FT. (82.80)	
	25	70.8						



**GEOTECHNICAL & ENVIRONMENTAL SERVICES, INC.**

**LOG OF BORING MW-5...PROJ. E-9317**

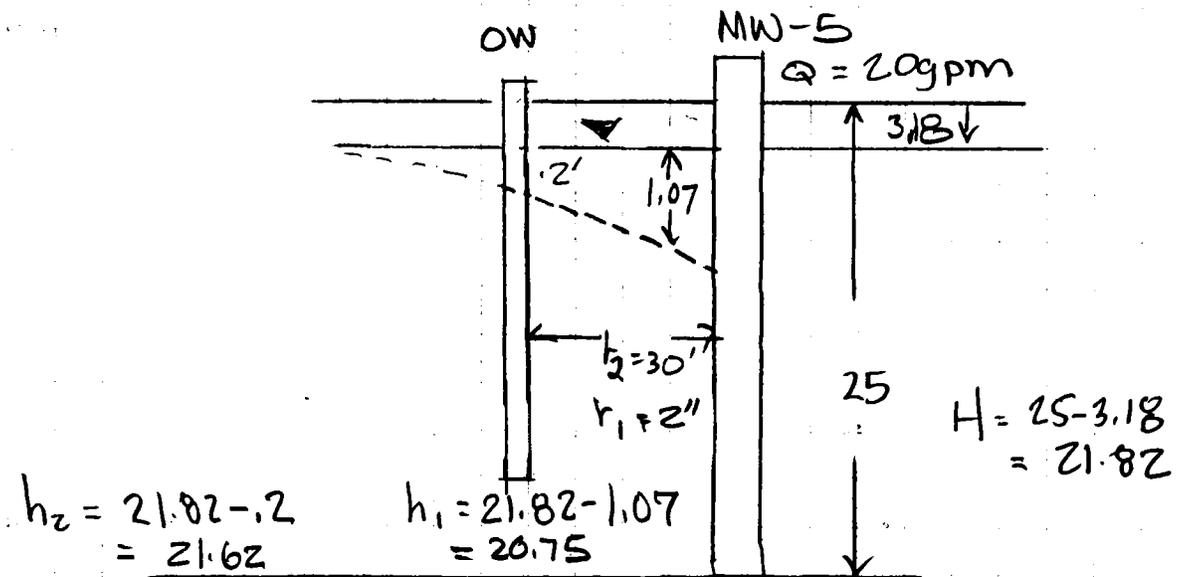
CLIENT NAME Solutions Environmental LOCATION Fort Story, Virginia  
 SURFACE ELEVATION 95.80 Feet DRILLING METHOD H.S. Augers  
 TOTAL DEPTH OF HOLE 25.0 Feet GEOLOGIST William J. Barker (4/29/83)

# FORT STORY BIOREMEDIATION PROJECT AQUIFER ANALYSIS

DETERMINE HYDRAULIC CONDUCTIVITY (K) FOR  
UNCONFINED (WATER TABLE) AQUIFER

FORMULA:  $K = \frac{1055 Q \log R_2/R_1}{(h_2^2 - h_1^2)}$  from "Groundwater & wells" pg 105

- K = hydraulic conductivity in gpd/sf
- Q = pumping rate in gpm
- $r_1$  = radius of well
- $r_2$  = distance to observation well (ow)
- $h_2$  = saturated thickness at OW
- $h_1$  = saturated thickness at pumping well



$$K = \frac{1055 (20) \log 30/.166}{(21.62)^2 - (20.75)^2} = \frac{47623}{36.9}$$

$K = 1,290 \text{ gpd/sf}$

$K = 6.1 \times 10^{-4} \text{ M/s or } 6.1 \times 10^{-2} \text{ cm/sec}$

CALCULATE HYDRAULIC CONDUCTIVITY  
AT MW LOCATIONS

$$\text{FORMULA: } K = \frac{1055Q \log R/r}{(H^2 - h^2)}$$

MW1:  $Q = 6 \text{ gpm}$ ;  $R = .33$ ;  $r = .08$   
 $H = 15 - 3.7 = 11.3$ ;  $h = 15 - 4.4 = 10.6$

$$K = \frac{1055(6) \log .33/.08}{(11.3^2) - (10.6)^2} = \frac{3895.6}{15.33}$$

$$K = 254.1 \text{ gpd/sf}$$

$$K = 1.2 \times 10^{-4} \text{ m/s or } 1.2 \times 10^{-2} \text{ cm/s}$$


---

MW2:  $Q = 6 \text{ gpm}$ ;  $R = .33$ ;  $r = .08$   
 $H = 15 - 6.5 = 8.5$ ;  $h = 15 - 7.2 = 7.8$

$$K = \frac{1055(6) \log .33/.08}{(8.5)^2 - (7.2)^2} = \frac{3895}{20.41}$$

$$K = 190.8 \text{ gpd/sf}$$

$$K = 9.0 \times 10^{-5} \text{ m/s or } 9.0 \times 10^{-3} \text{ cm/s}$$


---

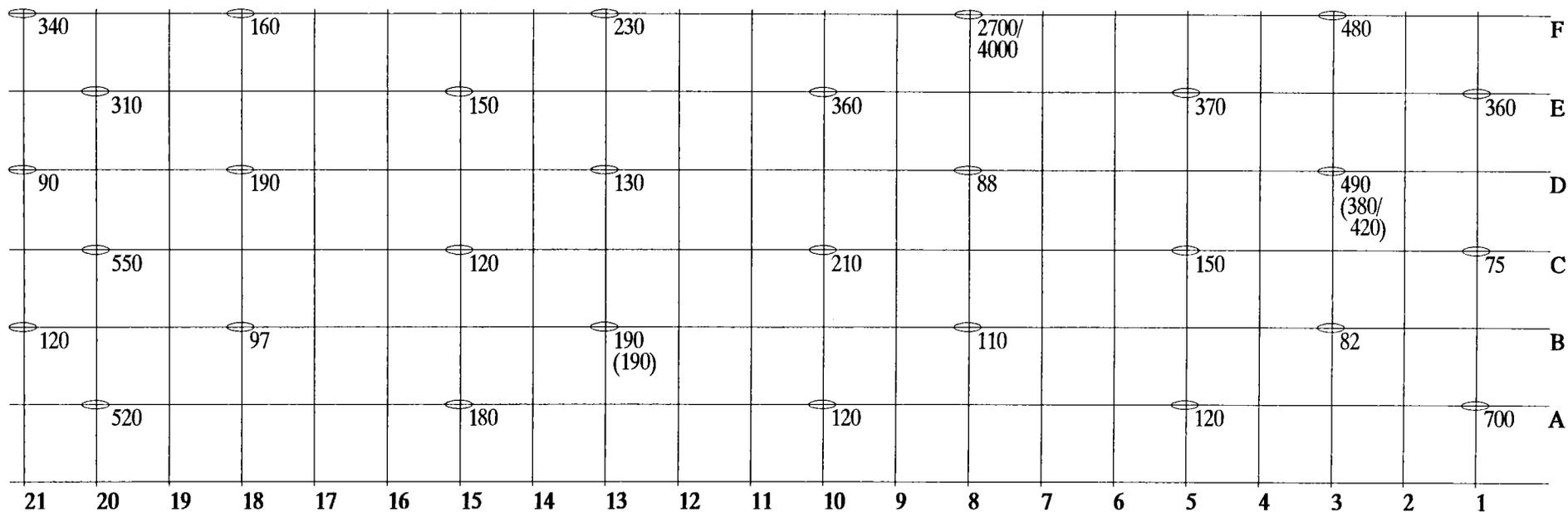
MW3:  $Q = 6 \text{ gpm}$ ;  $R = .33$ ;  $r = .08$   
 $H = 15 - 4.5 = 10.5$ ;  $h = 15 - 5.13 = 9.87$

$$K = \frac{1055(6) \log .33/.08}{(10.5)^2 - (9.87)^2} = \frac{3895}{12.84}$$

$$K = 303.3 \text{ gpd/sf}$$

$$K = 1.43 \times 10^{-4} \text{ m/s or } 1.4 \times 10^{-2} \text{ cm/s}$$

# LARC AREA BIOREMEDIATION FORT STORY, VIRGINIA Confirmation Sample Results

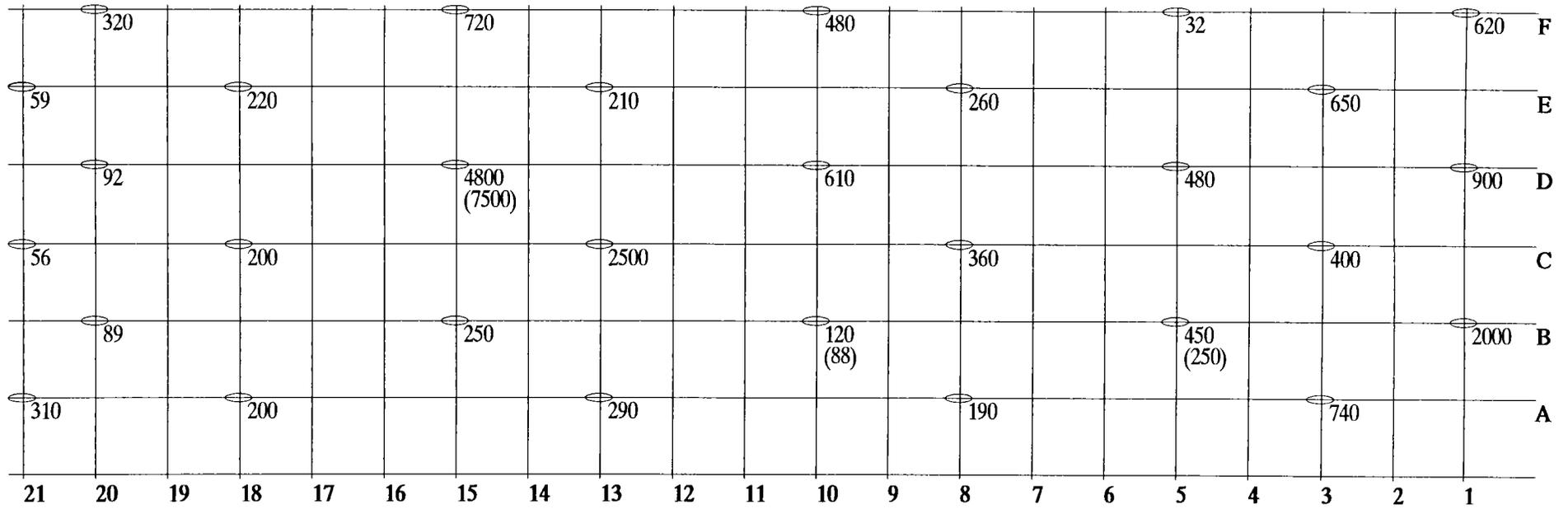


SUR\_418.WK1\4-28-94

DEPTH: SURFACE  
ANALYSIS METHOD: TPH 418.1  
○ SAMPLE LOCATION AND RESULT (PPM)

Figure 3

# LARC AREA BIOREMEDIATION FORT STORY, VIRGINIA Confirmation Sample Results

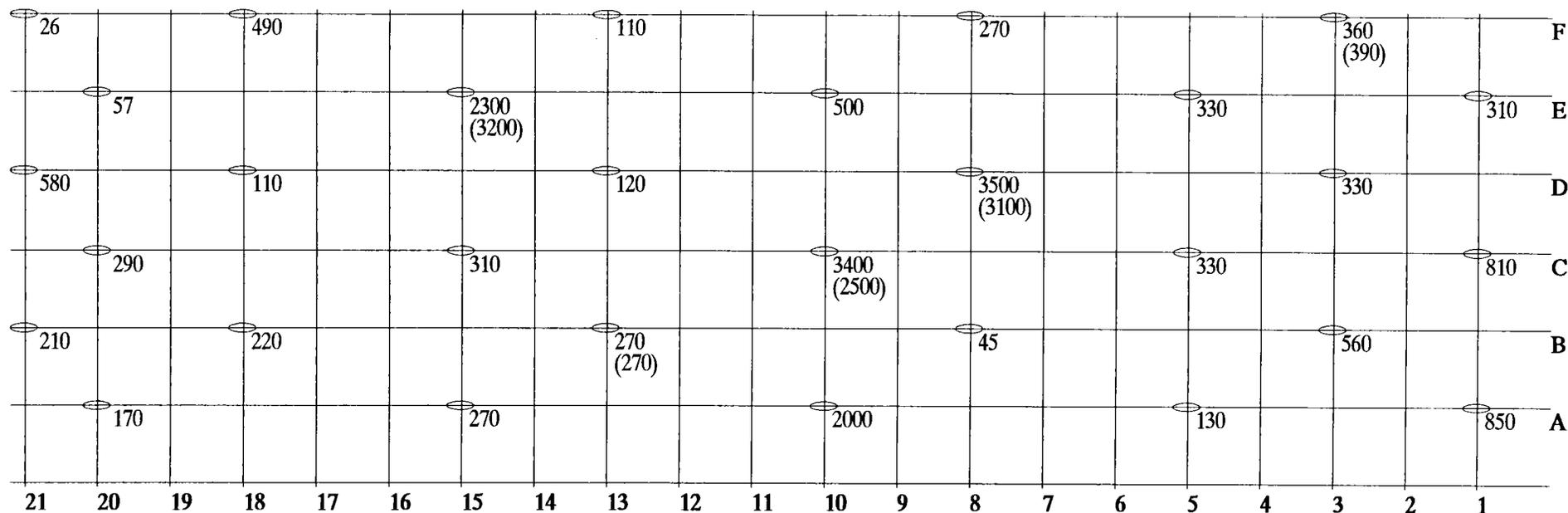


S24\_418.WK1\4-28-94

DEPTH: 24" BELOW SURFACE  
ANALYSIS METHOD: TPH 418.1  
○ SAMPLE LOCATION AND RESULT (PPM)

Figure 4

# LARC AREA BIOREMEDIATION FORT STORY, VIRGINIA Confirmation Sample Results

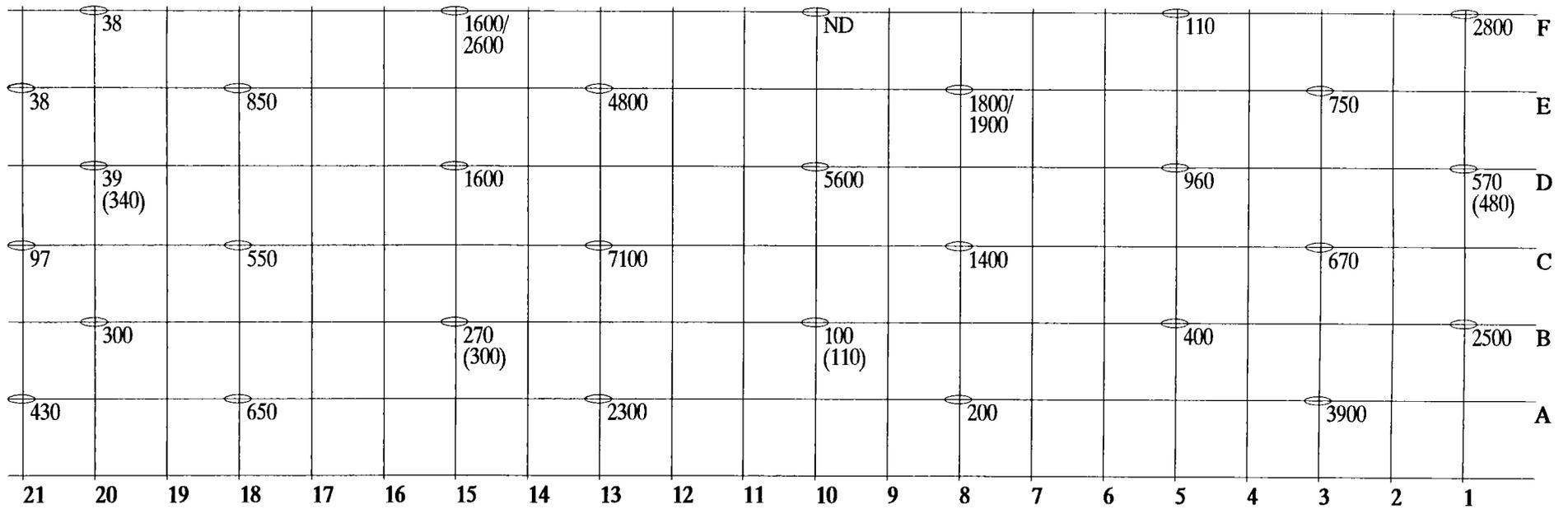


S36\_418.WK1\4-28-94

DEPTH: 36" BELOW SURFACE  
ANALYSIS METHOD: TPH 418.1  
○ SAMPLE LOCATION AND RESULT (PPM)

Figure 5

# LARC AREA BIOREMEDIATION FORT STORY, VIRGINIA Confirmation Sample Results

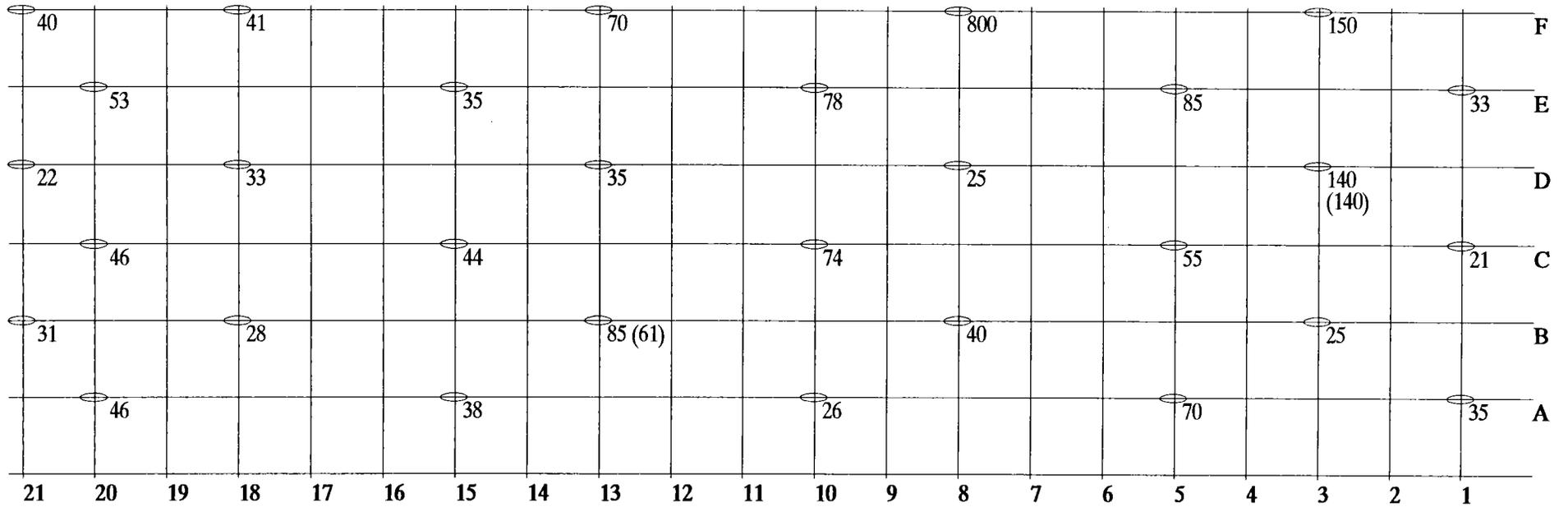


S48\_418.WK1\4-28-94

DEPTH: 48" BELOW SURFACE  
ANALYSIS METHOD: TPH 418.1  
○ SAMPLE LOCATION AND RESULT (PPM)

