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HALLIBURTON NUS
Environmental Corporation

661 ANDERSEN DRIVE PITTSBURGH, PENNSYLVANIA 15220 (412) 921-7090

R-33-5-91-13

REVISED FINAL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

PROJECT OPERATIONS PLAN

VOLUME I - QUALITY ASSURANCE PROJECT PLAN
VOLUME II - FIELD SAMPLING PLAN
VOLUME III - HEALTH AND SAFETY PLAN
APPENDIX A - FORMS

AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

EPA WORK ASSIGNMENT NUMBER 37-18-3L2S
CONTRACT NUMBER 68-W8-0037

HALLIBURTON NUS PROJECT NUMBER 2753

JANUARY 1992

SUBMITTED FOR HALLIBURTON NUS BY:

Jeffrey P. Orient

JEFFREY P. ORIENT, P.G.
PROJECT MANAGER

APPROVED:

Leonard C. Johnson

LEONARD C. JOHNSON
ARCS III PROGRAM MANAGER

technologies and services for a cleaner and safer world

VOLUME I

QUALITY ASSURANCE PROJECT PLAN

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1.0 INTRODUCTION

1.1 SUMMARY

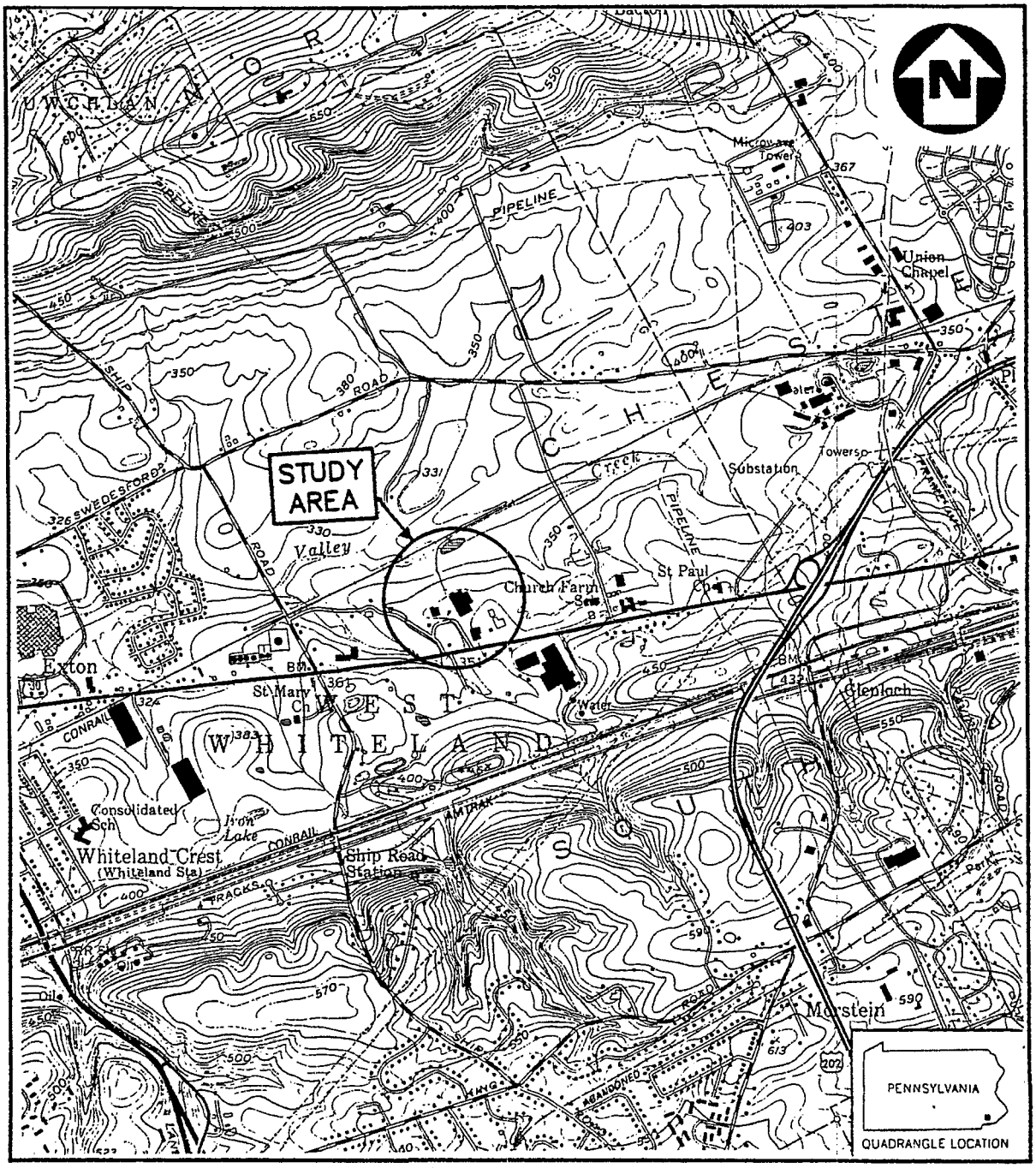
The Project Operations Plan (POP) is comprised of three plans, the Quality Assurance Project Plan (QAPP), the Field Sampling Plan (FSP), and the Health and Safety Plan (HASP). The QAPP (Volume I of the POP) provides quality assurance guidance for the Remedial Investigation/Feasibility Study (RI/FS) at the AIW Frank/Mid-County Mustang Site. The FSP (Volume II) provides guidance regarding the performance of the RI field investigation. The HASP (Volume III) describes appropriate health and safety requirements for field work. The Forms and Standard Operating Procedures (SOPs) to be used in performing the field work are included in Appendices A and B, respectively. Special Analytical Service (SAS) Request Forms are presented in Appendix C.