Figure 6

# LARC AREA BIOREMEDIATION FORT STORY, VIRGINIA Confirmation Sample Results

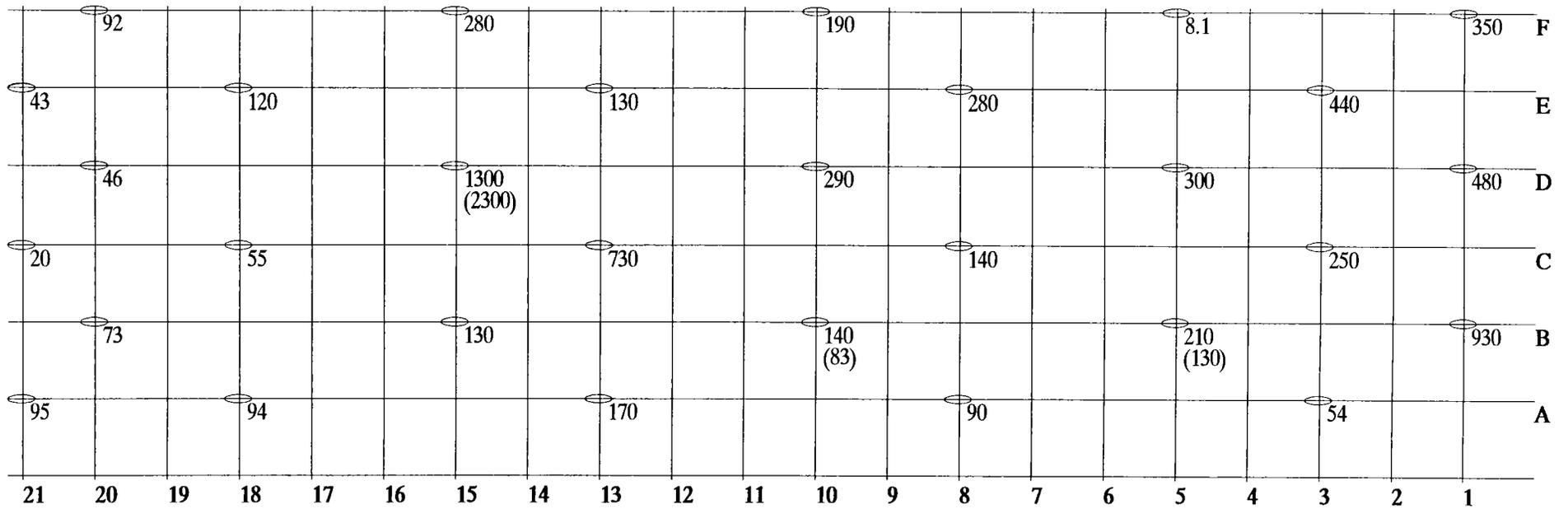


SUR\_D.WK14-28-94

DEPTH: SURFACE  
 ANALYSIS METHOD: TPH 8015-D  
 ○ SAMPLE LOCATION AND RESULT (PPM)

Figure 7

# LARC AREA BIOREMEDIATION FORT STORY, VIRGINIA Confirmation Sample Results

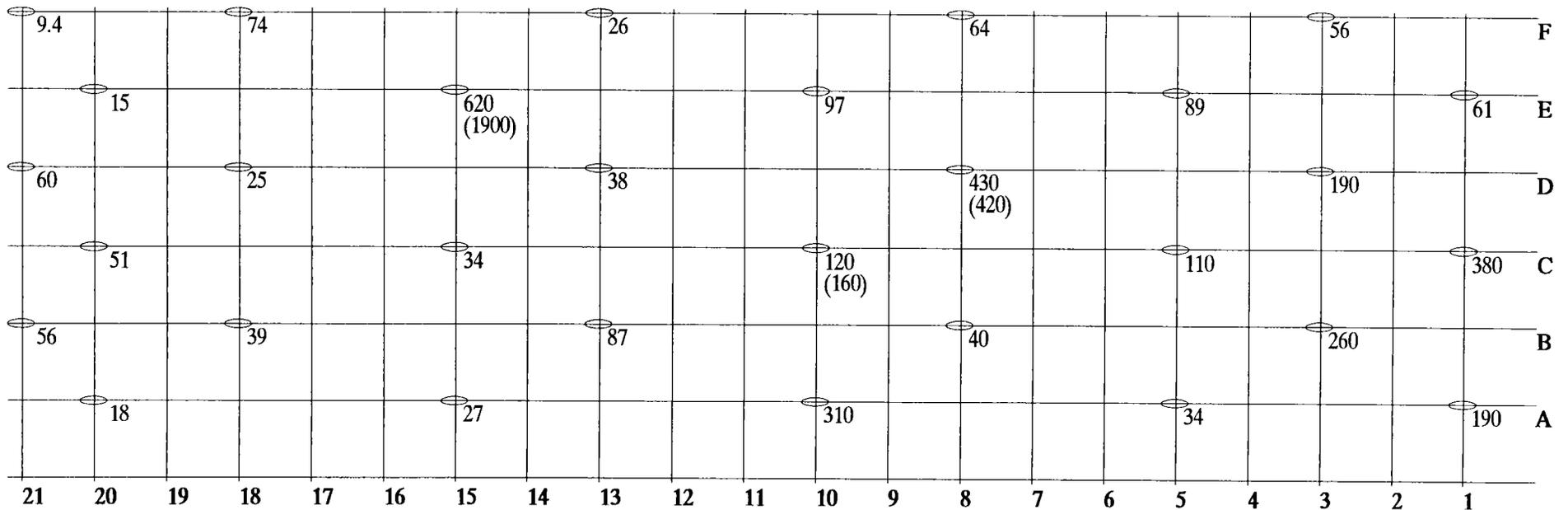


S24\_D.WK14-28-94

DEPTH: 24" BELOW SURFACE  
ANALYSIS METHOD: TPH 8015-D  
○ SAMPLE LOCATION AND RESULT (PPM)

Figure 8

# LARC AREA BIOREMEDIATION FORT STORY, VIRGINIA Confirmation Sample Results

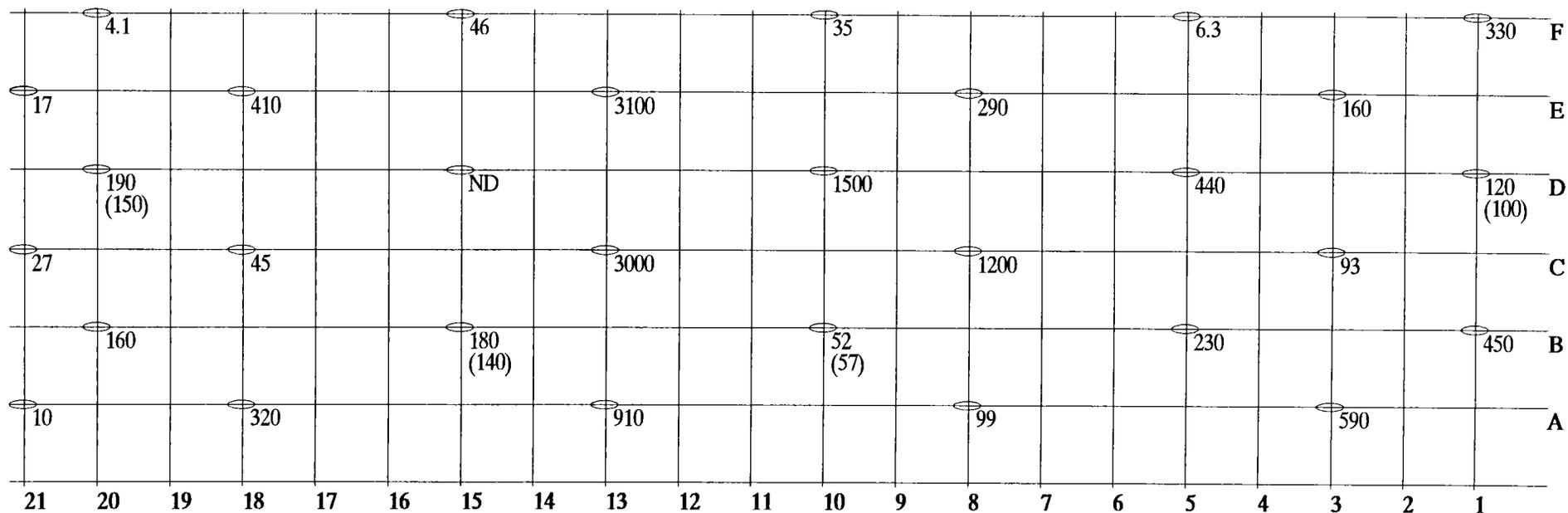


S36\_D.WK14-28-94

DEPTH: 36" BELOW SURFACE  
ANALYSIS METHOD: TPH 8015-D  
○ SAMPLE LOCATION AND RESULT (PPM)

Figure 9

# LARC AREA BIOREMEDIATION FORT STORY, VIRGINIA Confirmation Sample Results

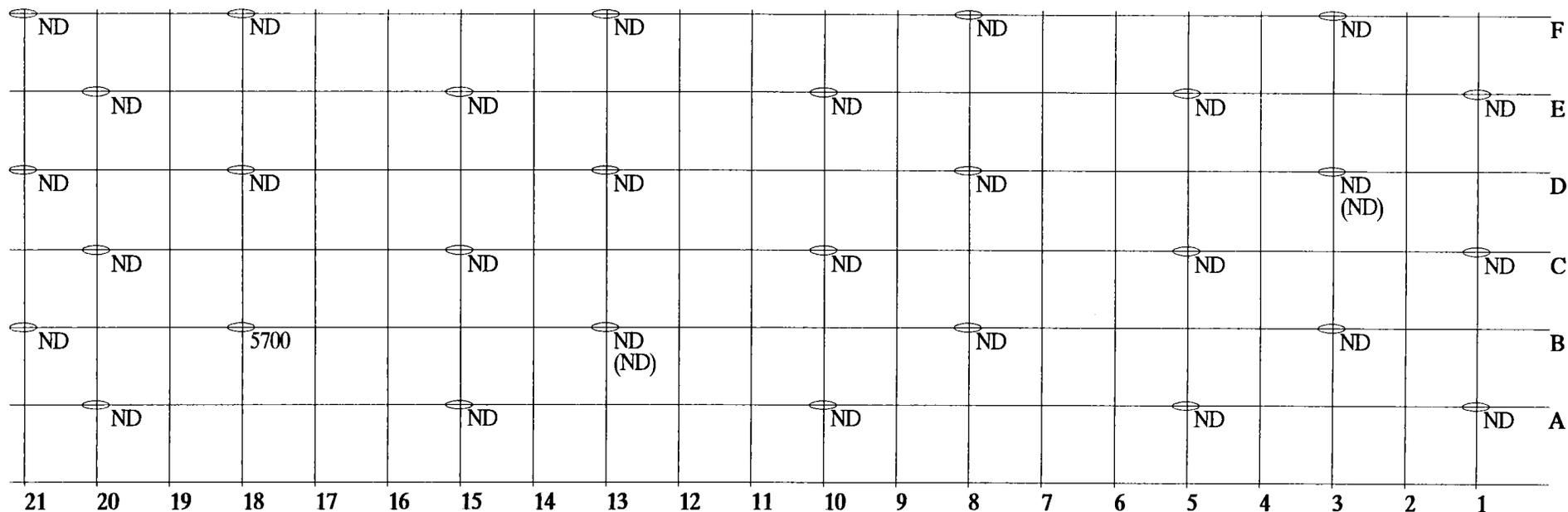


S48\_D.WK14-28-94

DEPTH: 48" BELOW SURFACE  
 ANALYSIS METHOD: TPH 8015-D  
 ○ SAMPLE LOCATION AND RESULT (PPM)

Figure 10

# LARC AREA BIOREMEDIATION FORT STORY, VIRGINIA Confirmation Sample Results

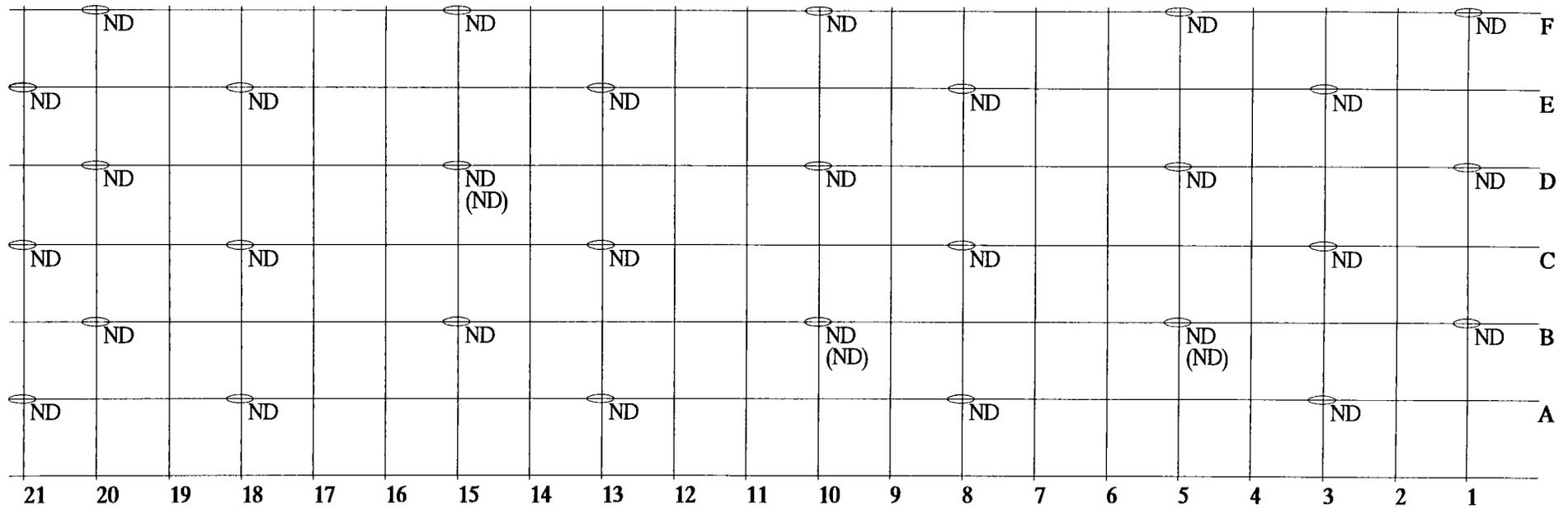


SUR\_G.WK14-28-94

DEPTH: SURFACE  
 ANALYSIS METHOD: TPH 8015-G  
 ○ SAMPLE LOCATION AND RESULT (PPM)

Figure 11

**LARC AREA BIOREMEDIATION  
FORT STORY, VIRGINIA  
Confirmation Sample Results**

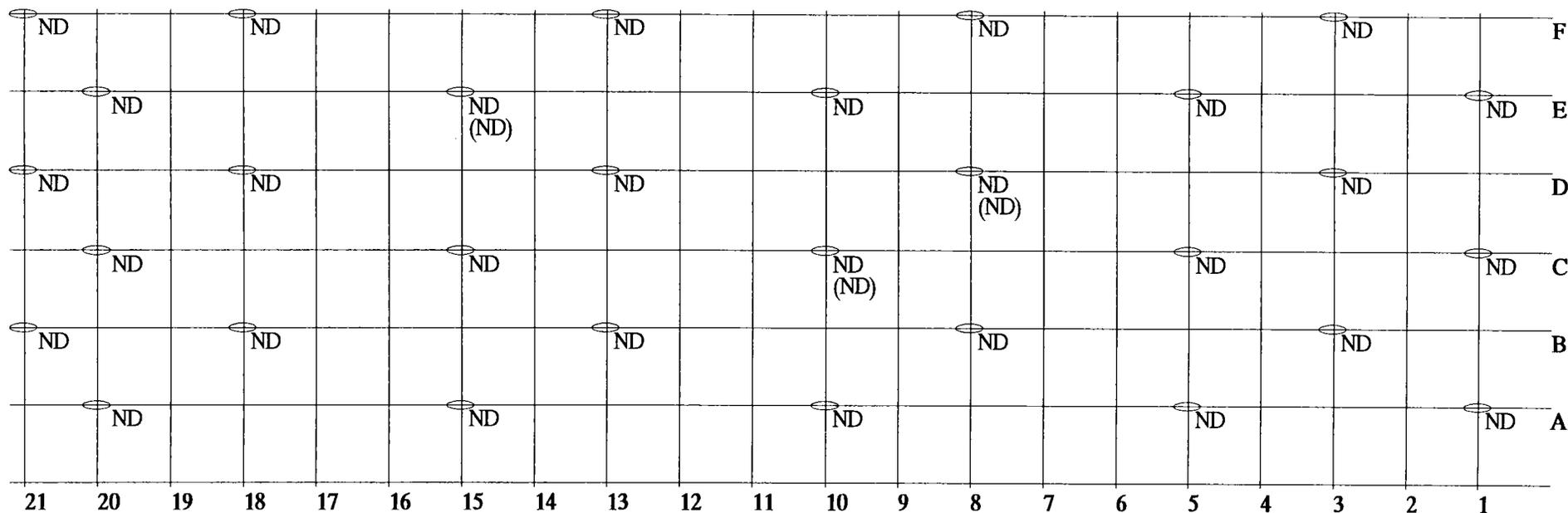


S24\_G.WK14-28-94

DEPTH: 24" BELOW SURFACE  
ANALYSIS METHOD: TPH 8015-G  
○ SAMPLE LOCATION AND RESULT (PPM)

Figure 12

# LARC AREA BIOREMEDIATION FORT STORY, VIRGINIA Confirmation Sample Results

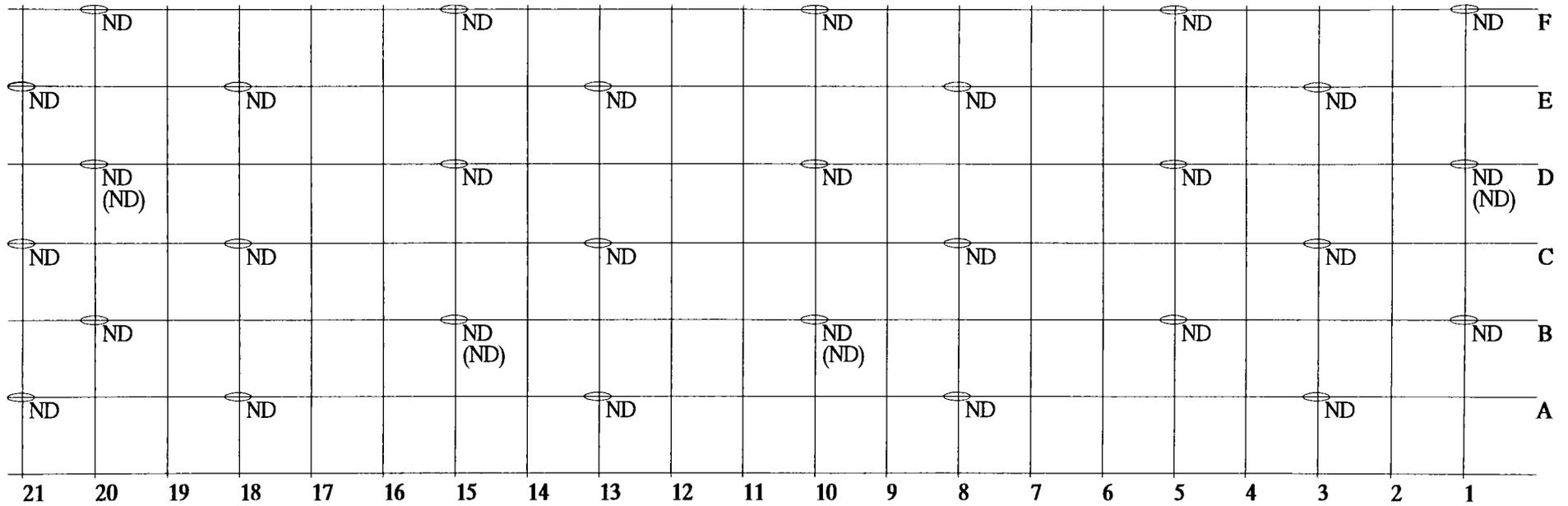


S36\_G.WK14-28-94

DEPTH: 36" BELOW SURFACE  
ANALYSIS METHOD: TPH 8015-G  
○ SAMPLE LOCATION AND RESULT (PPM)