1.2 SITE LOCATION AND DESCRIPTION

The study area is located approximately 1 mile east of Exton, in West Whiteland Township, Chester County, Pennsylvania (Figure 1-1). The AIW Frank/Mid-County Mustang Site consists of two adjoining properties. The AIW Frank Property is located at 717 East Lincoln Highway (Route 30). The Mid-County Mustang property (presently Rex Carle Automotive) is located at 891 East Lincoln Highway. The 16-acre study area combining AIW Frank and Mid-County Mustang is bounded to the north-northwest by Conrail property (Reading Railroad); to the south by Lincoln Highway; by open fields to the northwest, northeast and east-northeast; by Meridian (formerly Penn Central) Bank to the west-southwest; and by the Apple Press/Drexel Heating property to east-southeast. The planned RI/FS will extend beyond the site boundaries, as there is substantial evidence indicating that site contamination has migrated offsite.

1.2.1 AIW Frank Description

The AIW Frank Property is a small inactive manufacturing facility used in the past for the manufacture of styrofoam products and commercial refrigeration units. The former production areas of the facility are located in the southern half of the property. There are two abandoned buildings, two parking areas, associated roadways, and loading docks (Figure 1-2). One parking area is adjacent to Lincoln Highway. Immediately north of this parking area is a building 180 feet by 160 feet in dimensions. The second building lies 200 feet to the north-northwest of the first building. This rear building measures 175 feet by 250 feet. The front building was used for manufacturing by AIW Frank, and as an office



SOURCE: USGS MALVERN 7.5' QUADRANGLE; 1955, PHOTOREVISED 1983.

0 1
SCALE IN MILES

0 2000 4000
SCALE IN FEET

FIGURE 1-1

SITE LOCATION MAP
AIW FRANK/MID COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

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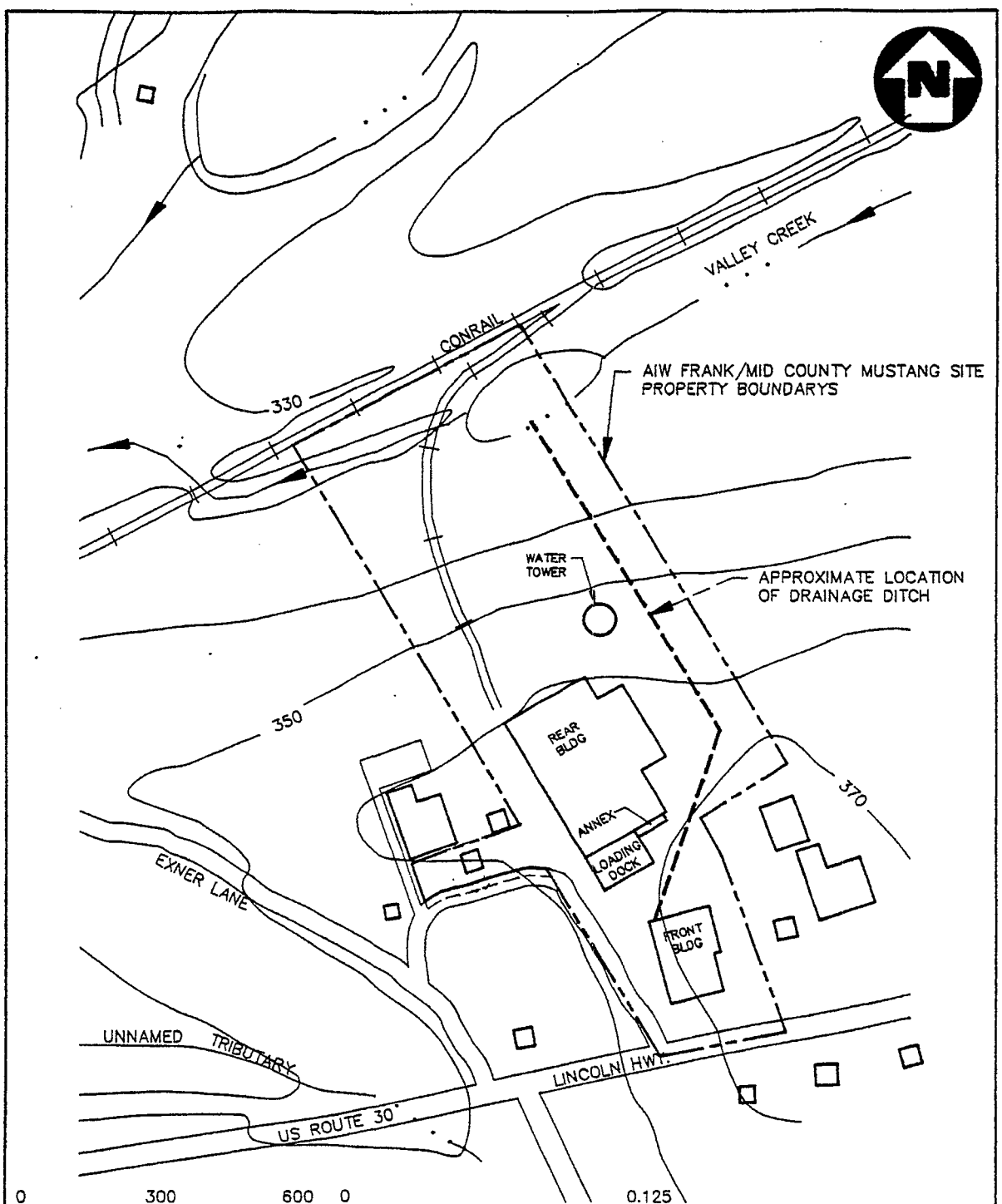

FIGURE 1–2

SITE LAYOUT MAP
AIW FRANK/MID COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

HALLIBURTON NUS
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by Continental Refrigerator Corporation. The rear building was used for warehousing when AIW Frank operated the facility and for manufacturing by Continental Refrigerator Corporation.

Both buildings have been gutted. On August 15, 1991, a fire of unknown origin destroyed the front building. Currently, parts of some of the concrete block walls remain standing, along with some metal beams and roof trusses that have been twisted and/or warped by the fire and subsequent building collapse. The rear building presently contains only some miscellaneous debris, a number of water/gas lines used for manufacturing operations and for fire protection, and approximately 30 empty to partially filled 55-gallon drums. The contents of the drums are unknown. Attached to the front of the rear building is a small annex containing numerous decomposed concrete blocks. The decomposition of the blocks is believed to be associated with some sort of acid leaching related to process operations in the annex.

Along the southern side of the second building is a loading dock area. East of the second building is the back parking area. In the southern corner of this parking area is the former location of an onsite waste solvent tank. The space between the two buildings comprises a driveway and an area where part of the office/manufacturing building has been demolished. In the paved area between the buildings are approximately 5 to 10 above-ground tank pedestals. Nearby, several large (approximately 8-inch-diameter) pipes were observed sticking up out of the ground. These pipes may access underground storage tanks, including three 20,000-gallon tanks known to be present at the facility outside of the boiler room door of the front building. The total number and volumes of tanks at the site is unclear. Liquid can be seen at depth in the tank standpipes. The tanks are believed to have been used for fuel oil storage in the past. A drainage ditch crosses through this area, heading into the area north of the buildings. The drainage ditch was used to discharge boiler water to Valley Creek during the period of time that AIW Frank operated at the site.

The northern half of the facility is an open area overgrown with brush and small trees. Valley Creek flows east to west, through the northernmost portion of the property, just south of the Reading Railroad and the property line. This creek is a cold water fishery, protecting trout fishing. Valley Creek has been impounded on the site to form a pond measuring roughly 310 feet by 60 feet (0.4 acres). Approximately 100 feet north of the back building there is a short, steep dropoff in elevation in the direction of Valley Creek. A 300,000-gallon water tower, used in the past as a fire water supply for the facility, is also located in the overgrown area near the rear of the back building. A small drainage ditch extends northward from near the water tower toward the pond (Figure 1-2). The site is partially fenced in across the front but is accessible to casual access through the open sides and back, and through gaps in the fence.

1.2.2 Mid-County Mustang Description

The Mid-County Mustang property (currently Rex Carle Automotive Service) is less than 1 acre in size and consists of an auto garage, a parking lot, and a small lawn area (Figure 1-2). The site is bordered by AIW Frank to the east; Pipe Maintenance Service to the north and west; and a small open field, Meridian Bank, and Lincoln Highway to the south. The area of concern at Mid-County Mustang is a septic field, located in the lawn area near the garage.

1.3 SITE HISTORIES

1.3.1 AIW Frank

Prior to the use of the property for manufacturing purposes, the site was utilized as a milk transfer station. In 1962, AIW Frank Corporation first leased the property from Louis Frame, the property owner. In 1975, AIW Frank bought the property from Mr. Frame. AIW Frank operated the facility as a styrofoam products (cups and plates) manufacturing plant from 1962 until they declared bankruptcy in 1981. Manufacturing operations were mostly confined to the front (closest to Route 30) building, with the rear building used for cold storage and for a small machine shop. AIW Frank reportedly used trichloroethene (TCE) and 1,1,1-trichloroethane (1,1,1-TCEA) to clean various equipment. Following the bankruptcy of AIW Frank Corporation, the site was bought and operated by Continental Refrigerator Corporation (CRC). From 1983 to approximately 1988, they manufactured refrigerators, freezers, and warming cabinets for institutional and food service industries. The rear building was used during this time period for manufacturing operations with the front building used for office space. Solvents may have been used during this time period to clean metal components of the refrigeration units. CRC is the current property owner. They no longer operate at the facility and have declared bankruptcy.