Figure 13

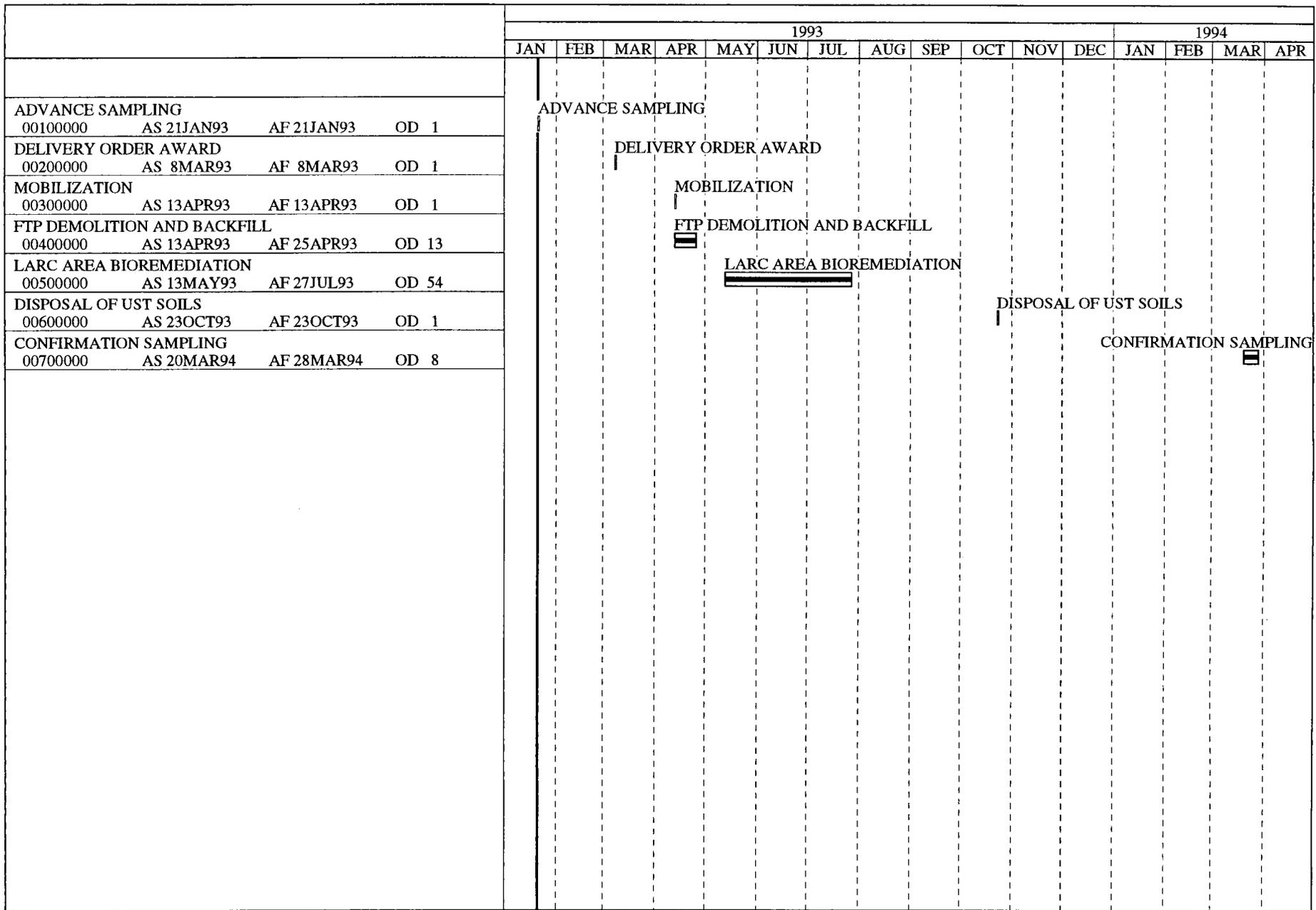
**LARC AREA BIOREMEDIATION  
FORT STORY, VIRGINIA  
Confirmation Sample Results**



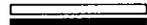
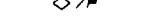
S48\_G.WK1\4-28-94

DEPTH: 48" BELOW SURFACE  
ANALYSIS METHOD: TPH 8015-G  
○ SAMPLE LOCATION AND RESULT (PPM)

Figure 14



Plot Date 23AUG94  
 Data Date 21JAN93  
 Project Start 21JAN93  
 Project Finish 20JAN93

 Activity Bar/Early Dates  
 Critical Activity  
 Progress Bar  
 Milestone/Flag Activity

LARC

Sheet 1 of 1

**FIGURE 15**  
**SCHEDULE OF REMEDIAL ACTIVITIES**  
**FORT STORY, VIRGINIA**

----- PREPARED BY IT CORPORATION -----

Date	Revision	Checked	Approved

**APPENDIX D**  
**DISPOSAL RECORDS**



## **MANIFESTS**



# South Carolina Department of Health and Environmental Control

9260-407  
Bureau of Solid & Hazardous Waste Mgt  
2600 Bull Street Columbia, SC 29204  
Phone (803) 734-5200  
Emergency & Hot Line (803) 253-6498

PLEASE PRINT or TYPE (Form designed for use on either 12-punch typewriter) Form Approved OMB No. 2050-0032 Expires 9-30-

UNIFORM HAZARDOUS WASTE MANIFEST		1. Generator's U.S. EPA ID No VA121372081500001	Manifest Document No 00001	2. Page 1 of 1	Information in the shaded areas is not required by Federal law, but is by State law.				
3. Generator's Name and Mailing Address Fort Story, DEH Office, Building 727, Fort Story, VA 23459-5000 Attn: Gary Longmire				A. State Manifest Document Number					
4. Generator's Phone (804) 422-7344				B. State Generator's ID					
5. Transporter 1 Company Name Laidlaw Environmental Services (IG) RM				6. U.S. EPA ID Number SICD0987574647		C. State Transporter's ID			
7. Transporter 2 Company Name Dart Trucking Co Inc.				8. U.S. EPA ID Number 12HAD09865825		D. Transporter's Phone (803) 452-6060			
9. Designated Facility Name and Site Address Laidlaw Environmental Services, Inc. Route 1, Box 225 Pinewood, SC 29125				10. U.S. EPA ID Number SICD070375985		E. State Transporter's ID			
						F. Transporter's Phone			
						G. State Facility's ID			
						H. Facility's Phone 803-452-5003			
11. U.S. DOT Description (including Proper Shipping Name, Hazard Class, and ID Number)						12. Containers No	13. Total Quantity	14. Unit #	15. Waste Number
a. Non-regulated solid waste, non-regulated soils						0, 0, 1	4, 500.0	P	177777
b.									
c.							47, 280		
15. Special Handling Instructions and Additional Information Work Order No.: 177870 Please send additional copy of completed manifest to: IT Corp. Attn: Tom Mathison, 2790 Mossie Blvd., Monroeville, PA 15146						K. Handling Codes for Wastes Listed Above			
a. [P,W]-[0,5,7,8,3]-[6,1,0,1]						c. [ ]-[ ]-[ ]			
b. [ ]-[ ]-[ ]						d. [ ]-[ ]-[ ]			
16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations and the laws of the State of South Carolina. If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment. OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.						<small>P.S. Reporting Guide for this document: 20 minutes for generators, 15 minutes for transporters, and 10 minutes for treatment, storage, and disposal facilities. This includes time for reviewing instructions, gathering data, and computing and reviewing the form. Send comments regarding the burden estimate, including suggestions for reducing the burden to: Chief, Information Policy Branch, PM 223 U.S. Environmental Protection Agency, 401 M St., S.W., Washington, D.C. 20460 and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503.</small>			
Printed/Typed Name Stephen A. McCall		Signature <i>Stephen A. McCall</i>		Month Day Year 10/20/73					
17. Transporter 1 Acknowledgement of Receipt of Materials		Printed/Typed Name		Signature		Month Day Year			
18. Transporter 2 Acknowledgement of Receipt of Materials		Printed/Typed Name MICHAEL FRANKS		Signature <i>Michael Franks</i>		Month Day Year 10/20/73			
Discrepancy Indication Space		a. 177870		cs		cs			
		c. [ ]		cs		cs			
19. Facility Owner or Operator Certification of receipt of hazardous materials covered by this manifest as per the notes in item 12.		Printed/Typed Name Jon [unclear]		Signature		Month Day Year			

GENERATOR  
TRANSPORTER  
FACILITY

D1856107

TRUCK # 9260 TRAILER # \_\_\_\_\_

COMPANY NAME: Pristin

DATE: \_\_\_\_\_ PRICE: \_\_\_\_\_ \$6.00

RE-WEIGH: \_\_\_\_\_ \$1.00

SIGNATURE: Kay Andreasen

CHARLIE'S TRUCK PAVILION, INC.  
5792 NORTHAMPTON BLVD.  
VA. BEACH, VA. 23455  
804/460-2032

STATION # \_\_\_\_\_  
DATE \_\_\_\_\_  
TIME \_\_\_\_\_  
WEIGHT \_\_\_\_\_  
TARE \_\_\_\_\_  
NET \_\_\_\_\_  
GROSS \_\_\_\_\_  
TAXES \_\_\_\_\_  
TOTAL \_\_\_\_\_  
REMARKS \_\_\_\_\_

ORIGINAL

D18 56107

TRUCK # 9360 TRAILER # \_\_\_\_\_

COMPANY NAME: Pristin

DATE: 10/20/93 PRICE: \_\_\_\_\_ \$6.00

RE-WEIGH: \$1.00

SIGNATURE: Kay Andreassen

CHARLIE'S TRUCK PAVILION, INC.  
5792 NORTHAMPTON BLVD.  
VA. BEACH, VA. 23455  
804/460-2032

ORIGINAL

018 56107

TRUCK # 9260 TRAILER # \_\_\_\_\_

COMPANY NAME: Pristen

DATE: 10-20-93 PRICE: 1.00 \$6.00

RE-WEIGH: \$1.00

SIGNATURE: Kay Andreassen

CHARLIE'S TRUCK PAVILION, INC.  
3792 NORTHAMPTON BLVD.  
VA. BEACH, VA. 23455  
804/460-2032

ORIGINAL



Laidlaw Environmental Services of SC, Inc.  
 Route 1, Box 255  
 Pinewood, South Carolina 29125

WORK ORDER NUMBER 177870 <sup>D1856107</sup> 5

MANIFEST NUMBER 00001

CUSTOMER NAME \_\_\_\_\_

PLANT LOCATION \_\_\_\_\_

VEHICLE WEIGHT:

GROSS <sup>07:27</sup> 10/21/93 77500 LB G

TARE <sup>09:04</sup> 10/21/93 30220 LB G

NET 47280

- ( ) FLATBED . . . . . DRUMS
- ( ) TANKER . . . . .est. \_\_\_\_\_ GALLONS
- (✓) DUMP TRUCK . est. \_\_\_\_\_ CU. YARDS
- ( ) ENCLOSED VAN . . . . . DRUMS

DATE \_\_\_\_\_

TIME IN: \_\_\_\_\_

TIME OUT: \_\_\_\_\_

TRAFFIC MANAGER		OTHER
TREATMENT		
OFF SPEC TREATMENT		
OFF SPEC		
OFF SCHEDULE		

HAULER: Doef 5

DRIVER: \_\_\_\_\_

1. Hard - File Daily in Order - 2. Lab Arrival - 3. Customer - 4. Accounting - 5. Weight File by State



# South Carolina Department of Health and Environmental Control

Bureau of Solid & Hazardous Waste Mgt  
2600 Bull Street, Columbia, SC 29201  
Phone: (803) 734-5200  
Emergency & Hot Lines: 803-253-6488

PLEASE PRINT or TYPE (Form designed for use on elite (12-pitch) typewriter)

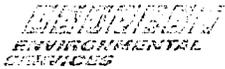
Form Approved OMB No. 2050-0039 Expires 9-30-

<b>UNIFORM HAZARDOUS WASTE MANIFEST</b>		1. Generator's U.S. EPA ID No. VA, 1, 2, 1, 3, 7, 2, 0, 8, 1, 5	Manifest Document No. 0, 0, 0, 0, 1, 2	2. Page 1 of 1	Information in the shaded areas is not required by Federal law, but is by State law.								
3. Generator's Name and Mailing Address Fort Story, DEH Office, Building 727, Fort Story, VA 23459-5000 Attn: Gary Longmire				A. State Manifest Document Number D 1 8 3 6 1 0 6		B. State Generator's ID							
4. Generator's Phone: 804 422-7344				C. State Transporter's ID		D. Transporter's Phone 803-452-6060							
5. Transporter 1 Company Name Dart Trucking Co Inc Laidlaw Environmental Services (IG)				E. State Transporter's ID		F. Transporter's Phone							
7. Transporter 2 Company Name				8. U.S. EPA ID Number		G. State Facility's ID							
9. Designated Facility Name and Site Address Laidlaw Environmental Services, Inc. Route 1, Box 225 Pinewood, SC 29125				10. U.S. EPA ID Number S, C, D, 0, 7, 0, 3, 7, 5, 9, 8, 1, 5		H. Facility's Phone 803-452-5003							
11. U.S. DOT Description (including Proper Shipping Name, Hazard Class, and ID Number)						12. Containers No.	13. Total Quantity	14. Unit	15. Waste Number				
a. Non-regulated solid waste, non-regulated soils						0, 0, 1	4, 5, 0, 0, 0	P	(7, 7, 7, 7)				
b.													
c.													
RECEIVED NOV 1 1988							49,040						
J. Additional Descriptions for Materials Listed Above						K. Handling Codes for Wastes Listed Above							
a. [P, W] - [0, 5, 7, 8, 8] - [6, 1, 0, 1]						c. [ ] - [ ] - [ ]							
b. [ ] - [ ] - [ ]						d. [ ] - [ ] - [ ]							
15. Special Handling Instructions and Additional Information Work Order No.: 177871 Please send additional copy of completed manifest to: IT Corp. Attn: Tom Mathison, 2790 Mossie Blvd., Monroeville, PA 15146						Public reporting burden for this collection of information is estimated to average 37 minutes for generators, 15 minutes for transporters, and 15 minutes for treatment, storage and disposal facilities. This includes the time for reviewing instructions, gathering data and conducting the review, collecting the data, reviewing the data, and completing and reviewing the form. Send comments regarding this burden estimate, including suggestions for reducing this burden, to Chief Information Policy, Bureau, PA-223 U.S. Environmental Protection Agency, 401 M St. S.W., Washington, D.C. 20460 and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503.							
16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classed, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations and the laws of the State of South Carolina. If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment. OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.													
Printed/Typed Name Stephen A. McCall				Signature <i>Stephen A. McCall</i>				Month Day Year 10 30 88					
17. Transporter 1 Acknowledgement of Receipt of Materials				Printed/Typed Name ROBERT E. DAVIS				Signature <i>Robert E. Davis</i>		Month Day Year 11 02 1988			
18. Transporter 2 Acknowledgement of Receipt of Materials				Printed/Typed Name				Signature 202 9213 19213				Month Day Year	
Discrepancy Indication Space													
a. [ ] - [ ] - [ ]													
b. [ ] - [ ] - [ ]													
19. Facility Owner or Operator, Certification of receipt of hazardous materials covered by this manifest except as noted in Item 9													
Printed/Typed Name				Signature <i>[Signature]</i>				Month Day Year					

GENERATOR

TRANSPORTER

FACILITY



Leidlaw Environmental Services of SC, Inc.  
 Route 1, Box 250  
 Pinewood, South Carolina 29125

WORK ORDER NUMBER 177871 21

MANIFEST NUMBER 00002

CUSTOMER NAME \_\_\_\_\_

PLANT LOCATION \_\_\_\_\_

FLATBED . . . . . DRUMS

TANKER . . . . . est. . . . . GALLONS

DUMP TRUCK . . . . . est. . . . . CU. YARDS

ENCLOSED VAN . . . . . DRUMS

VEHICLE WEIGHT:		
GROSS	0:51 10/21/93	82380 LB G
TARE	01:17 10/21/93	33340 LB G
NET		<u>49040</u>

DATE	
TIME IN:	
TIME OUT:	

TRAFFIC MANAGER		OTHER
TREATMENT		
OFF SPEC TREATMENT		
OFF SPEC		
OFF SCHEDULE		

HAULER: V. D. C. R. S. 21

DRIVER: \_\_\_\_\_

*2 hrs 26 mins. unloading time*

1. Hard - File Daily in Order - 2. Lab Arrival - 3. Customer - 4. Accounting - 5. Weight File by State



# South Carolina Department of Health and Environmental Control

110 - 2610  
9285 - 157  
Bureau of Solid & Hazardous Waste Mgt  
2600 Bull Street, Columbia SC 29201  
Phone (803) 734-5200  
Emergency & Holidays (803) 253-6485

PLEASE PRINT or TYPE (Form designed for use on elite [12-pitch] typewriter) Form Approved OMB No 2050-0039 Expires 9-30-9

## UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's U.S. EPA ID No  
V, A, 1, 2, 1, 3, 7, 2, 0, 8, 1, 5, 0, 0, 0, 3  
Manifest Document No  
0, 0, 0, 0, 3

2. Page 1 of 1  
Information in the shaded areas is not required by Federal law, but is by State law

3. Generator's Name and Mailing Address Fort Story, DEH Office, Building 727, Fort Story, VA 23459-5000 Attn: Gary Longmire		A. State Manifest Document Number
4. Generator's Phone (804) 422-7344		B. State Generator's ID
5. Transporter 1 Company Name PART TRUCKING Co. Inc Laidlaw Environmental Services (TG)		C. State Transporter's ID T197 KC 01
6. U.S. EPA ID Number 04 D 0 0 9 8 6 5 9 2 5 S, C, D, 9, 8, 7, 5, 7, 4, 6, 4, 7		D. Transporter's Phone 803-452-6060
7. Transporter 2 Company Name		E. State Transporter's ID
8. U.S. EPA ID Number		F. Transporter's Phone
9. Designated Facility Name and Site Address Laidlaw Environmental Services, Inc. Route 1, Box 225 Pinewood, SC 29125		G. State Facility's ID
10. U.S. EPA ID Number S, C, D, 0, 7, 0, 3, 7, 5, 9, 8, 5		H. Facility's Phone 803-452-5003

11. U.S. DOT Description (including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No. Type	13. Total Quantity	14. Unit Wt Vol	15. Waste Number
a. Non-regulated solid waste, non-regulated soils	0, 0, 1 D, T	EST. 4, 5, 0, 0, 0	P	7, 7, 7, 7
b.				
c.		47, 100		

J. Additional Descriptions for Materials Listed Above	K. Handling Codes for Wastes Listed Above
a. [P, W] - [0, 5, 7, 8, 8] - [6, 1, 0, 1]	c. [ ] - [ ] - [ ]
b. [ ] - [ ] - [ ]	d. [ ] - [ ] - [ ]

15. Special Handling Instructions and Additional Information  
Work Order No.: 177872  
Please send additional copy of completed manifest to: IT Corp.  
Attn: Tom Mathison, 2790 Mossie Blvd., Monroeville, PA 15146

P.L.C. reporting burden for this collection of information is estimated to average 37 minutes for generators, 15 minutes for transporters, and 10 minutes for treatment, storage, and disposal facilities. This includes time for reviewing instructions, gathering data, and completing and reviewing the form. Send comments regarding this burden estimate, including suggestions for reducing this burden, to Chief Information Policy Branch, PM 223 U.S. Environmental Protection Agency, 401 M St., S.W., Washington, D.C. 20460 and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503.

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations and the laws of the State of South Carolina.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment. OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name: Stephen A. McCall  
Signature: [Signature]  
Month Day Year: 10 20 93

17. Transporter 1 Acknowledgement of Receipt of Materials  
Printed/Typed Name: DAVID McLain  
Signature: [Signature]  
Month Day Year: 10 20 93

18. Transporter 2 Acknowledgement of Receipt of Materials  
Printed/Typed Name: [ ]  
Signature: [ ]  
Month Day Year: [ ]

Discrepancy Indication Space

a. 47100 lbs c. [ ] lbs  
b. [ ] lbs d. [ ] lbs

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19  
Printed/Typed Name: [ ]  
Signature: [Signature]  
Month Day Year: 10 20 93

GENERATOR

TRANSPORTER

FACILITY



Laidlaw Environmental Services of SC, Inc.  
Route 1, Box 255  
Pinewood, South Carolina 29125

WORK ORDER NUMBER 177872 20

MANIFEST NUMBER CCCC03

CUSTOMER NAME \_\_\_\_\_

PLANT LOCATION \_\_\_\_\_

VEHICLE WEIGHT:		
GROSS	10:50 10/21/93	80560 LB G
TARE	01:08 10/21/93	33460 LB G
NET		<u>47100</u>

- ( ) FLATBED . . . . . DRUMS
- ( ) TANKER . . . . . est. \_\_\_\_\_ GALLONS
- (  ) DUMP TRUCK . est. \_\_\_\_\_ CU. YARDS
- ( ) ENCLOSED VAN . . . . . DRUMS

DATE _____
TIME IN: _____
TIME OUT: _____

TRAFFIC MANAGER		OTHER
TREATMENT		
OFF SPEC TREATMENT		
OFF SPEC		
OFF SCHEDULE		

HAULER: Doest 20

DRIVER: \_\_\_\_\_

1. Hard - File Daily in Order - 2. Lab Arrival - 3. Customer - 4. Accounting - 5. Weight File by State

*2 hr. 18 min. unloading*



# South Carolina Department of Health and Environmental Control

Bureau of Solid & Hazardous Waste M.  
2600 Bull Street, Columbia, SC 29201  
Phone (803) 734-5200  
Emergency & Holidays (803)253-6468

PLEASE PRINT or TYPE (Form designed for use on elite [12-pitch] typewriter)

Form Approved OMB No 2050-0039 Expires 9

## UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's U.S. EPA ID No. **V, A, 1, 2, 1, 3, 7, 2, 0, 8, 1, 5, 0, 0, 0, 4**  
Manifest Document No. **0, 0, 0, 0, 4**

2. Page 1 of 1

Information in the shaded areas is required by Federal law, but is by State

3. Generator's Name and Mailing Address **Fort Story, DEH Office, Building 727,  
Fort Story, VA 23459-5000  
Attn: Gary Longmire**  
4. Generator's Phone ( **804** ) **422-7344**

A. State Manifest Document Number

B. State Generator's ID

5. Transporter 1 Company Name **Laidlaw Environmental Services (TG)** 6. U.S. EPA ID Number **S, C, D, 9, 8, 7, 5, 7, 4, 6, 4, 7**

C. State Transporter's ID  
D. Transporter's Phone **803-452-6060**

7. Transporter 2 Company Name 8. U.S. EPA ID Number

E. State Transporter's ID  
F. Transporter's Phone

9. Designated Facility Name and Site Address **Laidlaw Environmental Services, Inc.  
Route 1, Box 225  
Pinewood, SC 29125** 10. U.S. EPA ID Number **S, C, D, 0, 7, 0, 3, 7, 5, 9, 8, 5**

G. State Facility's ID

H. Facility's Phone **803-452-5003**

11. U.S. DOT Description (including Proper Shipping Name, Hazard Class, and ID Number)

12. Containers No. Type 13. Total Quantity 14. Unit Wt Vol 15. Waste Numbr

a. **Non-regulated solid waste, non-regulated soils**

**0, 0, 1 D, T 4, 0, 0, 0, 0 P** **EST** **7, 7, 7**

b.

c.

d.