Based on sampling of local private water supply wells in 1982, the Pennsylvania Department of Environmental Resources (PADER) determined a pattern of elevated TCE levels. These levels indicated a source area at or near the AIW Frank property. PADER's subsequent investigations continued into 1984 and indicated that improper handling and disposal of solvents during the active life of the AIW Frank facility had resulted in onsite groundwater and soil contamination. Groundwater and soil sampling conducted by Betz, Converse, and Murdoch (BCM) in 1983 showed the groundwater and soil at the site to be contaminated with TCE, tetrachloroethene (PCE), and 1,1,1-TCEA.

An NUS FIT Team conducted a multi-media investigation of the AIW Frank property and some of the surrounding industrial sites in 1985. This study also found elevated levels of the previously mentioned

contaminants in the groundwater and soils. In 1987, NUS performed a hazard ranking system scoring of the site, with the site receiving a score of 42.40. The site was subsequently placed on the National Priorities List as a final site in October 1989.

1.3.2 Mid-County Mustang

The Mid-County Mustang site is currently owned by CDS Investments of Paoli, Pennsylvania, and is leased by Rex Carle Automotive Service. The property was leased from CDS by Mid-County Mustang from the summer of 1982 until December 1984. Prior ownership has not been determined.

The facility is currently utilized as an automobile repair shop. It has been reported that the facility has been used as either an automobile repair shop or auto body shop since the 1940s. It has also been reported that previous operators had cleaned automobile engines with steam and solvents. This material was disposed into floor drains in the garage. At this point it was discharged into an onsite septic field which consisted of a stone bed located in the grassy area east-southeast of the garage.

Prior to the 1940s, it is believed that the site was a dairy.

In 1982, groundwater sampling activities conducted by PADER revealed the presence of TCE in the Mid-County Mustang well. As a result, CDS Investments retained Applied Geotechnical and Environmental Services Corporation (AGES) to conduct an investigation of both the Pipe Maintenance Service Facility and Mid-County Mustang in 1984. The investigation discovered the presence of several volatile organic compounds.

Remedial activities at Mid-County Mustang were completed in the fall of 1984. This work included the excavation of the contaminated tile field and the contaminated soils to a depth of 2 to 3 feet below the tile field. In addition, the floor drains in the garage were cemented to prevent future problems of a similar nature. The excavated material, which reportedly contained elevated levels of 1,1,1-TCEA, was placed on plastic sheeting and surrounded by bales of hay to prevent runoff from the area. The latter measures were taken at the recommendation of PADER so that contaminants present would volatilize. FIT III analytical results for samples obtained from the excavated material did not reveal the presence of solvents. The excavated material has subsequently been removed from the site.

1.4 SCOPE OF WORK

As mentioned in Section 3.5 of the Revised Final Work Plan (HALLIBURTON NUS December 1991) seven primary objectives were identified:

- Determine the lateral and vertical extent of groundwater contamination, particularly with respect to downgradient receptor wells and surface water discharge.
- Identify sources of groundwater contamination.
- Determine the extent of soil contamination.
- Investigate surface water/sediment contamination.
- Determine human public health risks associated with groundwater contamination by evaluating potential domestic use.
- Evaluate the risks posed by wastes within the onsite buildings, and underground storage tanks.
- Determine appropriate remedial responses for groundwater, soils, and wastes.

HALLIBURTON NUS has developed a sampling and analysis program to comply with the first two objectives and to provide the data by which the second two objectives can be met. The RI and FS reports that will be prepared will address the last three objectives. In addition, an ecological assessment will be performed to determine site impacts on local ecological systems, and the burned-out onsite building will be demolished. Additional details on the scope of work and RI/FS objectives are contained in Sections 3.5 and 4 of the RI/FS Work Plan (HALLIBURTON NUS, December 1991), respectively.

1.4.1 Field Investigation

This section presents a brief description of the field activities that will be conducted during this RI/FS. A detailed description of these tasks is presented in the Field Sampling Plan (Volume II).

Groundwater Investigation

- Install four additional onsite wells and eight additional offsite wells to evaluate groundwater contamination. Existing wells will be evaluated for use in the RI.

- Sample and analyze five existing monitoring wells, one nearby abandoned well, and twelve new monitoring wells (two rounds).

- Sample and analyze up to 14 residential/commercial wells (one round).

- Analyze monitoring wells for TCL/TAL compounds and various parameters used to evaluate water quality/water treatment.

Surface Water/Sediment Sampling

- Collect eight surface water and nine sediment samples.

- Analyze for TCL/TAL parameters and a variety of water quality (water samples) and physical (sediment) parameters.

- Confirm literature biota/user inventory with field survey.

Subsurface/Surface Soil Sampling

- Conduct soil gas survey to identify "hot spots" of contamination. Collect a subsurface soil sample from each hot spot area identified.

- Collect background soil samples, soil samples from within the ditch which directs surface water to Valley Creek, and soil samples from "hot spots" identified during soil gas survey.

- Excavate test pits at known source areas. Collect soil samples from test pits.

- Analyze soil samples for TCL/TAL parameters. Selected samples will be analyzed for physical parameters.

Drums/Tanks/Building Investigation

- Visual inventory of liquids/sludge/solid waste in drums/tanks/buildings will be conducted.
- A geophysical survey will be used to investigate location of buried drums/tanks.
- Collect samples of residual liquids in drums/tank/equipment. Collect samples of solid material as appropriate.
- Analyze liquids/solids for TAL metals, TCL PCBs, RCRA characteristics, and physical parameters.0
- Demolish the burned-out onsite building.

2.0 PROJECT ORGANIZATION AND MANAGEMENT

2.1 SITE CONTROL

This section provides a brief discussion of site access and site security control for the field work to be performed during the AIW Frank/Mid-County Mustang Site Remedial Investigation.

2.1.1 Site Access

The AIW Frank/Mid-County Mustang Site is accessible by public roads. Permission to enter the site shall be obtained by the EPA.

The field activities will include groundwater sampling of existing and newly installed monitoring wells, and residential wells. Surface water and/or sediments will also be collected from nine locations. Subsurface and surface soil samples will be collected from various locations. In addition, any liquids/solids found in drums, tanks, or piping will also be sampled.

No HALLIBURTON NUS or subcontractor personnel shall enter properties without first making their presence known to the current property owner (Continental Refrigerator Corporation). The property owners will be contacted by the HALLIBURTON NUS Project Manager (PM) or designee, and/or the EPA Remedial Project Manager (RPM) to gain permission for site access. Anticipated field dates will be given to the appropriate contacts. All offsite activities having the potential for land disturbance will be documented with before and after photographs for land restoration. Permission to sample the residential wells and arranging a suitable time for collecting the well sample will be obtained by HALLIBURTON NUS personnel, with appropriate support as needed from EPA personnel.

In addition to notifying the property owner of HALLIBURTON NUS' presence, no HALLIBURTON NUS or subcontractor personnel will enter the site until: (1) written or verbal authorization is received from the PM or designee, (2) at least 24-hour notice is given to the RPM before initiation of field activities, and (3) each field team member possesses personal identification in the form of a driver's license, company identification card, or a suitable substitute approved by the Field Operations Leader (FOL).

2.1.2 Site Security/Control

The fence gate across the front of the site will be kept locked at all times when field personnel are not on site. All monitoring wells will be locked whenever they are not in use for sampling or aquifer testing activities. Keyed-alike locks will be installed on all new and previously installed monitoring wells. The HALLIBURTON NUS FOL, PM, and the EPA RPM will be given keys to the wells.

2.2 PROJECT ORGANIZATION

The overall project organization and responsibilities of key management personnel are discussed in Section 5 of the RI/FS Work Plan. The organizational chart presented in the RI/FS Work Plan is reproduced in this section as Figure 2-1 for easy reference. Personnel qualifications for HALLIBURTON NUS project staff were presented in the ARCS III technical proposal. The proposed RI/FS engineering subcontractor submitted qualifications during the procurement process, which have been reviewed by both HALLIBURTON NUS and ARCS III technical personnel.

Pertinent telephone numbers for key project personnel include:

Lisa Nichols (EPA RPM) - 215/597-3216
Len Johnson (HALLIBURTON NUS ARCS III Program Manager) - 215/971-0900
Jeff Orient (HALLIBURTON NUS Project Manager) - 412/788-1080
John Mikan (HALLIBURTON NUS ARCS III Health and Safety Officer) - 412/788-1080
Rex Miller (PADER Project Manager) - 215/832-6204
Paul Persing (HALLIBURTON NUS Field Operations Leader) - 215/971-0900