J. Additional Descriptions for Materials Listed Above

K. Handling Codes for Wastes Listed Above

a. **P, W - 0, 5, 7, 8, 8 - 6, 1, 0, 1**

b.

15. Special Handling Instructions and Additional Information  
**Work Order No.: 177930  
Please send additional copy of completed manifest to: IT Corp.  
Attn: Tom Mathison, 2790 Mossie Blvd., Monroeville, PA 15146  
Phone 1-800-444-9586**

P.P.S. reporting burden for this collection of information is estimated to average 37 minutes for generators, 15 minutes for transporters, and 15 minutes for treatment, storage, and disposal facilities. This includes reviewing instructions, gathering data and reviewing existing information, reviewing instructions, gathering data and completing and reviewing the form. Send comments regarding this burden estimate or suggestions for reducing this burden to Chief Information Officer, Branch PM 223, U.S. Environmental Protection Agency, 401 M St., Washington, D.C. 20460 and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503.

16. **GENERATOR'S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations, the laws of the State of South Carolina.  
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment, OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name **Stephen A. McCall**

Signature **Stephen A. McCall** Month Day Year **11, 02, 1999**

17. Transporter 1 Acknowledgement of Receipt of Materials  
Printed/Typed Name **Lee Rannell**

Signature **Lee Rannell** Month Day Year **11, 02, 1999**

18. Transporter 2 Acknowledgement of Receipt of Materials  
Printed/Typed Name

Signature Month Day Year

19. Discrepancy Indication Space  
a. **36420** lbs. c. **0**  
b. lbs. d.

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.  
Printed/Typed Name **Jan Todd** Signature **Jan Todd** Month Day Year **1, 03, 1993**

GENERATOR

TRANSPORTER

FACILITY



Laidlaw Environmental Services of SC, Inc.  
Route 1, Box 255  
Pinewood, South Carolina 29125

WORK ORDER NUMBER 177930 16

MANIFEST NUMBER 00004

CUSTOMER NAME \_\_\_\_\_

PLANT LOCATION \_\_\_\_\_

VEHICLE WEIGHT:		
GROSS	08:58 10/27/93	68520 LB G
TARE	10:32 10/27/93	32100 LB G
NET		<u>36420</u>

FLATBED . . . . . DRUMS

TANKER . . . . .est. GALLONS

DUMP TRUCK . est. CU. YARDS

ENCLOSED VAN . . . . . DRUMS

DATE _____
TIME IN: _____
TIME OUT: _____

TRAFFIC MANAGER		OTHER
TREATMENT		
OFF SPEC TREATMENT		
OFF SPEC		
OFF SCHEDULE		

HAULER: Laidlaw 16

DRIVER: \_\_\_\_\_

1. Hard - File Daily in Order - 2. Lab Arrival - 3. Customer - 4. Accounting - 5. Weight  
File by State

DISPATCH WORK TICKET

Dispatch Order: 2015695  
Dispatch Seq : 2.0

LIDLAW ENVIRONMENTAL  
SERVICES (TG), Inc.  
350 RAILROAD STREET  
PO BOX 321  
ROEBUCK, SC 29376  
(803) 587-1999

WO Number : 55438  
WO Sequence : 2.0  
Equipment Type: DUMP

Trailer : 6096T  
-Equipment type:  
-Location : PINWOOD, SC  
-Addition Info : PINWOOD

Driver : DOE  
Tractor: 60062

Event Location : LAIDLAW ENVIRONMENTAL SERVICES (LESPIN)  
-Address 1 : ROUTE 1, BOX 255  
-Address 2 :  
-City, State : PINWOOD, SC 29125  
-Telephone : (513) 782-4507  
-Contact : QUENTON NICHOLS

Event : DELIVERY  
Event Date : 10/27/93  
Event Time :

Dispatch Date : 10/25/93  
Dispatch Time : 18:00

Disposal Work Order: 177930

Customer PO:

Driver Note: FOR DIRECTIONS TO SITE CONTACT LOUY BERNADO 804-888-6931

Time Arrival: 8:58 Time Departure: 10:32 Total Time: 1 1/2

Condition of Drums & Material: \_\_\_\_\_

Manifest: 00004 T.S.D.F: \_\_\_\_\_

Tanker Cleaning Time: \_\_\_\_\_

Reason for Demurrage: \_\_\_\_\_

Beginning Mileage: \_\_\_\_\_ Ending Mileage: \_\_\_\_\_

X Joe Ramon Customer Representative  
X Janis Laidlaw Representative  
X \_\_\_\_\_ TSDF Representative

DISPATCH WORK TICKET

Dispatch Order: 2015695  
Dispatch Seq : 1.0

LAIDLAW ENVIRONMENTAL  
SERVICES (TG), Inc.  
350 RAILROAD STREET  
PO BOX 321  
ROEBUCK, SC 29376  
(803) 587-1999

WO Number : 55438  
WO Sequence : 1.0  
Equipment Type: DUMP

Trailer : 6096T  
-Equipment type:  
-Location : PINWOOD, SC  
-Addition Info : PINWOOD

Driver : DOE  
Tractor: 60062

Event Location : FT. STORY [FTSVIR]  
-Address 1 : US ARMY TRANS  
-Address 2 :  
-City, State : VIRGINIA BCH, VA  
-Telephone : (513) 782-4507  
-Contact : QUENTON NICHOLS

Event : PICKUP  
Event Date : 10/26/93  
Event Time : 11:00

Dispatch Date : 10/25/93  
Dispatch Time : 18:00

Disposal Work Order: 177930

Customer PO:

ver Note: FOR DIRECTIONS TO SITE CONTACT LOUY BERNADO 804-888-6931

Next Event : DEL  
Next Location : PINWOOD, SC

Time Arrival: 11:10 Time Departure: 12:00 PM Total Time: 1 hr

Condition of Drums & Material: \_\_\_\_\_

Manifest: 00004 T.S.D.F: \_\_\_\_\_

Tanker Cleaning Time: \_\_\_\_\_

Reason for Demurrage: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Beginning Mileage: \_\_\_\_\_ Ending Mileage: \_\_\_\_\_

X Road Beamer Customer Representative  
X Joe Ramey Laidlaw Representative  
X \_\_\_\_\_ TSDf Representative



# South Carolina Department of Health and Environmental Control

Bureau of Solid & Hazardous Waste  
2600 Bull Street, Columbia, SC 29201  
Phone (803) 734-5200  
Emergency & Holidays (803)253-64

PLEASE PRINT or TYPE (Form designed for use on elite [12-pitch] typewriter) Form Approved OMB No 2050-0039 Expires 1

## UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's U.S. EPA ID No. **V A 1 2 1 3 7 2 0 8 1 5** Manifest Document No. **00005**

2. Page 1 of 1 Information in the shaded areas required by Federal law, but is by State

3. Generator's Name and Mailing Address **Fort Story, DEH Office, Building 727, Fort Story, VA 23459-5000**  
Attn: Gary Longmire

A. State Manifest Document Number

4. Generator's Phone **(804) 422-7344**

B. State Generator's ID

5. Transporter 1 Company Name **Laidlaw Environmental Services (TG)** 6. U.S. EPA ID Number **S C D 9 8 7 5 7 4 6 4 7**

C. State Transporter's ID  
D. Transporter's Phone **803-452-6060**

7. Transporter 2 Company Name

E. State Transporter's ID

9. Designated Facility Name and Site Address **Laidlaw Environmental Services, Inc. Route 1, Box 225 Pinewood, SC 29125** 10. U.S. EPA ID Number **S C D 0 7 0 3 7 5 9 8 5**

F. Transporter's Phone

G. State Facility's ID  
H. Facility's Phone **803-452-5003**

11. U.S. DOT Description (including Proper Shipping Name, Hazard Class, and ID Number)

12. Containers No. Type 13. Total Quantity 14. Unit Wt Vol 15. Waste Numt

a. **Non-regulated solid waste, non-regulated soils**

**0, 0, 1 D, T** **EST** **40000** **P** **7, 7, 7**

b.

c.

d.

J. Additional Descriptions for Materials Listed Above

K. Handling Codes for Wastes Listed Above

a. **P, W - 0, 5, 7, 8, 8 - 6, 1, 0, 1**

15. Special Handling Instructions and Additional Information

Public reporting burden for this collection of information is estimated to average 37 minutes for generators, 15 minutes for transporters, and 30 minutes for treatment, storage, and disposal facilities. This includes reviewing instructions, gathering data and completing and reviewing the form. Send comments regarding the burden estimate and suggestions for reducing this burden to Chief Information Officer, U.S. Environmental Protection Agency, 401 M Street, Washington, D.C. 20460 and to the Office of Information and Regulatory Affairs, Office of Management and Budget, Washington, D.C. 20503.

**Work Order No.: 177929**  
Please send additional copy of completed manifest to: **IT Corp. Attn: Tom Mathison, 2790 Mossie Blvd, Monroeville, PA 15146**  
Phone **1-800-444-9586**

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classed, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations and the laws of the State of South Carolina.  
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name **Stephen A. McCall**

Signature **Stephen A. McCall** Month Day Year **11/02/99**

17. Transporter 1 Acknowledgement of Receipt of Materials  
Printed/Typed Name **Theodore Brown**

Signature **Theodore Brown** Month Day Year **11/02/99**

18. Transporter 2 Acknowledgement of Receipt of Materials  
Printed/Typed Name

Signature Month Day Year

19. Discrepancy Indication Space  
a. **41040** lbs. c. **41040** lbs. d.

20. Facility Owner or Operator; Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.  
Printed/Typed Name **Jan Todd**

Signature **Jan Todd** Month Day Year **11/02/99**

GENERATOR TRANSPORTER FACILITY



Laidlaw Environmental Services of SC, Inc.  
Route 1, Box 255  
Pinewood, South Carolina 29125

WORK ORDER NUMBER 177929 17

MANIFEST NUMBER 00005

CUSTOMER NAME \_\_\_\_\_

PLANT LOCATION \_\_\_\_\_

VEHICLE WEIGHT:	
GROSS: 00	10/27/93 73120 LB G
TARE 10:31	10/27/93 31480 LB G
NET	41640

( ) FLATBED . . . . . DRUMS

( ) TANKER . . . . .est. GALLONS

( ) DUMP TRUCK . est. CU. YARDS

( ) ENCLOSED VAN . . . . . DRUMS

DATE _____
TIME IN: _____
TIME OUT: _____

TRAFFIC MANAGER		OTHER
TREATMENT		
OFF SPEC TREATMENT		
OFF SPEC		
OFF SCHEDULE		

HAULER: Laidlaw 17

DRIVER: \_\_\_\_\_

1. Hard - File Daily in Order - 2. Lab Arrival - 3. Customer - 4. Accounting - 5. Weight File by State

DISPATCH WORK TICKET

Dispatch Order: 2015701  
Dispatch Seq : 1.0

LIDLAW ENVIRONMENTAL  
SERVICES (TG), Inc.  
350 RAILROAD STREET  
PO BOX 321  
ROEBUCK, SC 29376  
(803) 587-1999

WO Number : 55435  
WO Sequence : 1.0  
Equipment Type: DUMP

Trailer : 60103T  
-Equipment type:  
-Location : PINWOOD, SC  
-Addition Info : PINWOOD

Driver : THEODORE BROWN  
Tractor: 60054

Event Location : FT. STORY [FTSVIR]  
-Address 1 : US ARMY TRANS  
-Address 2 :  
-City, State : VIRGINIA BCH, VA  
-Telephone : (513) 782-4507  
-Contact : QUENTON NICHOLS

Event : PICKUP  
Event Date : 10/26/93  
Event Time : 10:30

Dispatch Date : 10/26/93  
Dispatch Time : 01:00

Disposal Work Order: 177929

Customer PO:

Driver Note: FOR DIRECTIONS TO THE SITE CALL 804-888-6931 LOUY BERNADO

Next Event : DEL  
Next Location : PINWOOD, SC

Time Arrival: 10:30am Time Departure: 12:00pm Total Time: \_\_\_\_\_

Condition of Drums & Material: \_\_\_\_\_

Manifest: 00005 T.S.D.F.: \_\_\_\_\_

Tanker Cleaning Time: \_\_\_\_\_

Reason for Demurrage: \_\_\_\_\_

Beginning Mileage: 145306 Ending Mileage: 145724

Theodore Brown Customer Representative  
X Theodore Brown Laidlaw Representative  
X \_\_\_\_\_ TSDf Representative

DISPATCH WORK TICKET

Dispatch Order: 2015701  
Dispatch Seq : 2.0

WO Number : 55435  
WO Sequence : 2.0  
Equipment Type: DUMP

LIDLAW ENVIRONMENTAL  
SERVICES (TG), Inc.  
350 RAILROAD STREET  
PO BOX 321  
ROEBUCK, SC 29376  
(803) 587-1999

Trailer : 60103T  
-Equipment type:  
-Location : PINWOOD, SC  
-Addition Info : PINWOOD

Driver : THEODORE BROWN  
Tractor: 60054

Event Location : LAIDLAW ENVIRONMENTAL SERVICES [LESPIN]  
-Address 1 : ROUTE 1, BOX 255  
-Address 2 :  
-City, State : PINWOOD, SC 29125  
-Telephone : (513) 782-4507  
-Contact : QUENTON NICHOLS

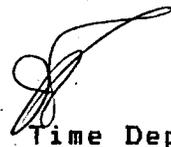
Event : DELIVERY  
Event Date : 10/27/93  
Event Time :

Dispatch Date : 10/26/93  
Dispatch Time : 01:00

Disposal Work Order: 177929

Customer PO:

Over Note: FOR DIRECTIONS TO THE SITE CALL 804-888-6931 LOUY BERNADO

Time Arrival: 9:00  Time Departure: 10:31 Total Time: \_\_\_\_\_

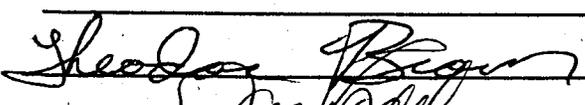
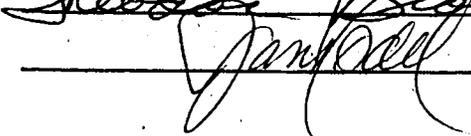
Condition of Drums & Material: \_\_\_\_\_

Manifest: 00005 T.S.D.F: \_\_\_\_\_

Tanker Cleaning Time: \_\_\_\_\_

Reason for Demurrage: \_\_\_\_\_

Beginning Mileage: \_\_\_\_\_ Ending Mileage: \_\_\_\_\_

X  \_\_\_\_\_ Customer Representative  
Laidlaw Representative  
X  \_\_\_\_\_ TSDf Representative

FED. VAD 05 793 4176  
STATE VAD 05 793 41766

# PetroChem

Recovery Services, Inc.  
635 Maltby Avenue  
P.O. Box 1458  
Norfolk, Virginia 23501  
(804) 627-8791

# Nº 15481

24 HOUR EMERGENCY  
RESPONSE  
# 1-804-627-8791

DATE

CUSTOMER'S  
ORDER NO.                     

CUSTOMER'S NAME                     

ADDRESS                     

JOB LOCATION                     

                          4/15/93  
RT CORP  
2790 Moss Side BLVD  
FORT STARY

SOLD BY	CASH	C.O.D.	CHARGE	ON ACCT.	MDSE RET'D.	PAID OUT	SHIP VIA	PREPAID <input type="checkbox"/>	COLLECT <input type="checkbox"/>
---------	------	--------	--------	----------	----------------	----------	----------	----------------------------------	----------------------------------

QUANTITY	DESCRIPTION	PRICE	AMOUNT
1	1,100 GALLONS OF USED WATER & OIL		
2	GALLONS OF USED WATER & FUEL		
3	WATER CONFORMING		
4	WATER NON-CONFORMING		
5			
6			
<b>CHECK ONE:</b>			
<input type="checkbox"/> MSDS			
<input type="checkbox"/> USE EMERGENCY RESPONSE GUIDE			
<input checked="" type="checkbox"/> PRODUCT LISTED ABOVE			
Destination:	<u>Petro Chem</u>		

THE CUSTOMER AGREES THAT IT SHALL NOT PROVIDE TO PETRO CHEM RECOVERY SERVICES, INC. ANYTHING BUT WASTE OIL AND WASTE OIL DERIVATIVES AND SHALL NOT INCLUDE SUCH THINGS AS PCB's AND TCE's OR ANY HAZARDOUS MATERIALS AS DEFINED IN THE CODE OF FEDERAL REGULATIONS.

All claims and returned goods MUST be accompanied by this bill.

PetroChem Raymond West

**ACCEPTANCE OF JOB** - The prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work specified. Payment will be made as outlined.

Date of Acceptance: 4-15-93 Signature: Bill Simpson

Payment to be made as follows: Net 10 days upon completion of PetroChem Recovery Services, Inc. work order. \_\_\_\_\_ Service Charge per month over 30 days together with attorney's fees amounting to 25% of the total amount due if incurred.

PORTLOCK PRINTING 543-5381

FED. VAD 05 793 4176  
STATE VAD 05 793 41766

### PetroChem

Recovery Services, Inc.  
635 Maltby Avenue  
P.O. Box 1458  
Norfolk, Virginia 23501  
(804) 627-8791

Nº 14201

CUSTOMER'S ORDER NO. P.O. # 474953 DATE 4 / 14 / 1993  
CUSTOMER'S NAME I.T. CORP  
ADDRESS 2790 Masside Boulevard  
JOB LOCATION FORT STORX

SOLD BY	CASH	C.O.D.	CHARGE	ON ACCT.	MDSE. RET'D.	PAID OUT	SHIP VIA	PREPAID <input type="checkbox"/>	COLLECT <input type="checkbox"/>	
QUANTITY	DESCRIPTION					PRICE	AMOUNT			
1	5716	GALLONS OF USED OIL & WATER								
2		GALLONS OF USED FUEL & WATER								
3										
4										
5										
6										
7										
8										
9										
10										
11	Destination: <u>Petrochem</u>									

THE CUSTOMER AGREES THAT IT SHALL NOT KNOWINGLY PROVIDE TO PETRO CHEM RECOVERY SERVICES, INC. ANYTHING BUT WASTE OIL AND WASTE OIL DERIVATIVES AND SHALL NOT KNOWINGLY INCULDE SUCH THINGS AS PCB'S AND TCE'S OR ANY HAZARDOUS MATERIALS AS DEFINED IN THE CODE OF FEDERAL REGULATIONS.

All claims and returned goods MUST be accompanied by this bill.

PetroChem AZ Norton

ACCEPTANCE OF JOB — The prices, specifications and conditions are satisfactory and are hereby accepted. You are authorized to do the work specified. Payment will be made as outlined.

Date of Acceptance: 4-14-93 Signature: Bill Simpson  
Payment to be made as follows: Net 10 days upon completion of PetroChem Recovery Services, Inc. work order. \_\_\_\_\_ Service Charge per month over 30 days together with attorney's fees amounting to 25% of the total amount due if incurred.