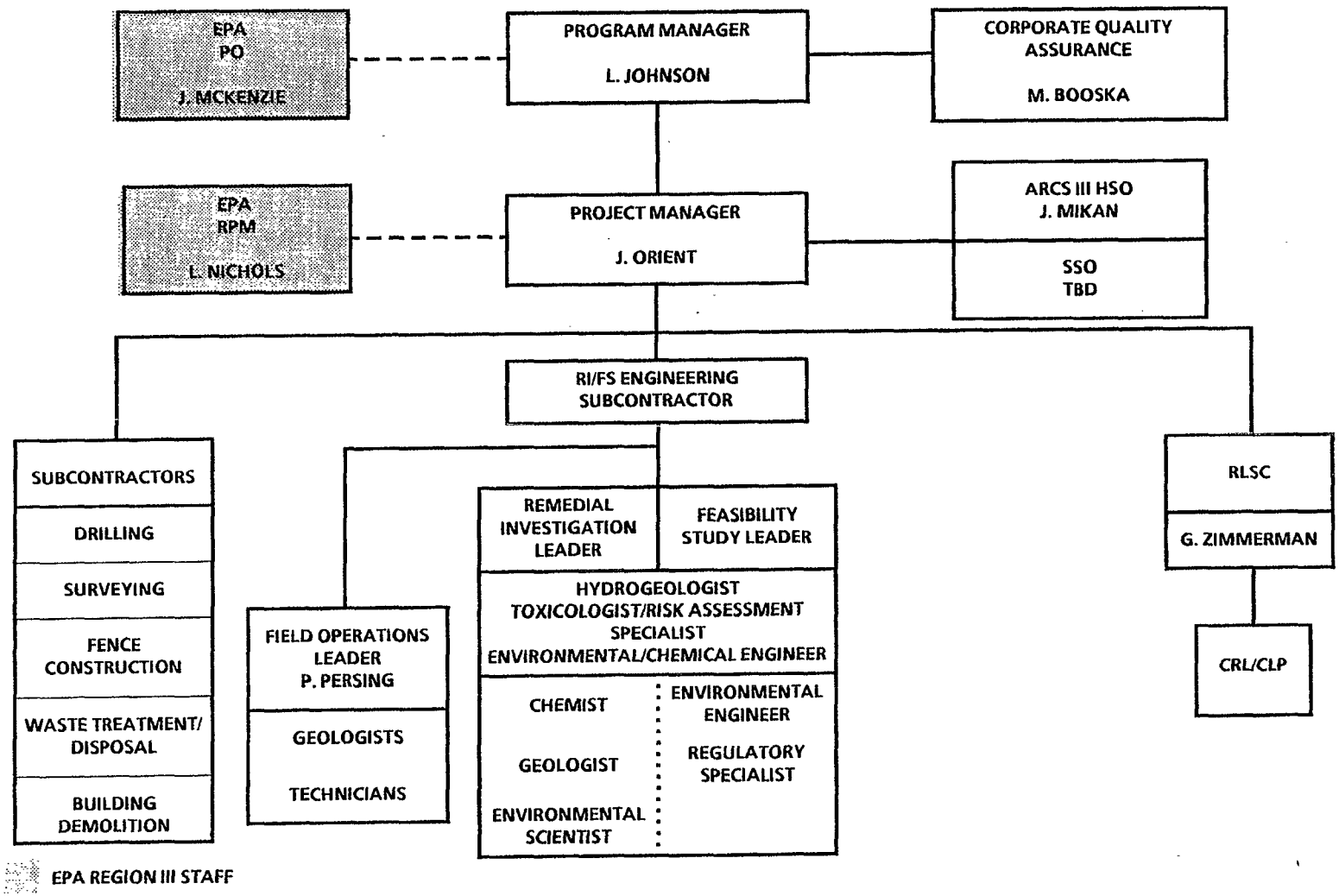
Field work will be performed by a single team under the direction of the FOL. As shown in Figure 2-1, the FOL will interface directly with the RI/FS engineering subcontractor lead personnel and the HALLIBURTON NUS Project Manager. The FOL will be responsible for coordinating and overseeing all field activities and will interface with the RI/FS subcontractor personnel and the Health and Safety Site Officer (SSO) in planning and performing the RI tasks. In accordance with the RI/FS subcontractor personnel and the Health and Safety Plan (HASP), the SSO or his designee will interact with the field team members during performance of their tasks.

2.3 RESPONSIBILITIES OF KEY PERSONNEL

Key personnel for field operations are identified in Figure 2-1. Their specific responsibilities are discussed below.

FIGURE 2-1

PROJECT ORGANIZATION
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA



- Field Operations Leader (FOL) - The FOL is responsible for all day-to-day aspects of the AIW Frank/Mid-County Mustang Site RI field work. The responsibilities of the FOL include

  - Assuring that all field team members are familiar with this QAPP, FSP, and HASP.

  - Assuring that the field work is completed in accordance with the FSP and QAPP.

  - Assuring that all field team members have completed health and safety training.

  - Coordinating the activities of the field team.

  - Coordinating equipment needs.

  - Maintaining site records relative to the field investigation.

  - Reporting to the Project Manager on a regular basis regarding the status of all field work and any problems encountered.

  - Completing Task Modification Requests, as necessary, for approval by the Project Manager.

  - Coordination of sampling activities with the RLSC.

- Health and Safety Site Officer (SSO) - The SSO reports to the ARCS III Health and Safety Officer (HSO) and to the FOL and Project Manager. Details of the SSO's responsibilities are presented in the HASP and include

  - Controlling specific health and safety related field operations such as personnel decontamination, monitoring of worker heat or cold stress, distribution of safety equipment, etc.

  - Assuring that field team personnel comply with all procedures established by the HASP.

  - Identifying assistant SSOs or SSO designees.

  - Terminating work if an imminent safety hazard, emergency situation, or other potentially dangerous situation is encountered.

- Regional Laboratory Sample Coordinator (RLSC) - The RLSC is responsible for the following tasks:

  - Scheduling laboratory service through the EPA Sample Management Office (SMO) and other vendors.

  - Tracking samples and coordinating with EPA Region III Regional Sample Control Center (RSCC).

  - Scheduling data validation.

  - Identifying laboratory analytical methods and laboratory QC.

- Quality Assurance Officer (QAO) - The QAO will designate a Quality Assurance Representative (QAR). The QAR is responsible for the following:

  - Field audits
  - Project QA audits

2.4 HALLIBURTON NUS PERSONNEL TRAINING

HALLIBURTON NUS personnel qualifications were briefly addressed in Section 1.1. All personnel receive a variety of technical and administrative training. These may include attending project management training, technical writing courses, quality improvement process awareness sessions, quality education process training, sessions or seminars in specific technical areas (i.e., treatment processes, hydrogeology, HRS scoring, RCRA, and so on) and, of course, health and safety training. The balance of this section focuses on HALLIBURTON NUS' health and safety program.

As required under OSHA Standard 29 CFR 1910.120, HALLIBURTON NUS employees and their subcontractors are required to obtain the appropriate level of training prior to working at CERCLA or at certain RCRA sites. HALLIBURTON NUS personnel will be trained in accordance with HALLIBURTON NUS Health and Safety Standard Operational Procedures (HSSOPs). Subcontractors must provide documentation of their compliance with 1910.120.

2.4.1 Specific 29 CFR 1910.120 Training

The level of training that is required is specified in the HSSOPs and is dependent upon the level of involvement in site work. The level of training required, as specified in the HSSOPs, that must be completed is listed below:

- 40-Hour "initial training" with an additional minimum of 3 days actual field experience, for general site workers.

- 24-Hour "initial training" for occasional site workers with a additional minimum of 1 day of actual field experience. Occasional site workers are workers responsible for performing a specified limited task who will not be exposed over permissible exposure limits and published exposure limits, or be required to wear respiratory protection.

- 24-Hour "initial training" with an additional minimum of 1 day of actual field experience is required for workers regularly on site but who work in areas monitored and fully characterized. Such characterization must indicate that exposures are under permissible exposure limits and published exposure limits, that respirators are not necessary, and that there are no health hazards or the possibility of an emergency developing.

- 8-Hour management and supervisor training.

- 8-Hour refresher training, required on a annual basis after the initial 40-hour or 24-hour trainings, listed above.

- Each of the field training requirements specified above requires that the training be conducted under the direct supervision of a trained, experienced supervisor.

2.4.2 Training Content

The content of each training program must comply with 29 CFR 1910.120 paragraph (e)(2) and HALLIBURTON NUS HSSOPs. The content of the 40-hour, the two 24-hour, and the 8-hour refresher courses as conducted by HALLIBURTON NUS are as follows:

- Review of 29 CFR 1910.120
- Toxicology
- Chemical and Physical Hazards

- Respiratory Protection
- Personal Protective Equipment
- Decontamination
- Monitoring Instrumentation
- Site Operations
- Field Exercises
- Written Examination

The content of the 8-hour HALLIBURTON NUS' management and supervisory courses follow the requirements of 29 CFR 1910.120. Onsite management and supervisors directly responsible for, or who supervise employees engaged in, hazardous waste operations must receive 40 hours initial training, 3 days field experience, and at least 8 additional hours of specialized training at the time of job assignment. Training must include topics as, but not limited to, the employer's safety and health program and the associated training program, personal protective equipment program, spill containment program, and health hazard monitoring procedures and techniques.

2.4.3 Records Maintenance

As stated above all HALLIBURTON NUS employees are required to successfully complete the required health and safety training. HALLIBURTON NUS maintains documentation in a Health and Safety Data Base maintained by the Health Sciences Department in Pittsburgh, Pennsylvania. The training date for the initial training, refresher training, and management/supervisory trained are all recorded in the Data Base. Written documentation is also provided to those HALLIBURTON NUS personnel who successfully complete the training. HALLIBURTON NUS personnel also participate in a medical monitoring program. Baseline and annual physicals are required and results are evaluated and maintained by a qualified physician.

2.4.4 Site-Specific Training

As well as the training required above, HALLIBURTON NUS requires site-specific training for all HALLIBURTON NUS personnel and their subcontractors before they can initiate any site work. The content of the site-specific training is based upon the same information as described above except it addresses information specific to the site and task for the job being performed. The number of hours for the site-specific training is dependent on the site, the task performed, and the role of the individual performing the specific task. The site Health and Safety Plan (Volume III) provides the basis for the site-specific training. Documentation of site-specific training must be maintained in the permanent site log book.

2.5 SCHEDULE

The AIW Frank/Mid-County Mustang Site RI field activities are estimated to take approximately 17 weeks to complete. The anticipated mobilization date for the bulk of the field work is January 13, 1992, with an anticipated ending date of April 27, 1992. Some limited site investigation activities (building/drum tank survey and sampling) may be performed ahead of the mobilization date if lab arrangements can be made. A detailed schedule for project activities is included with the project work plan.

3.0 QUALITY ASSURANCE OBJECTIVES

The Work Plan for the AIW Frank/Mid-County Mustang Site contains a summary of available site information, defines the data gaps and the RI/FS objectives, and identifies the types and amount of data necessary to complete the RI/FS. The RI/FS objectives are summarized below:

- Fully define the extent of contamination in the groundwater. Characterize contamination in the soils, surface water and sediments.
- Fully characterize the contents of onsite drums, tanks, and buildings.
- Assess the risks to public health and the environment from exposure to site contaminants.
- Evaluate appropriate remedial actions for groundwater, surface water, and sediment.

In order to meet these objectives, additional site data are required. The data collection and quality assurance requirements described in this document are intended to provide data that are adequate in both number and quality to support completion of the RI/FS.