## **WASTE PROFILES**





September 24, 1993

Mr. Jeff Hubbard  
USACE - ATTN: CEMRO-ED-ER  
Zorinsky Federal Building  
215 North 17th Street  
Omaha, NE 68102-4978

Re: Contract No. DACW45-90-D-9002  
Delivery Order No. 55 - Fort Story  
Decision Logic for Non-hazardous Characterization of Waste Soils

Dear Mr. Hubbard:

Generator's knowledge of operations conducted at the LARC Storage Area and the Fire Fighter Training Area at Fort Story and analytical results from a sample of the subject waste provide that this waste does not exhibit the characteristic of ignitability, corrosivity or reactivity and the waste is not a Listed Waste found in Subpart D of Part 261, 40 CFR.

Analytical results provided in the June 29, 1993 lab report included analysis for RCRA Toxicity Characteristics (TCLP for Waste Codes D004 through D043) and all compounds analyzed were found to be below regulatory levels. Based on the lab report and historical information about the site, the waste soils are not considered TSCA waste. When considering all of the information available for the waste soils, the soils are characterized as Non-Hazardous.



# Customer Notification And Certification

FORM A

Only Statements with Original Signatures will be Accepted

Generator Name/Location: U.S. Army Transportation Center - Fort Story, Shore Ar., Virginia Beach

I.D. Number: VA 1213720815 VA 23696

Waste Profile or ARF Designation: PW-05788-6101

Manifest Number: 00001

EPA Hazardous Waste Number(s): 7777

Waste Analysis Attached? YES \_\_\_\_\_ NO \_\_\_\_\_ On file at facility. X

### Unrestricted Waste Notification (Category 1)

If you generate a hazardous waste that is **not** a land disposal restricted waste (the waste has no applicable treatment standards), mark the statement below.

I notify that I am familiar with the waste through analysis and testing or through knowledge of the waste to support this notification that the waste is not restricted as specified in 40 CFR 268, Subpart D and all applicable prohibitions set forth in 40 CFR 268.32 or RCRA Section 3004(d).

### Restricted Waste Notification (Category 2)

If you generate a hazardous waste that is restricted from land disposal (the waste has applicable treatment standards), mark the statement below. **Note:** All appropriate standards must be accounted for. A waste may pass one or more standards and require treatment or be varianced for others. In this case, all applicable categories must be checked.

I notify that I am familiar with the waste through analysis and testing or through knowledge of the waste to support this notification that the waste is subject to the treatment standards specified in 40 CFR 268, Subpart D. Waste must be treated to the appropriate regulatory treatment standard, by the appropriate regulatory treatment method; qualifies for a variance as described in Category 3 below; or meets the standard as described under Category 4 below.

For hazardous debris, the waste contains the following contaminants subject to treatment (check all that apply): \_\_\_ § 268.45(b) (1)-Toxicity characteristic debris; \_\_\_ § 268.45(b) (2)-Debris contaminated with listed waste; \_\_\_ § 268.45(b) (3)-Cyanide reactive debris. This hazardous debris is subject to the alternative treatment standards of 40 CFR 268.45.

Corresponding Treatment Standard(s) \_\_\_\_\_

### Restricted Waste Variance Notification (Category 3)

If you generate a waste which does not require treatment prior to land disposal because of a variance (including a case-by-case extension under 40 CFR 268.5, a nationwide variance under 40 CFR 268 Subpart C, a no migration petition under 40 CFR 268.6, or other applicable variance), mark the statement below and list the appropriate variance in the space provided.

(3a) Restricted Waste Variance Notification  
I notify pursuant to 40 CFR 268.7(a) (3) that I am familiar with the waste through analysis and testing or through knowledge of the waste to support this notification that this waste is subject to a national capacity variance under 40 CFR 268 Subpart C, or a case-by-case extension under 40 CFR 268.5, or an exemption under 40 CFR 268.6.  
Applicable Variance (List the variance and give the date the waste is subject to prohibitions)

(3b) Hazardous Debris Extension Notification  
For the hazardous debris waste stream accompanying this notification, I notify that I have made the necessary submittals to EPA pursuant to 40 CFR 268.5(g), as described in the May 14, 1993 Federal Register (Vol. 58, No. 92, page 28510) and therefore this hazardous debris shipment qualifies for the one year case-by-case extension.  
Applicable Variance Date: May 8, 1994

### Restricted Waste Certification (Category 4)

If you generate a hazardous waste that is restricted from land disposal (the waste has applicable treatment standards), and the waste meets the standards as generated, mark the statement below. **Note:** All applicable standards must be accounted for. A waste may pass one or more standards and require treatment or be varianced for others. In this case, all applicable categories must be checked.

I certify under penalty of law that I personally examined and am familiar with the waste through analysis and testing or through knowledge of the waste to support this certification that the waste complies with the treatment standards specified in 40 CFR 268, Subpart D and all applicable prohibitions set forth in 40 CFR 268.32 or RCRA Section 3004(d). I believe that the information I submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting a false certification including the possibility of fine and imprisonment.  
Applicable Standards Passed (List the appropriate standard(s) for constituents not requiring treatment)

SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_  
PRINT NAME: \_\_\_\_\_ TITLE: \_\_\_\_\_

**LIDLAW ENVIRONMENTAL SERVICES OF SOUTH CAROLINA, INC**  
**NONBIODEGRADABLE NOTIFICATION/CERTIFICATION FORM**

GENERATOR NAME: U.S. Army Transportation Center - Fort Story

MANIFEST NUMBER: 00001

ARF #: PW-05788-6601

**SORBENT NOTIFICATION: PLEASE CHECK THE APPROPRIATE LINE.**

I have not added sorbents (i.e., material that is used to soak up free liquids by either adsorption or absorption, or both. Sorb means to either adsorb, absorb, or both.) to the waste streams indicated above.

I have added sorbents (i.e., material that is used to soak up free liquids by either adsorption or absorption, or the both. Sorb means to either adsorb, absorb or both.) to the waste streams indicated above. Please complete certification below.

**SORBENT CERTIFICATION:**

I certify that any sorbent agents added to the waste are considered nonbiodegradable as indicated in 40 CFR section 264.314/265.314.

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Print Name: \_\_\_\_\_ Title: \_\_\_\_\_

JUL-14-1993 14:43 FROM CENRO-MH-H TO 385137824510 P.02 JUN-29-1993 17:58

**TRANSMITTAL OF SHOP DRAWINGS, EQUIPMENT DATA, MATERIAL SAMPLES, OR MANUFACTURER'S CERTIFICATES OF COMPLIANCE** DATE: TRANSMITTAL NO. **55-1-1**  
(Read instructions on the reverse side prior to initiating this form)

**SECTION I - REQUEST FOR APPROVAL OF THE FOLLOWING ITEMS** (If an action will be initiated by the contractor)

TO: U.S. ARMY CORPS OF ENGINEERS  
ATTN: CENRO-85-8R (HUBBARD)  
BORINSKY FEDERAL BUILDING  
215 N. 17th STREET  
OMAHA, NE 68102-4978

FROM: WINDY COATES FOR GLENTIN NICHOLS  
IT CORPORATION  
11499 CHESTER RD.  
CINCINNATI, OH 45246

CONTRACT NO. **2-ACW-45-90-D9002**

CHECK ONE:  
 THIS IS A NEW TRANSMITTAL.  
 THIS IS A REBUTTAL OF TRANSMITTAL.

SPECIFICATION SEC. NO. (Cover only one section of it each time.) PROJECT TITLE AND LOCATION  
**PORT STORY - VIRGINIA BEACH VA**

ITEM NO.	DESCRIPTION OF ITEM SUBMITTED (Type, size, model number, etc.)	MFG OR CONTR. CAT., CURVE DRAWING OR PROCEDURE NO. (See instructions on p. 4)	QUANTITIES	CONTRACT REFERENCE DOCUMENT		FOR CONTRACTOR USE CODE	VARIATION (See instruction No. 8)	FOR CE USE CODE
				SPEC. PARA. NO.	DRAWING SHEET NO.			
1	LAYDOWN PROFILE FOR NON-HAZARDOUS SOIL		1					A
2	CHEMICAL WASTE MANAGEMENT PROFILE FOR NON-HAZARDOUS SOIL		1					A
3	ENVIROSAFE PROFILE FOR NON-HAZARDOUS SOIL		1					A
	EB 7/14/93 YMW 7/14/93							



REMARKS: **PLEASE REVIEW AND APPROVE, OR ADVISE AS TO CORRECTIONS REQUIRED.**

I certify that the above submitted items have been reviewed in detail and are correct and in strict conformance with the contract, drawings and specifications except as otherwise stated.

NAME AND SIGNATURE OF CONTRACTOR

**SECTION II - APPROVAL ACTION**

ENCLOSURES RETURNED (List by Item No.)

NAME, TITLE AND SIGNATURE OF APPROVING AUTHORITY: *J. H. Slattery*  
**J. H. SLATTERY, Chief, Industrial Hygiene**

DATE: **7-14-93**



Secure Landfill

August 22, 1993

Mr. Quentin Nichols  
IT CORPORATION  
11499 Chester Road  
Cincinnati, OH 45246

RE: U.S. ARMY TRANSPORTATION CENTER - FORT STORY, VA

Dear Mr. Nichols:

We are pleased to submit, for your consideration, the following Proposal:

<u>LAW CODE #</u>	<u>WASTE DESCRIPTION</u>	<u>DISPOSAL PRICE</u>
05788-6101	Non-Hazardous Soil	\$75.00/ton (bulk)

\*Each load is subject to a \$750.00 minimum disposal charge.

Please be reminded that the aforementioned rates reflect disposal of waste materials which are of a solid consistency. In order to avoid "off-spec" charges or possible rejections, please ensure that your waste complies with the above. If liquids are present in the loads, an "off-spec" charge will be invoiced to your Company.

Proposal contingent upon approval of Authorization Request Form (ARF) by the South Carolina Department of Health and Environmental Control.

This proposal is not a commitment by Laidlaw Environmental Services of South Carolina, Incorporated to accept any particular volume or quantity of waste. Laidlaw reserves the right to refuse acceptance of waste based upon governmentally imposed disposal limits or other business considerations.

Please follow the instructions contained in the enclosed Scheduling Guideline when scheduling a shipment of the above product.

This quote is valid thirty days from the date of receipt of supplemental permits.

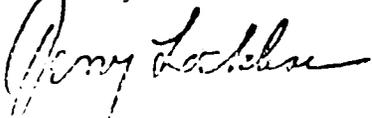
All shipments to our site are subject to Federal and State taxes as outlined in the enclosed Scheduling Guideline.

Page 2  
August 22, 1993

In addition to our disposal and treatment capabilities, we offer a large waste transportation fleet ready to serve your waste hauling needs. For service, quotations, or questions, please call 1-800-537-8478.

We appreciate this opportunity of quoting on your chemical waste disposal needs and look forward to servicing your requirements in the very near future.

Sincerely,



Jerry L. Locklear  
Facility Sales Coordinator

JLL/szk

enclosures

cc: Chuck Cormack  
Ruth Rilee

check (circle) back  
push piece

AUG 21 1993

APPROVED

Amendment  New

AUTHORIZATION REQUEST FORM

- Landfill
- Recycle
- Landfarm
- Other 8 9 93 SW
- Reclaim
- Incinerate
- Energy Reccl

Bill To:  
ST. CHARLES  
1144 CHESTER RD  
COLUMBIA, SC 29204  
ATTN: GREGORY MICHELS  
(803) 782-4507

South Carolina Department of Health and Environmental Control  
Bureau of Solid and Hazardous Waste (803) 734-5200

Authorization Number: PW-05788-6101

To be entered by TSD Facility 898147

Generator Information:

Generator ID # VA1213720815 Name U.S. ARMY TRANSPORTATION CENTER - FORT STAN  
 Address SHORE DRIVE City VIRGINIA BEACH State VA Zip Code 23696  
 Official Contact ITM MATHISON Title PRJ. MGR. (IT) Telephone (800) 444-9586  
Interraco City, Independent County

Treatment, Storage, or Disposal Facility Information:

Facility EPA ID # SCD070375985 Name GSX SERVICES OF S.C. INC.

001 Line # (This line # will always represent this specific waste stream:)

ORIGINAL DOCUMENT  
DO NOT USE WHITEOUT

NON-HAZARDOUS SOIL

Description of Hazardous Waste

7777

EPA/DHEC Waste Codes

DOT Hazard Class

Process Producing Waste:  
REMOVAL OF UNDERGROUND STORAGE TANK  
CONTAINING WASTE OIL

NA  
GENERATOR DECLARES THAT THIS  
WASTE IS NON-HAZARDOUS  
(777)

NA

Enter Quarter for One-Time Disposal: 3 / 9.3 Qtr/yr.

Handling Method: D 8 1

If Multiple Shipments Enter Frequency Here:        times/yr.

Volume: (lbs/yr. only) 120,000

Physical State of Waste @ 70°F

Flash Point (cc)

1.  solid, 2.  liquid, 3.  N/A

1.  N/A 2.  <60°F 3.  60-140°F 4.  >140°F

For DHEC Use Only:

Date Received       

Notes:       

5788-610  
-4-93 (ny)

ATTACHMENTS

22

AUTHORIZATION REQUEST FORM (con't)

Facility Use Only:

--	--

Packaging for Shipment:  In Drums (size)   In Bulk  Other

Method of Transportation:  Railroad tanker  truck  Other  Specific Gravity: NA

Viscosity @ 70°F:  Low  Medium  High NA Layering:  None  Bilayered  Multilayer

Suspended Solids: % by weight or volume, Specify exact % NA Dissolved Solids: by % weight, Specify exact % NA

Thousands of Btu's/lb, Specify: NA Organically Bound Sulfur (wt %): NA Organically Bound Chloride: NA

Organically Bound Nitrogen (Wt %) NA Toxicity:  High  Medium  Low  Unknown Ash %: NA

Affinity for Water:  Hydrophilic  Lipophilic pH (if hydrophilic): 5-6

Visual Description of waste: DRY SOIL

Constituents: List specific constituents by name and corresponding percentage in waste stream.

Volatile Organics	%	Non Volatile Organics	%	Acid or Alkalis	%	Salts & Inorganics	%
						SOIL	90-10
						WATER	0-10

GENERATOR DECLARES THIS WASTE IS NON-HAZARDOUS (777)

Water: 0-10 %

22 ATTACHMENTS  
AND INITIALS NUMBERED.

5788-610  
8-4-93 (

AUTHORIZATION REQUEST FORM (con't)

Metallic: (total-metals not EP Toxicity Test) TCLP (mg/L)

Toxics:

As <u>&lt;0.1</u> ppm	Cr <sup>+3</sup> _____ ppm	Ag <u>&lt;0.01</u> ppm	Fe _____ ppm
Ba <u>&lt;0.5</u> ppm	Cr <sup>+6</sup> _____ ppm	Ni _____ ppm	Sb _____ ppm
Cd <u>0.006</u> ppm	Hg <u>&lt;0.0002</u> ppm	Cu _____ ppm	Mn _____ ppm
Pb <u>0.15</u> ppm	Se <u>&lt;0.05</u> ppm	Ti _____ ppm	Co _____ ppm
Zn _____ ppm	TOTAL Cr <u>&lt;0.05</u> ppm	_____ ppm	_____ ppm

Cyanide (REACTIVE) <u>&lt;0.50</u> ppm
Pesticides <u>NONE</u> ppm
Carcinogens <u>0.073</u> ppm
Other Toxics _____ ppm

SEE ATTACHED ANALYTICAL

Other Information : \_\_\_\_\_

Certification :

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and Imprisonment for knowing violations.

Signature : Stephen A. McCall  
 Print Name : Stephen A. McCall

Date Submitted : 29 Jul 93  
 Title : CHF, ENRD

GENERATOR DECLARED THAT WASTE IS NON-HAZARDOUS (777)

TSDF NOTICE OF ACCEPTANCE:

As required by South Carolina Regulation R.61-79.264.12(b) and R.61-79.265.12(c), based on the information presented in this document, this facility has the appropriate permit(s) for and will accept the waste as described on this form.

22 ATTACHMENTS ARE INITIALED, NUMBERED, CODED, AND DATED.

Signature : Micky Gardner  
 Print Name : MICKY GARDNER

Date Submitted : 8-4-93  
 Title : Approvals Coordinator

5788-1

PLEASE COMPLETE THIS FORM AND RETURN TO GSX, PINWOOD, SC

GENERATOR NAME: U.S. ARMY TRANSPORTATION CENTER - FORT ST. MYERS

WASTE DESCRIPTION: NON-HAZARDOUS SOIL

PROCESS PRODUCING WASTE AT POINT OF GENERATION: REMEDIATION OF UNDERGROUND STORAGE TANK CONTAINING WASTE OIL

EPA/DHEC CODE(S): ( ) ( ) GSX CODE # PV-  
(If one has been assigned)

NO YES

- Does this waste contain more than 49 ppm PCB?
- Does this waste contain dioxin?
- Does this waste contain over 1000 ppm of the Halogenated Organics listed in Appendix III of 268, regulated under 268.32?
- Could this waste be properly classified as ignitable (D001) as defined in 40 CFR 261.23?
- Does this waste contain free liquid, with a flashpoint less than 140°F?
- Could this waste be properly classified as reactive (D003) as defined in 40 CFR 261.23?
- Is this waste an oxidizer as defined by 49 CFR 173.151?
- Does this waste contain cyanide greater than 250 ppm as detected by EPA Method 9010?
- Does this waste contain sulfide greater than 500 ppm as detected by EPA Method 9030?
- Could this waste be properly classified as F020, F021, F022, F023, F026, F027 as defined in 40 CFR 261.31? (See attachment #1)
- Is this waste restricted from land disposal per the Hazardous and Solid Waste Amendments of 1984, effective November 8, 1986, and expanded November 8, 1988? These wastes include F001, F002, F003, F004, F005, as defined in Attachment #2.
- Has anything been added to solidify this waste?
- If yes, has the waste been stabilized in such a way to pass the unconfined compressive strength as determined by the test given in the statutory Interpretive Guidance of June 11, 1986.
- If yes, did the solidification agent used contain greater than one percent total organic carbon?
- Has anything been added to this waste to reduce the level of F001 thru F005 listed solvents or Halogenated Organic compound listed in Appendix III of 268, regulated under 268.32?
- Has this waste been treated to reduce the level of F001 thru F005 listed solvents or Halogenated Organic compounds listed in Appendix III of 268, regulated under 268.32?
- I have studied the "First Third" waste listings given in 268.10 (see attachment 3) and certify that none of these descriptions apply to this waste, except those declared on page one of the ARF.
- Is this waste derived from or mixed with any waste listed in the "First Third" 268.10?
- Is this waste derived from or mixed with any RCRA hazardous waste other than those listed on page one of this ARF?

If so, state the hazardous waste codes from which this waste is derived or mixed with.

CERTIFICATION

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons responsible for gathering information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

GENERATOR SIGNATURE: Stephen A. McCall

22 ATTACHMENTS AND INITIAL NUMBERED.

5788-61



# ANALYTICAL SERVICES

## CERTIFICATE OF ANALYSIS

IT Corporation/Fort Story  
2790 Mosside Boulevard  
Monroeville, PA 15146  
Attn: Tom Mathison

June 29, 1993

Job Number: O304034/035 Revised

The Certificate of Analysis is for the following:

Client Project ID: 519029  
Date Received by Lab: 04/04/93  
Number of Samples: One  
Sample Type: Soil

### 1.0 Introduction

On April 4, 1993, one soil sample was received at ITAS Pittsburgh, labeled SPC-01. Results were faxed to Tom Mathison on April 16, 1993.

### 2.0 Analytical Results/Methodology

Results are presented in the enclosed tables and were determined in accordance with Methods 3010, 3520, 3550, 6010, 7470, 8020, 8080, 8240, 8270, 9045, and 9095, Sections 7.1.2.2, 7.3.4.1, and 7.3.4.2, referenced in Test Methods for Evaluating Solid Waste, EPA SW-846, 3rd ed., 1986; Direct flame determination of ignitability; ITAS-Pittsburgh Methodology; Federal Register, Vol. 57, No. 227, Tuesday, November 24, 1992; Federal Register, Vol. 55, No. 126, Friday, June 29, 1990.

Results are based on sample concentration and expressed in milligrams per kilogram or parts per million and micrograms per liter or parts per billion. ND denotes that the compound is not detected at or above the indicated detection limit. Duplicate results indicate duplicate analysis.

Reviewed and Approved:

Carrie L. Smith, Project Manager

American Council of Independent Laboratories  
International Association of Environmental Testing Laboratories  
American Association for Laboratory Accreditation

GENERATOR DECLARES HAZARDOUS WASTE IS NONHAZARDOUS 17777  
1992 ATTACHED 79  
AND INITIALED, NUMBERED, 100

IT Corporation/Fort Story  
Date: 04/19/93

Client Project ID: 519029

IT ANALYTICAL SERVICES  
PITTSBURGH, PA  
Job Number: Q304034/035

---

2.0 Analytical Results/Methodology (Continued)

Volatile Organic Compounds

Sample SPC-01 was analyzed twice and confirmed matrix interference on the surrogates. Also, the methylene chloride results did not exhibit good reproducibility. Both analyses have been provided.

TCLP Metals

The spike recoveries for mercury and silver on sample SPC-01 were not within the advisory QC limits.

3.0 Quality Control

QA/QC information can be found immediately following the analytical data.

REVISIONS ENCLARED THAT THIS  
PAGE IS NON-REPRODUCIBLE  
(7777)

24 22 ATTACHMENTS  
NOT RECORDED, NUMBERED,  
INDEXED AND DATED.

5788 46101

IT Corporation/Fort Story  
Date: 04/19/93

IT ANALYTICAL SERVICES  
PITTSBURGH, PA  
Job Number: Q304034/035

Client Project ID: 519029

---

General Chemistry Analysis

Client Sample ID: SPC-01  
Sample Date: 04/03/93  
Lab Sample ID: Q30403401  
Analysis Date: 04/12, 13/93

Compound	Concentration mg/Kg
Reactive Cyanide*	ND250
Reactive Sulfide*	ND500

Lab Sample ID: Method Blank  
Analysis Date: 04/12, 13/93

Compound	Concentration mg/Kg
Reactive Cyanide*	ND250
Reactive Sulfide*	ND500

\* Results were determined by methodologies specified in SW-846, 3rd edition, 1986. These methods are prone to failure in both accuracy and reproducibility, therefore, we cannot assume any liability for these results. The reported detection limits are the EPA action levels for this analysis.

35 ATTACHMENTS  
REINITIALED, NUMBERED,  
INDEXED, AND DATED.

5188-610

IT Corporation/Fort Story  
Date: 04/19/93

Client Project ID: 519029

IT ANALYTICAL SERVICES  
PITTSBURGH, PA  
Job Number: Q304034/035

---

General Chemistry Analysis

Client Sample ID: SPC-01  
Sample Date: 04/03/93  
Lab Sample ID: Q30403401  
Analysis Date: 04/05/93

Parameter	Result
pH	5.90/5.91
Ignitability	> 140 °F Does not ignite, burn / > 140 °F Does not ignite, burn
Paint Filter Liquids Test	Passed, no free liquids / Passed, no free liquids

4922  
ALL SAMPLES RECEIVED  
AND ANALYZED,  
CODED, AND LABELED.

FN 88-6

IT Corporation/Fort Story  
Date: 04/19/93

IT ANALYTICAL SERVICES  
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q304034/035

TCLP Metals Analysis

Client Sample ID: SPC-01  
Sample Date: 04/03/93  
Lab Sample ID: Q30403501  
TCLP Extraction Date: 04/08/93  
Analysis Date: 04/14/93  
Mercury: 04/12/93

Parameter	Concentration mg/L	Matrix Spike Percent Recovery
Arsenic	ND0.1	100%
Barium	ND0.5	102%
Cadmium	0.006	94%
Chromium	ND0.05	91%
Lead	0.15	95%
Mercury	ND0.0002	64%*
Selenium	ND0.05	99%
Silver	ND0.01	44%*

\* Outside QC limits.

5122 ATTACHMENTS  
AND INITIALED, NUMBERED,  
CODED, AND DATED.

LABORATORY DECLARES THAT THIS  
WASTE IS NON-HAZARDOUS  
(7777)

5188-6

IT Corporation/Fort Story  
Date: 04/19/93

IT ANALYTICAL SERVICES  
PITTSBURGH, PA  
Job Number: Q304034/035

Client Project ID: 519029

TCLP Metals Analysis

Lab Sample ID: TCLP Preparation Blank  
TCLP Extraction Date: 04/08/93  
Analysis Date: 04/14/93  
Mercury: 04/12/93

Parameter	Concentration mg/L
Arsenic	ND0.1
Barium	ND0.5
Cadmium	ND0.005
Chromium	ND0.05
Lead	ND0.05
Mercury	ND0.0002
Selenium	ND0.05
Silver	ND0.01

Vertical stamp: RECEIVED  
APR 21 1993  
LABORATORY

Vertical stamp: RECEIVED  
APR 21 1993  
LABORATORY

5788-401  
9-4-93

IT Corporation/Fort Story  
Date: 04/19/93

Client Project ID: 519029

IT ANALYTICAL SERVICES  
PITTSBURGH, PA  
Job Number: Q304034/035

---

TCLP Metals Analysis

Lab Sample ID: Method Blank  
Analysis Date: 04/14/93  
Mercury: 04/12/93

Parameter	Concentration mg/L
Arsenic	ND0.1
Barium	ND0.5
Cadmium	ND0.005
Chromium	ND0.05
Lead	ND0.05
Mercury	ND0.0002
Selenium	ND0.05
Silver	ND0.01

ALL INFORMATION CONTAINED  
HEREIN IS UNCLASSIFIED

7822

5988-61  
101

IT Corporation/Fort Story  
Date: 06/29/93

IT ANALYTICAL SERVICES  
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q304034/035 Revised

Volatile Organic Compounds

Client Sample ID: SPC-01  
Sample Date: 04/03/93  
Lab Sample ID: Q30403401  
Analysis Date: 04/08/93

Compound	Concentration µB/Kg
Methylene chloride	73
Acetone	ND100
Carbon disulfide	ND5
2-Butanone	ND100
1,1,1-Trichloroethane	ND5
Carbon tetrachloride	ND5
Trichloroethene	ND5
1,1,2-Trichloroethane	ND5
Benzene	ND5
4-Methyl-2-pentanone	ND51
Tetrachloroethene	ND5
Toluene	ND5
Chlorobenzene	ND5
Ethylbenzene	ND5
Xylenes (total)	ND5
1,1,2Trichloro-1,2,2 Trifluoromethane	ND5
Ethyl acetate	ND5
Trichlorofluoromethane	ND5
Diethyl ether	ND5

Surrogate Spike  
Percent Recovery

Toluene-d <sub>8</sub>	118%*
Bromofluorobenzene	67%*
1,2-Dichloroethane-d <sub>4</sub>	98%

\* Outside QC limits.

GENERATOR DECLARES THAT THIS WASTE IS NON-HAZARDOUS (7777) 8/22

5188-61  
1102

IT Corporation/Fort Story  
Date: 06/29/93

IT ANALYTICAL SERVICES  
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q304034/035 Revised

Volatile Organic Compounds

Client Sample ID: SPC-01 Reanalysis  
Sample Date: 04/03/93  
Lab Sample ID: Q30403401  
Analysis Date: 04/08/93

Compound	Concentration µg/Kg
Methylene chloride	46
Acetone	ND100
Carbon disulfide	ND5
2-Butanone	ND100
1,1,1-Trichloroethane	ND5
Carbon tetrachloride	ND5
Trichloroethene	ND5
1,1,2-Trichloroethane	ND5
Benzene	ND5
4-Methyl-2-pentanone	ND51
Tetrachloroethene	ND5
Toluene	ND5
Chlorobenzene	ND5
Ethylbenzene	ND5
Xylenes (total)	ND5
1,1,2Trichloro-1,2,2 Trifluoromethane	ND5
Ethyl acetate	ND5
Trichlorofluoromethane	ND5
Diethyl ether	ND5

Surrogate Spike  
Percent Recovery

Toluene-d <sub>8</sub>	125%*
Bromofluorobenzene	70%*
1,2-Dichloroethane-d <sub>4</sub>	104%

Outside QC limits.

9425 ATTACHMENTS  
ARE INITIALED, NUMBERED,  
CODED, AND DATED.

5788-611  
1103

IT Corporation/Fort Story  
Date: 06/29/93

IT ANALYTICAL SERVICES  
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q304034/035 Revised

Volatile Organic Compounds

Lab Sample ID: Method Blank  
Analysis Date: 04/08/93

Compound	Concentration µg/Kg
Methylene chloride	ND5
Acetone	ND100
Carbon disulfide	ND5
2-Butanone	ND100
1,1,1-Trichloroethane	ND5
Carbon tetrachloride	ND5
Trichloroethene	ND5
1,1,2-Trichloroethane	ND5
Benzene	ND5
4-Methyl-2-pentanone	ND50
Tetrachloroethene	ND5
Toluene	ND5
Chlorobenzene	ND5
Ethylbenzene	ND5
Xylenes (total)	ND5
1,1,2Trichloro-1,2,2 Trifluoromethane	ND5
Ethyl acetate	ND5
Trichlorofluoromethane	ND5
Diethyl ether	ND5

Surrogate Spike  
Percent Recovery

Toluene-d <sub>8</sub>	97%
Bromofluorobenzene	85%
1,2-Dichloroethane-d <sub>4</sub>	97%

PLEASE PRINT THIS  
 REPORT  
 AND ATTACHED DOCUMENTS  
 TOGETHER WITH ORIGINAL

10/29 ATTACHMENTS

188-461

IT Corporation/Fort Story  
Date: 04/19/93

IT ANALYTICAL SERVICES  
PITTSBURGH, PA

Client Project ID: 519029

Job Number: Q304034/035

TCLP Volatile Compounds

Client Sample ID: SPC-01  
Sample Date: 04/03/93  
Lab Sample ID: Q30403501  
TCLP Extraction Date: 04/08/93  
Analysis Date: 04/13/93

GENERATOR DECLARES THAT THIS WASTE IS NON-HAZARDOUS (D177)

Parameter	Concentration mg/L	Matrix Spike Percent Recovery
Vinyl chloride	ND0.010	66%
1,1-Dichloroethene	ND0.005	94%
Chloroform	ND0.005	105%
1,2-Dichloroethane	ND0.005	105%
2-Butanone	ND0.010	161%
Carbon Tetrachloride	ND0.005	100%
Trichloroethene	ND0.005	102%
Benzene	ND0.005	100%
Tetrachloroethene	ND0.005	101%
Chlorobenzene	ND0.005	100%

Method Blank 2      Method Blank 2  
Surrogate Spike  
Percent Recovery

Toluene-d <sub>8</sub>	102%	97%
Bromofluorobenzene	93%	88%
1,2-Dichloroethane-d <sub>4</sub>	100%	98%

11922  
ANALYST'S SIGNATURE

188-610

IT Corporation/Fort Story  
Date: 04/19/93

Client Project ID: 519029

IT ANALYTICAL SERVICES  
PITTSBURGH, PA  
Job Number: Q304034/035

TCLP Volatile Compounds

Lab Sample ID: TCLP Preparation Blank  
TCLP Extraction Date: 04/08/93  
Analysis Date: 04/13/93

Parameter	Concentration mg/L
Vinyl chloride	ND0.010
1,1-Dichloroethene	ND0.005
Chloroform	ND0.005
1,2-Dichloroethane	ND0.005
2-Butanone	ND0.010
Carbon Tetrachloride	ND0.005
Trichloroethene	ND0.005
Benzene	ND0.005
Tetrachloroethene	ND0.005
Chlorobenzene	ND0.005

Method Blank 1	Surrogate Spike Percent Recovery
Toluene-d <sub>8</sub>	95%
Bromofluorobenzene	102%
1,2-Dichloroethane-d <sub>4</sub>	93%

COPIES OF THIS REPORT  
AVAILABLE FOR  
REVIEW  
DATE 04/19/93

12122 ATTACHMENTS  
AND INITIALED, NUMBERED,  
CODED, AND DATED.

519029  
04/19/93

IT Corporation/Fort Story  
Date: 04/19/93

Client Project ID: 519029

IT ANALYTICAL SERVICE  
PITTSBURGH, PA  
Job Number: Q304034/03

TCLP Volatile Compounds

Lab Sample ID: Method Blank 1  
Analysis Date: 04/12/93

Parameter	Concentration mg/L
Vinyl chloride	ND0.010
1,1-Dichloroethene	ND0.005
Chloroform	ND0.005
1,2-Dichloroethane	ND0.005
2-Butanone	ND0.010
Carbon Tetrachloride	ND0.005
Trichloroethene	ND0.005
Benzene	ND0.005
Tetrachloroethene	ND0.005
Chlorobenzene	ND0.005

Surrogate Spike  
Percent Recovery

Toluene-d <sub>8</sub>	101%
Bromofluorobenzene	111%
1,2-Dichloroethane-d <sub>4</sub>	100%

GENERATION DELETED  
THIS IS HIGHLY  
DANGEROUS

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788-1010  
4-19-93

IT Corporation/Fort Story  
Date: 04/19/93

Client Project ID: 519029

IT ANALYTICAL SERVICES  
PITTSBURGH, PA  
Job Number: Q304034/03

TCLP Volatile Compounds

Lab Sample ID: Method Blank 2  
Analysis Date: 04/13/93

Parameter	Concentration mg/L
Vinyl chloride	ND0.010
1,1-Dichloroethene	ND0.005
Chloroform	ND0.005
1,2-Dichloroethane	ND0.005
2-Butanone	ND0.010
Carbon Tetrachloride	ND0.005
Trichloroethene	ND0.005
Benzene	ND0.005
Tetrachloroethene	ND0.005
Chlorobenzene	ND0.005

Surrogate Spike  
Percent Recovery

Toluene-d <sub>8</sub>	101%
Bromofluorobenzene	87%
1,2-Dichloroethane-d <sub>4</sub>	92%

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04-93

IT Corporation/Fort Story  
Date: 04/19/93

Client Project ID: 519029

IT ANALYTICAL SERVICES  
PITTSBURGH, PA  
Job Number: Q304034/035

TCLP Semivolatile Compounds

Client Sample ID: SPC-01  
Sample Date: 04/03/93  
Lab Sample ID: Q30403501  
TCLP Extraction Date: 04/08/93  
Extraction Date: 04/12/93  
Analysis Date: 04/15/93

Parameter	Concentration mg/L	Matrix Spike Percent Recovery
1,4-Dichlorobenzene	ND0.050	48%
Hexachloroethane	ND0.050	46%
Nitrobenzene	ND0.050	54%
Hexachlorobutadiene	ND0.050	57%
2,4,6-Trichlorophenol	ND0.050	63%
2,4,5-Trichlorophenol	ND0.250	64%
2,4-Dinitrotoluene	ND0.050	69%
Hexachlorobenzene	ND0.050	74%
Pentachlorophenol	ND0.250	89%
Total Methylphenol	ND0.050	58%
Pyridine	ND0.250	44%

Surrogate Spike  
Percent Recovery

Nitrobenzene-d <sub>5</sub>	77%	52%
2-Fluorobiphenyl	82%	57%
Terphenyl	81%	65%
Phenol-d <sub>5</sub>	74%	48%
2-Fluorophenol	68%	41%
2,4,6-Tribromophenol	75%	68%

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IT Corporation/Fort Story  
Date: 04/19/93

Client Project ID: 519029

IT ANALYTICAL SERVICES  
PITTSBURGH, PA  
Job Number: Q304034/035

TCLP Semivolatile Compounds

Lab Sample ID: TCLP Preparation Blank  
TCLP Extraction Date: 04/08/93  
Extraction Date: 04/12/93  
Analysis Date: 04/15/93

Parameter	Concentration mg/L
1,4-Dichlorobenzene	ND0.050
Hexachloroethane	ND0.050
Nitrobenzene	ND0.050
Hexachlorobutadiene	ND0.050
2,4,6-Trichlorophenol	ND0.050
2,4,5-Trichlorophenol	ND0.250
2,4-Dinitrotoluene	ND0.050
Hexachlorobenzene	ND0.050
Pentachlorophenol	ND0.250
Total Methylphenol	ND0.050
Pyridine	ND0.250

Surrogate Spike  
Percent Recovery

Nitrobenzene-d <sub>5</sub>	74%
2-Fluorobiphenyl	81%
Terphenyl	78%
Phenol-d <sub>5</sub>	71%
2-Fluorophenol	69%
2,4,6-Tribromophenol	76%

GENERATOR DECLARES THAT THIS  
WASTE IS NON-HAZARDOUS  
(7777)

16 of 22 ATTACHMENTS  
ARE INITIALED, NUMBERED,  
CODED, AND DATED.

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04-93

IT Corporation/Fort Story

Date: 04/19/93

Client Project ID: 519029

IT ANALYTICAL SERVICE  
PITTSBURGH, PA

Job Number: Q304034/01

TCLP Semivolatile Compounds

Lab Sample ID: Method Blank

Extraction Date: 04/12/93

Analysis Date: 04/15/93

Parameter	Concentration mg/L
1,4-Dichlorobenzene	ND0.010
Hexachloroethane	ND0.010
Nitrobenzene	ND0.010
Hexachlorobutadiene	ND0.010
2,4,6-Trichlorophenol	ND0.010
2,4,5-Trichlorophenol	ND0.050
2,4-Dinitrotoluene	ND0.010
Hexachlorobenzene	ND0.010
Pentachlorophenol	ND0.050
Total Methylphenol	ND0.010
Pyridine	ND0.050

Surrogate Spike  
Percent Recovery

Nitrobenzene-d <sub>5</sub>	73%
2-Fluorobiphenyl	70%
Terphenyl	78%
Phenol-d <sub>5</sub>	64%
2-Fluorophenol	61%
2,4,6-Tribromophenol	56%

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LABORATORY

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IT Corporation/Fort Story  
Date: 04/19/93

Client Project ID: 519029

IT ANALYTICAL SERVICE  
PITTSBURGH, PA  
Job Number: Q304034/03.

Selected Volatile Organic Compounds

Client Sample ID: See below  
Sample Date: 04/03/93  
Analysis Date: 04/14/93

Client Sample ID	Lab Sample ID	Benzene	Toluene	Ethylbenzene	Total Xylenes	
					Concentration $\mu\text{g}/\text{Kg}$	
SPC-01	Q30403401	ND2	18	ND2	ND2	
--	Method Blank	ND2	ND2	ND2	ND2	

Surrogate Spike Percent Recovery:

Client Sample ID	Lab Sample ID	Alpha, Alpha, Alpha-Trifluorotoluene
SPC-01	Q30403401	92%
-	Method Blank	88%

GENERATOR DECLARES THAT THIS  
WASTE IS NON-HAZARDOUS  
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8-4-93

IT Corporation/Fort Story  
Date: 04/19/93

Client Project ID: 519029

IT ANALYTICAL SERVICE  
PITTSBURGH, PA  
Job Number: Q304034/01

Polychlorinated Biphenyls Analysis

Client Sample ID: SPC-01  
Sample Date: 04/03/93  
Lab Sample ID: Q30403401  
Extraction Date: 04/07/93  
Analysis Date: 04/15/93

Parameter	Concentration µg/Kg
Aroclor 1016	ND44
Aroclor 1221	ND44
Aroclor 1232	ND44
Aroclor 1242	ND44
Aroclor 1248	ND44
Aroclor 1254	ND44
Aroclor 1260	ND44
	Surrogate Spike Percent Recovery
Dibutylchloroendate	75%
Tetrachlorometaxylene	62%

19 5 22 ATTACHMENTS  
AND INITIALED, NUMBERED,  
CODED, AND DATED.

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IT Corporation/Fort Story  
Date: 04/19/93

Client Project ID: 519029

IT ANALYTICAL SERVICES  
PITTSBURGH, PA  
Job Number: Q304034/01

Polychlorinated Biphenyls Analysis

Lab Sample ID: Method Blank  
Extraction Date: 04/07/93  
Analysis Date: 04/15/93

Parameter	Concentration µg/Kg
Aroclor 1016	ND43
Aroclor 1221	ND43
Aroclor 1232	ND43
Aroclor 1242	ND43
Aroclor 1248	ND43
Aroclor 1254	ND43
Aroclor 1260	ND43

Surrogate Spike  
Percent Recovery

Dibutylchloroendate	79%
Tetrachlorometaxylene	78%

GENERATOR DECLARES THAT THIS  
WASTE IS NON-HAZARDOUS  
(7777)

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LABORATORY  
CORPORATION

5188-6101  
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# TC Rule Certification / Recertification Form

Generator Name: U.S. ARMY TRANSPORTATION CENTER-FORT STOKY EPA ID#: VA1213720815  
 Location: VIRGINIA BEACH, VA  
 Profile #: \_\_\_\_\_

**CHARACTERISTICS OF HAZARDOUS WASTE:** Indicate if this waste contains any of the following characteristics based on criteria mandated by 40 CFR 261.21, 261.22, 261.23, and 261.24.

	*Regulatory Threshold Level	(Check One)		(Check One)		Actual Value	
		Yes	No	Scientific Data	Generator's Knowledge		
D001	Characteristic of Ignitability < 140 °F		✓	✓		> 140 °F	
D002	Characteristic of Corrosivity ≤ 2 or ≥ 12.5		✓	✓		5.90/5.91 pH	
D003	Characteristic of Reactivity		✓	✓		< 250 mg/l in CN < 200 mg/kg acid fuel	
Constituent	*Regulatory Threshold Level, ppm	(Check One)		(Check One)		Actual Value (ppm)	SEE ATTACHED ANALYTICAL
		Yes	No	Scientific Data	Generator's Knowledge		
D004	(Arsenic)		✓	✓		< 0.1	SEE ATTACHED ANALYTICAL
D005	(Barium)		✓	✓		< 0.5	
D006	(Cadmium)		✓	✓		0.006	
D007	(Chromium)		✓	✓		< 0.05	
D008	(Lead)		✓	✓		0.15	
D009	(Mercury)		✓	✓		< 0.0002	
D010	(Selenium)		✓	✓		< 0.05	
D011	(Silver)		✓	✓		< 0.01	
D012	Endrin		✓		✓		
D013	Lindane		✓		✓		
D014	Methoxychlor		✓		✓		
D015	Toxaphene		✓		✓		
D016	2,4-D (2,4-Dichlorophenoxyacetic acid)		✓		✓		
D017	2,4,5-TP Silvex		✓		✓		
D018	Benzene		✓	✓		< 0.005	
D019	Carbon Tetrachloride		✓	✓		< 0.005	
D020	Chlordane		✓		✓		
D021	Chlorobenzene		✓	✓		< 0.005	
D022	Chloroform		✓	✓		< 0.005	
D023	o-Cresol		✓	✓		< 0.050	
D024	m-Cresol		✓	✓		< 0.050	
D025	p-Cresol		✓	✓		< 0.050	

215 22 ATTACHMENTS ARE INITIALED, NUMBERED, CODED, AND DATED.

- Continued -

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Constituent	Regulatory Threshold Level, ppm	(Check One)		(Check One)		Actual Value (ppm)
		Yes	No	Scientific Data	Generator's Knowledge	
D026 Creosol	200.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.050
D027 1,4-Dichlorobenzene	7.5		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.050
D028 1,2-Dichloroethane	0.5		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.005
D029 1,1-Dichloroethylene	0.7		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.005
D030 2,4-Dinitrotoluene	0.13		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.050
D031 Heptachlor (and its hydroxide)	0.003		<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
D032 Hexachlorobenzene	0.13		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.050
D033 Hexachlorobutadiene	0.5		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.050
D034 Hexachlorocyclopentadiene	3.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.050
D035 Methyl ethyl ketone	200.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.010
D036 Nitrobenzene	2.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.050
D037 Pentachlorophenol	100.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.250
D038 Pyridine	5.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.250
D039 Tetrachloroethylene	0.7		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.005
D040 Trichloroethylene	0.5		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.005
D041 2,4,5-Trichlorophenol	400.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.250
D042 2,4,6-Trichlorophenol	2.0		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.050
D043 Vinyl Chloride	0.2		<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		20.010

As defined by the TCLP (Method 1311), EP Toxicity is no longer acceptable.

THIS WASTE IS NOT HAZARDOUS UNLESS IT CONTAINS ANY OF THE FOLLOWING LISTED HAZARDOUS WASTES:

Indicate if this waste also contains any listed hazardous wastes coded in 40 CFR 261.31, 261.32 and 261.33 by including the appropriate EPA hazardous waste code(s).

**GENERATOR CERTIFICATION:**

I hereby certify that all information submitted on this form and all attached documents are true and accurate. In the event that this form is not fully completed, I authorize Laidlaw Environmental Services to conduct necessary testing at my expense to properly complete the form.

Signature: Stephen A. McCall

Date: 27 Jul 93

Print Name: Stephen A. McCall

Title: Chief, ENRD

**THIS CERTIFICATION/RECERTIFICATION IS REQUIRED FOR EACH PROFILE. ORIGINAL SIGNATURE REQUIRED**

Revised 8-17-90

68-88-101  
 30-88-101  
 2-88-101  
 88-101

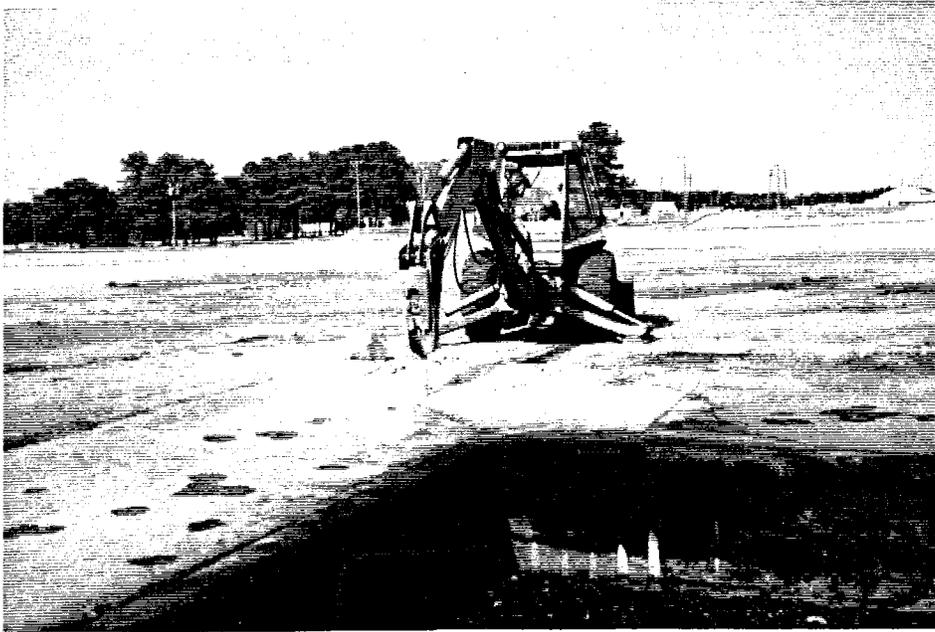
**APPENDIX E**  
**PHOTO DOCUMENTATION**



**Photograph No. 1**  
**Excavator Loading Concrete into Container**



**Photograph No. 2**  
**Extraneous Items in Excavation**



**Photograph No. 3**  
**Hydraulic Hammer Breaking Concrete**



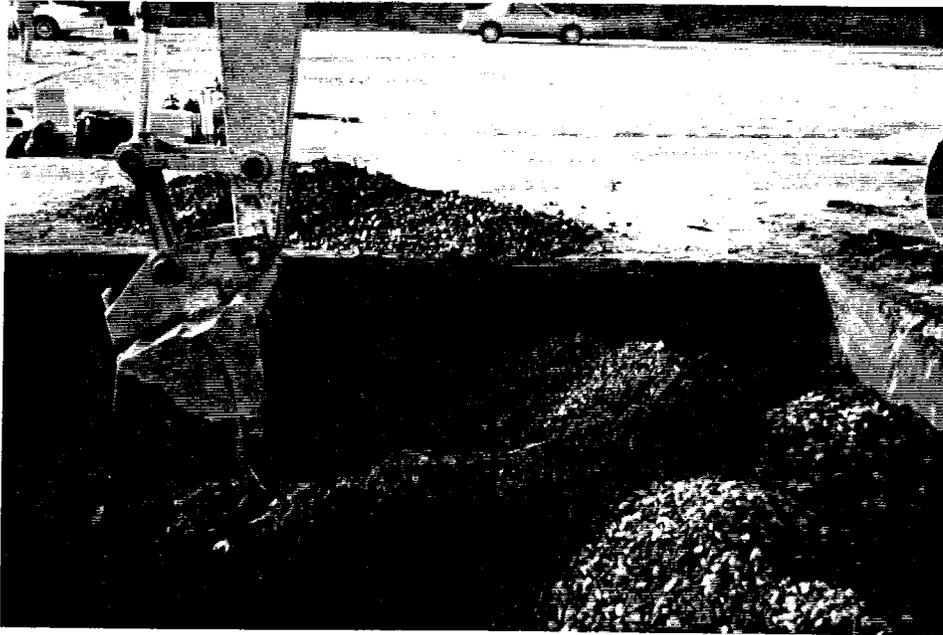
**Photograph No. 4**  
**Excavator Retrieving Concrete Rubble**



**Photograph No. 5**  
**Washing Product from Material in Pit**



**Photograph No. 6**  
**Retrieving Product from Pit**



**Photograph No. 7**  
**Gravel, Stone and Debris in Pit**



**Photograph No. 8**  
**Gravel and Debris on Side of Pit**



**Photograph No. 9**  
**Setting Vacuum Hose in Fire Pit**



**Photograph No. 10**  
**Vacuum Truck Pumping from Fire Pit**



**Photograph No. 11**  
**Pressure Washing Gravel from Fire Pit**



**Photograph No. 12**  
**Loading Soil from Fire Pit Site**



**Photograph No. 13**  
**Unloading Soil at LARC Area**



**Photograph No. 14**  
**Digging Soil at Fire Pit Site**



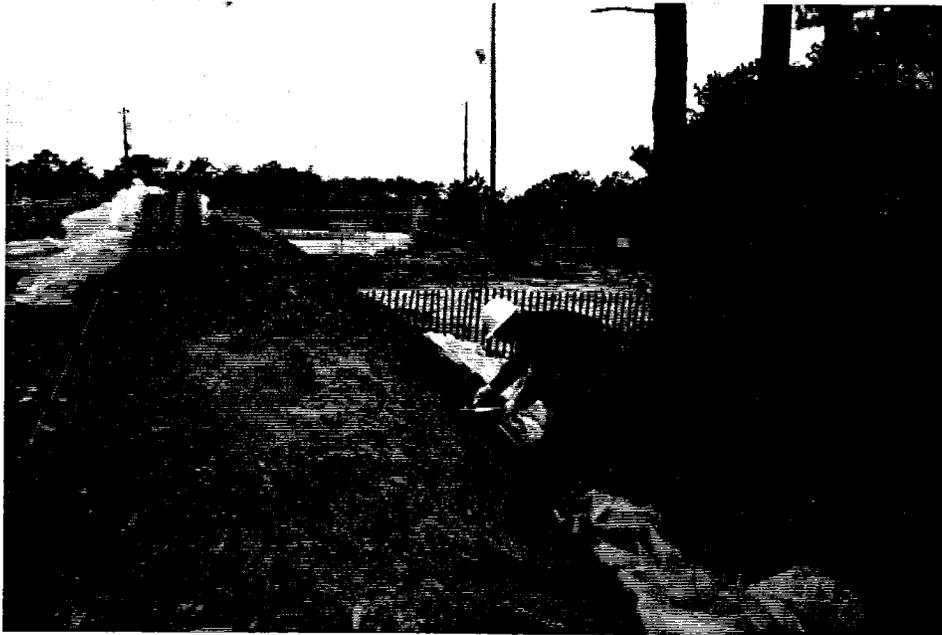
**Photograph No. 15**  
**Pushing Fill Gravel into Fire Pit**



**Photograph No. 16**  
**Rolling Poly in Holding Cell**



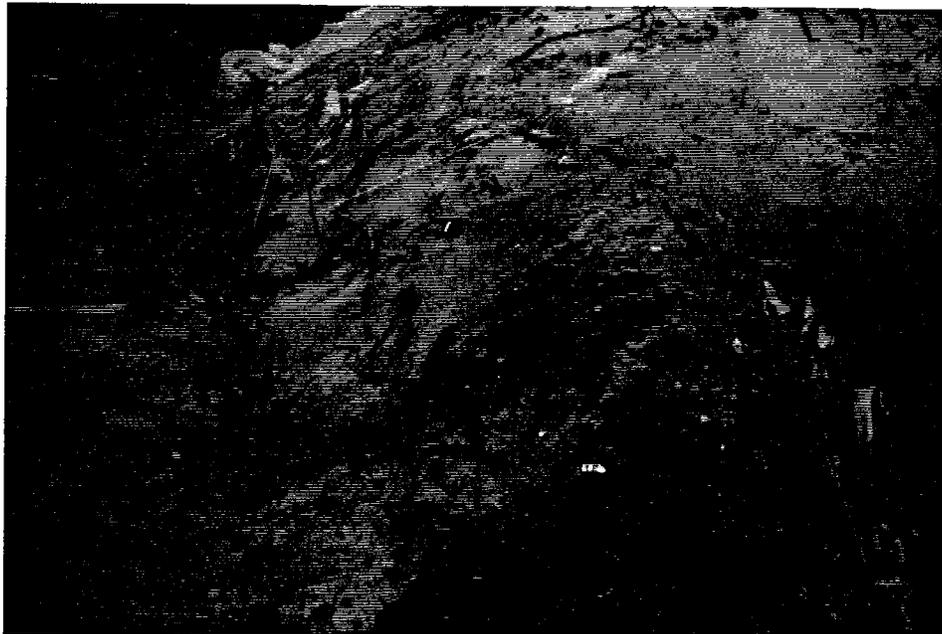
**Photograph No. 17**  
**Soil from Fire Pit to Holding Cell**



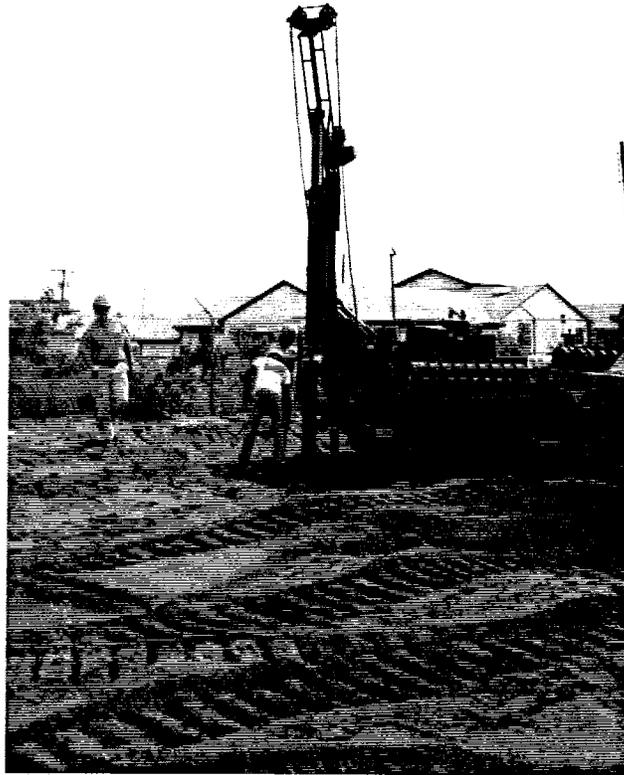
**Photograph No. 18**  
**Collecting Soil Sample in LARC Area**



**Photograph No. 19**  
**UST Soil Sampling**



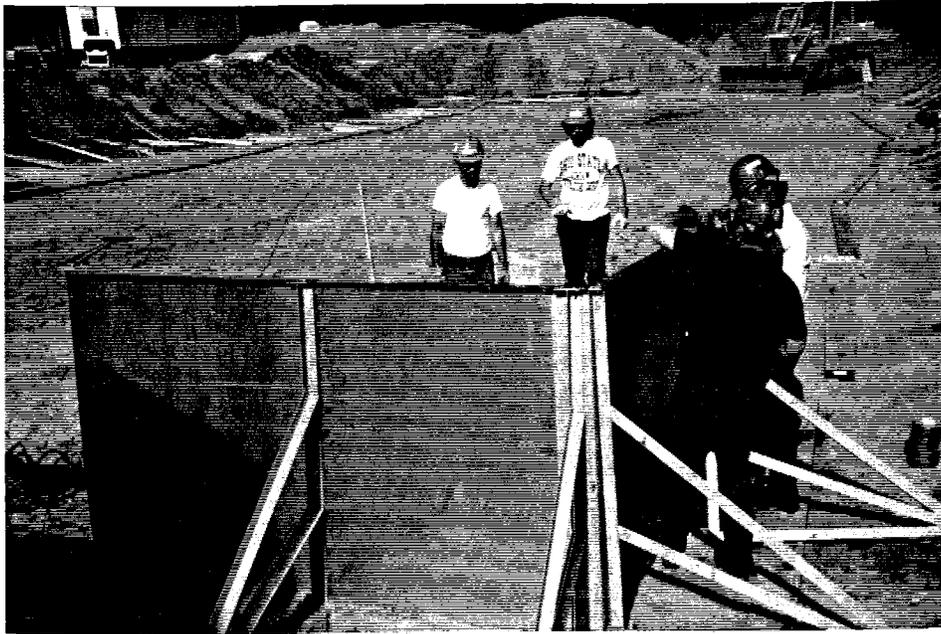
**Photograph No. 20**  
**UST Soil**



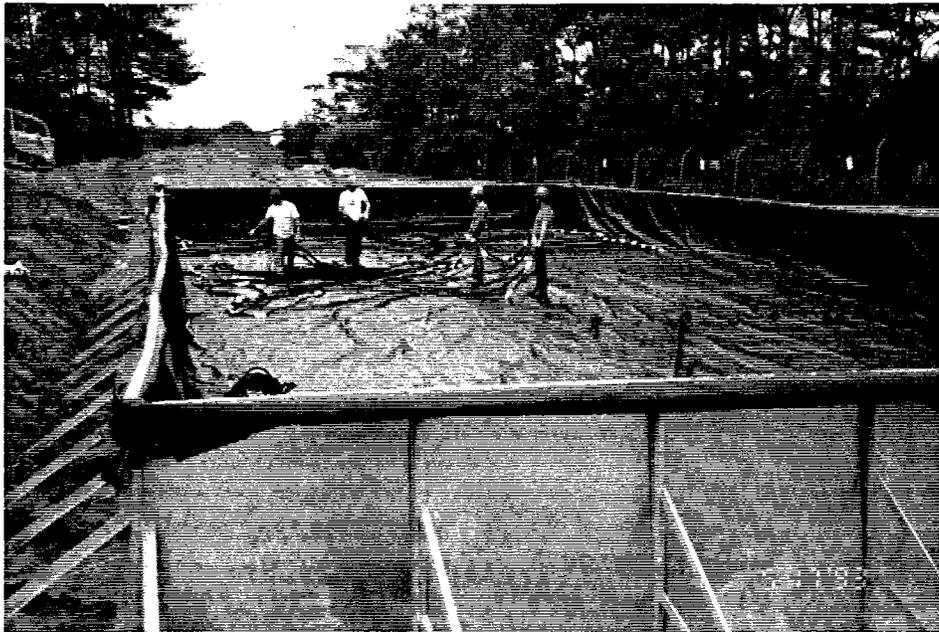
**Photograph No. 21**  
**Drilling Rig for Well Installation**



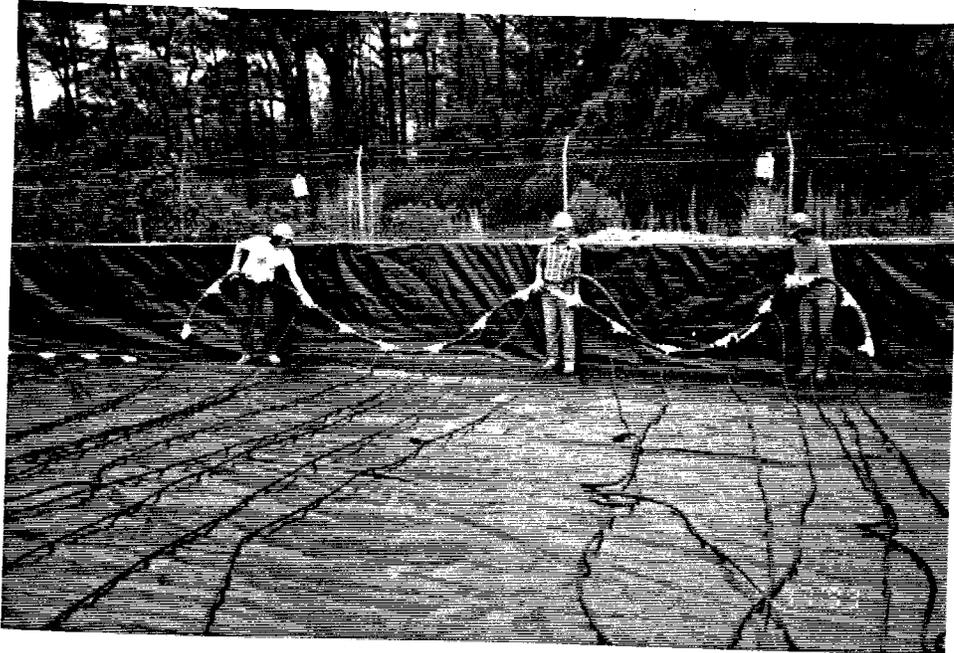
**Photograph No. 22**  
**Laying Out Area for Pool**



**Photograph No. 23**  
**Assembling of Pool**



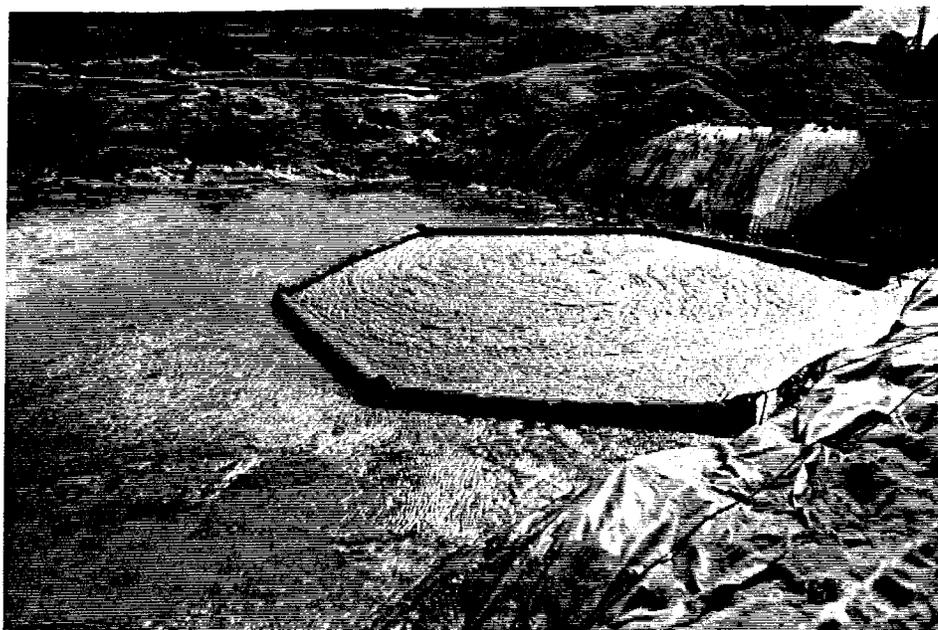
**Photograph No. 24**  
**Liner in the Pool Area**



**Photograph No. 25**  
**Liner and Air Lines Installed in the Pool**



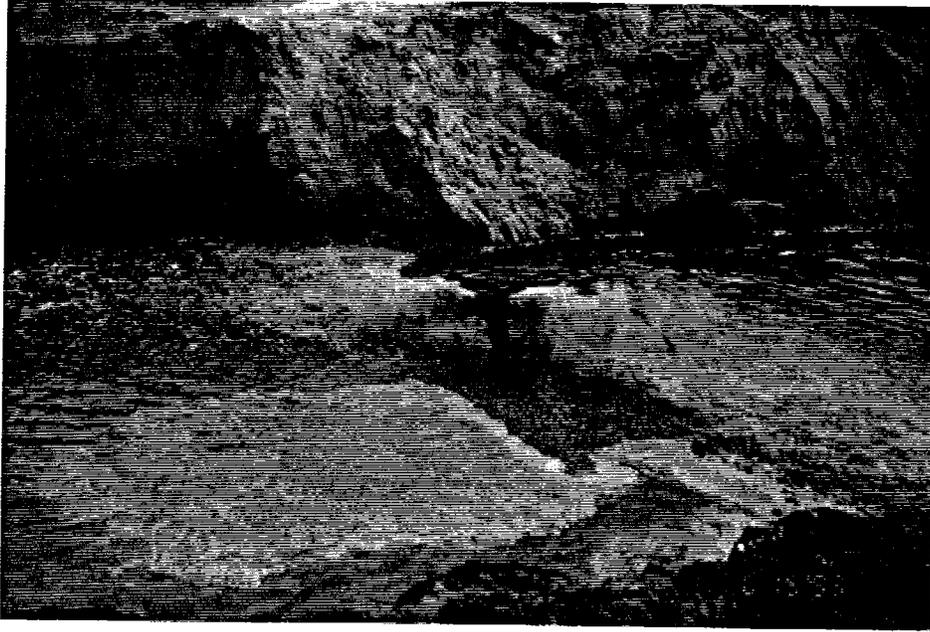
**Photograph No. 26**  
**Pool Assembly**



**Photograph No. 27**  
**Oily Water in Collection Pit**



**Photograph No. 28**  
**Oily Water**



**Photograph No. 29**  
**Satellite Pool Showing Hydraulic Pump to Agitate and Aerate Contaminated Soil and Water**



**Photograph No. 30**  
**Satellite Pool Showing Hydraulic Pump to Agitate and Aerate Contaminated Soil and Water**



**Photograph No. 31**  
**Stockpiling the Sand that was Processed**



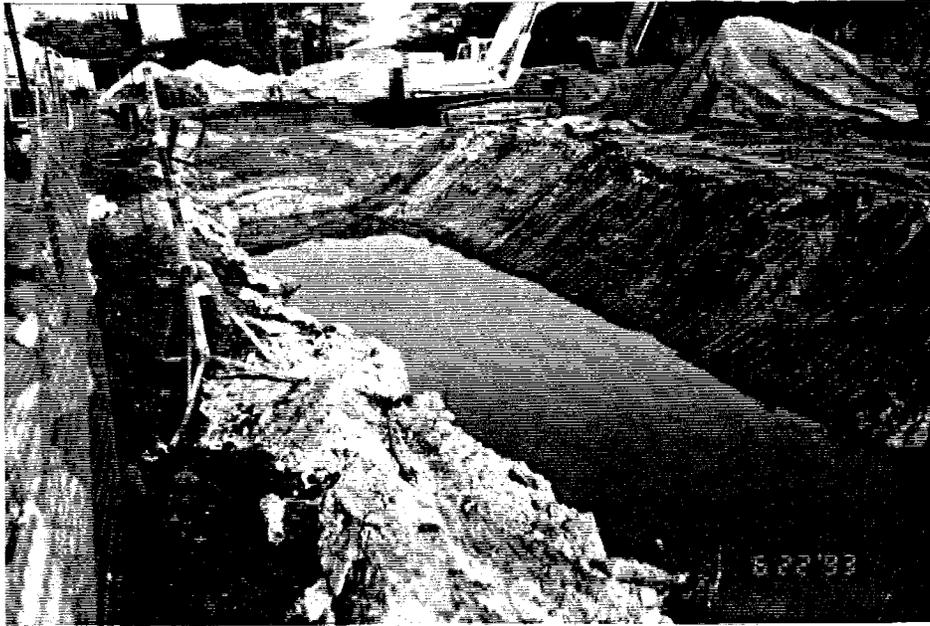
**Photograph No. 32**  
**Stockpiling the Sand that was Processed**



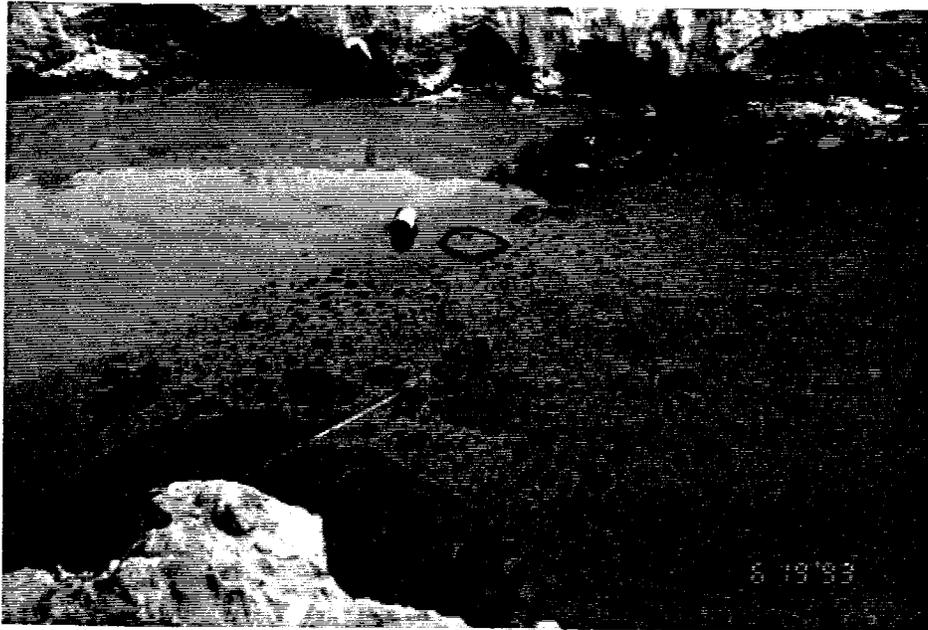
**Photograph No. 33**  
**Debris Pile**



**Photograph No. 34**  
**Decon Area**



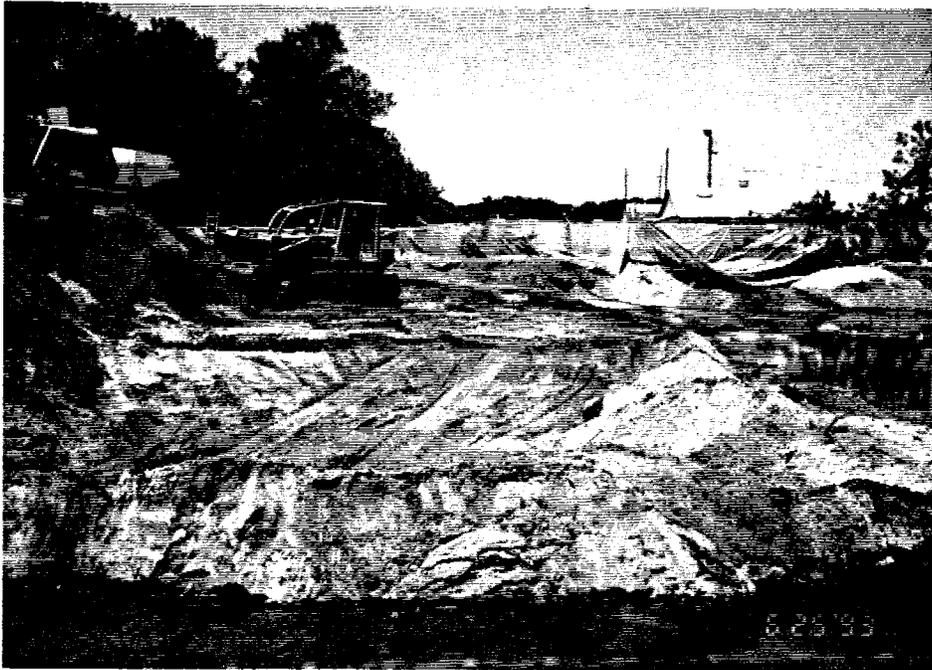
**Photograph No. 35**  
**Closing Out Pit #3**



**Photograph No. 36**  
**Heavy Oil on Top of Pit #6**



**Photograph No. 37**  
**Closing Down the North Side of Site--all Clean Sand**



**Photograph No. 38**  
**Closing Out Pit No. 3**



**Photograph No. 39**  
**Samples Were Taken in the LARC Area**



**Photograph No. 40**  
**These Samples Were Taken Approximately 2 Feet Down Below Surface**



CLEAN SAND

**APPENDIX G**  
**SHALLOW AQUIFER ANALYSIS REPORT**



**SHALLOW AQUIFER  
ANALYSIS  
FOR  
BIOREMEDIATION AREA  
LARC MAINTENANCE SITE  
FORT STORY  
VIRGINIA BEACH  
VIRGINIA**

**May 12, 1993**

Prepared for  
Solutions Environmental Associates, Inc..  
814-B Greenbrier Circle  
Chesapeake, VA 23320

***GES***

Geotechnical & Environmental Services, Inc.  
P.O. Box 354  
Mt. Sidney, VA 24467  
(703) 248-0610

Project Number E-9317



May 12, 1993

Ms. Dorothy Small  
Solutions Environmental Associates, Inc.  
814-B Greenbrier Circle  
Chesapeake, Virginia 23320

Reference: Fort Story Bioremediation Project

Dear Ms. Small:

We have completed our analysis of the shallow unconfined aquifer under the referenced site to determine the optimum recovery well system to provide hydraulic isolation during bioremediation operations. To obtain the necessary field data, a total of six (6) wells were installed within the boundary of the site. The location of the wells are shown on the attached Plate 1. Four (4) of the wells labeled MW-1 through MW-4 were installed near the site corners as two (2) inch diameter monitoring wells completed to a depth of approximately fifteen (15) feet. Monitoring well No. 5, installed to a depth of twenty-five (25) feet on the west end of the site, is the four (4) inch diameter pump test well. Approximately thirty (30) feet northwest of MW-5 is MW-6 which is a two (2) inch diameter observation well installed to a depth of fifteen (15) feet. Logs for each of these wells with the exception of MW-6 are attached.

Water levels in the wells twenty-four (24) hours after installation ranged from three (3.0) to six point three five (6.35) feet below ground surface. The elevation of the static water levels across the site indicate the groundwater movement is toward the north as expected. Based on the measured static water level elevations, an average hydraulic gradient of .002 ft/ft was determined between monitoring wells.

Monitoring wells MW-1 through MW-4 were pumped after development for approximately thirty (30) to sixty (60) minutes at a rate of six (6) gpm until a static pumping level (drawdown) was established on each well. The pump was then turned off and the recovery rate measured. Based on this data, an estimate of the hydraulic conductivity was calculated for each well. The rates determined ranged from 190 to 303 gpd/sf or  $9.0 \times 10^{-3}$  cm/sec to  $1.4 \times 10^{-2}$  cm/sec which is within the range for the fine to medium sand logged in each well boring.

**Geotechnical & Environmental Services**

P. O. Box 354 • Mt. Sidney, VA 24467 • (703) 248-0610

UST Compliance Services • Environmental Site Assessments  
Contamination Studies • Landfill Studies • Geotechnical Investigations

In addition to the short pump testing of MW-1 through MW-4, an eight (8) hour pump test was performed on MW-5. The pump test was performed at a pumping rate of 20 gpm with the four (4) inch submersible pump setting at twenty (20) feet, five (5) feet above the well bottom. Water level changes (drawdowns) were measured in MW-1, MW-4, MW-6 (observation well) and in the pumping well (MW-5) during the eight (8) hour period. The water pumped from the test well (MW-5) was discharged on site east of the pumping well and each monitoring well.

Utilizing the time-drawdown data for each monitoring well, an average hydraulic conductivity value was calculated using a modification of the equilibrium well formula for unconfined aquifers found in "Groundwater and Well" by Johnson Division UOP. The average value calculated was 1,290 gpd/sf or  $6.1 \times 10^{-2}$  cm/sec. An aquifer transmissivity of 107,384 gpd/ft was determined from the time-drawdown data from MW-6 (nearest well) utilizing aquifer analysis software titled Jacobfit. This software uses Jacob's form of the Theis equation and least squares method of analysis to determine transmissivity and storage coefficient. The time-drawdown curve for MW-6, labeled as OM-1, is attached.

To determine the optimum number of recovery wells and corresponding pumping rates required to provide hydraulic isolation, a computer software capture analysis was performed utilizing the pump test data from the eight (8) hour pump test, the average calculated hydraulic gradient and an estimated effective porosity of .20. Based on this analysis, capture of all groundwater to assure no off site groundwater flow can be accomplished by either two (2) wells pumping at 25 gpm each or three (3) wells pumping at 12.5 gpm each. The site plans (plate 2 and 3) showing the locations of the required recovery wells for each scenario and showing the flow lines during continuous pumping are attached.

Using the two (2) well scenario, the existing MW-5 can be utilized with the addition of one (1) more four (4) inch diameter well to a depth of twenty-five (25) feet. The three (3) well scenario assumes the use of three (3) two (2) inch diameter, five (5) feet long well points installed to a depth of fifteen (15) feet at the locations shown on Plate 3.

DRAWN BY: 13AUG84  
 CHECKED BY: JJA  
 APPROVED BY: JJA  
 DRAWING NUMBER: 519029-B1

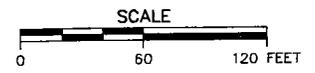
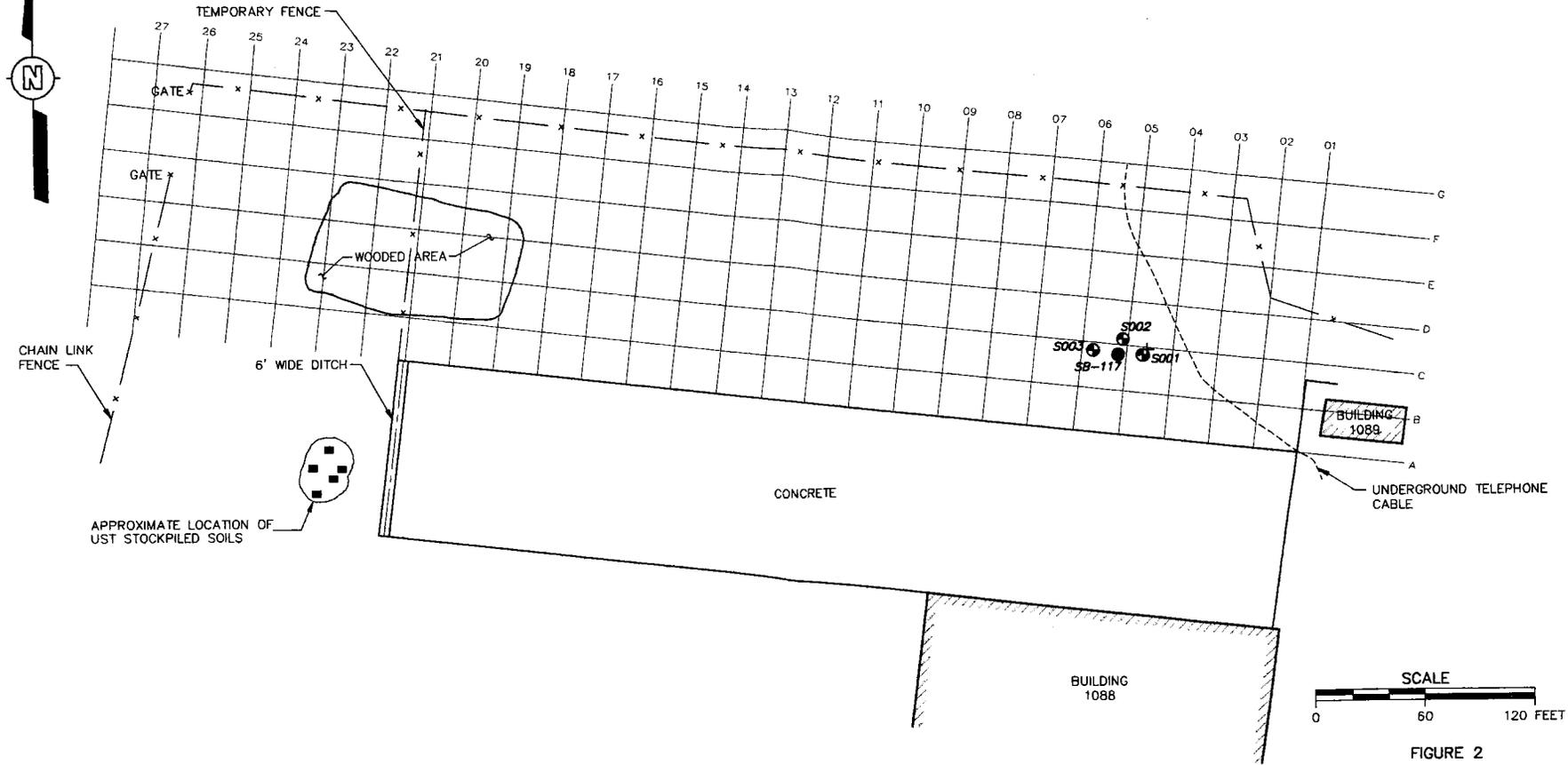
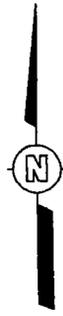


FIGURE 2

LARC AREA PLAN  
 FORT STORY  
 VIRGINIA BEACH, VIRGINIA

PREPARED FOR  
 U.S. ARMY CORPS OF ENGINEERS  
 OMAHA, NEBRASKA

**LEGEND:**

- SB-117 ● SOIL BORING (PREVIOUSLY PERFORMED BY JMM, INC.)
- S003 ⊕ SAMPLE LOCATION.
- COLLECTION LOCATION FOR COMPOSITE SAMPLE SPC-01.



11:38 AM