3.1 DATA QUALITY OBJECTIVES

Data quality objectives (DQOs) are qualitative and/or quantitative statements regarding the quality of data needed to support the RI/FS activities. In order to develop site-specific DQOs, the intended use of the data must be defined. This use must be balanced between data quality needs and time, as well as cost constraints.

Specific analytical protocols are selected to meet the DQOs in the following ways:

- Compare Applicable or Relevant and Appropriate Requirements (ARARs), risk-based criteria, and data needs for risk assessment or engineering purposes to the detection limits for available analytical methods.
- Select analytical methods to allow quantitation of the analytes at levels sufficiently below the ARARs to minimize the number of critical data points.

- Evaluate the maximum allowable variability in the data based on the ARARs comparison.

- Develop site-specific acceptable variability based on the intended data use and method-specific precision and accuracy information.

Table 3-1 presents a summary of the proposed sampling and analysis program for the AIW Frank/Mid-County Mustang Site. The information in this table was developed to meet the RI/FS objectives.

3.2 PRECISION, ACCURACY, REPRESENTATIVENESS, COMPLETENESS, AND COMPARABILITY (PARCC) GOALS

The quality of a data set is measured by certain characteristics of the data, namely the PARCC parameters. Some of the parameters are expressed quantitatively, while others are expressed qualitatively. The objectives of the RI/FS and the intended use of the data define the PARCC goals.

3.2.1 Precision and Accuracy

Precision and accuracy characterize the amount of variability and bias inherent in a data set. Precision describes the reproducibility of measurements of the same parameter for a sample under the same or similar conditions. Precision is expressed as a range (the difference between two measurements of the same parameter) or as a relative percent difference (the range relative to the mean, expressed as a percent). Range and Relative Percent Difference (RPD) values are calculated as follows:

$$\text{Range} = \text{OR} - \text{DR}$$

$$\text{and} \qquad \text{RPD} = \frac{|\text{OR} - \text{DR}|}{1/2\,(\text{OR} + \text{DR})} \times 100\%$$

where:

OR = original sample result

DR = duplicate sample result

The internal laboratory control limits for precision are three times the standard deviation of a series of RPD or range values. RPD values may be calculated for both laboratory and field duplicates, and can be compared to the control limits as a quality assurance check.

TABLE 3-1

SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

Media	Analysis	Data Use[a]	Selected Analytical Option	Target Detection Limit	Proposed Analytical Method	Source of Analyses	Number of Samples	Field Duplicates[b]	Equipment Rinsate Blanks[c]	Field Blanks[d]	Trip Blanks[e]	Matrix Spike/ Matrix Spike Duplicate
Groundwater (1st Round)	TCL Volatiles	1,2,3,4	V	1 µg/L	Draft Superfund AnalyticalMethods for Low Concentration Water for Organic Analyses	CLP SAS	33 (1)	2	2	2	8	2/2
	TCL Base/Neutral and Acid Extractables and Pesticides/PCBs	1,2,3,4	IV	CRDL	CLP Protocol	CLP RAS	33 (1)	2	2	2	0	2/2
	TAL Metals/CN-Total	1,2,3,4	IV	CRDL	CLP Protocol	CLPRAS	33 (1)	2	2	2	0	2/2
	TAL Metals-Dissolved	1,2,3,4	IV	CRDL	CLP Protocol	CLP RAS	33 (1)	2	2	2	0	2/2
	pH, Eh, Temperature, Conductivity	1,2	I	NA	NA	Field Analysis	33 (1)	0	0	0	0	0/0
	Chemical Oxygen Demand (COD)	1,3,4	III	5 mg/L	EPA 410.2	CLP SAS	10 (2)	1	0	0	0	0/0
	Total Organic Carbon (TOC)	1,3,4	III	1 mg/L	EPA 415.1	CLP SAS	10 (2)	1	0	0	0	0/0
	Biological Oxygen Demand (BOD_5)	1,3,4	III	1 mg/L	SM 5210B	CLP SAS	10 (2)	1	0	0	0	0/0
	Total Suspended Solids (TSS)	1,3,4	III	4 mg/L	EPA 160.2	CLP SAS	10 (2)	1	0	0	0	0/0
	Total Dissolved Solids (TDS)	1,3,4	III	10 mg/L	EPA 160.1	CLP SAS	10 (2)	1	0	0	0	0/0
	Alkalinity (as $CaCO_3$)	1,3,4	III	1 mg/L	EPA 310.1	CLP SAS	10 (2)	1	0	0	0	0/0
	NO_3/NO_2-Nitrogen	1,3,4	III	0.01 mg/L	EPA 353.3	CLP SAS	10 (2)	1	0	0	0	0/0
	NH_3-Nitrogen (Ammonia)	1,3,4	III	0.1 mg/L	EPA 350.2	CLP SAS	10 (2)	1	0	0	0	0/0
	Chlorides	1,3,4	III	2 mg/L	EPA 325.2	CLP SAS	10 (2)	1	0	0	0	0/0
	Sulfates	1,3,4	III	1 mg/L	EPA 375.4	CLP SAS	10 (2)	1	0	0	0	0/0
Groundwater (2nd Round)	TCL Volatiles	1,2,3,4	V	1 µg/L	Draft Superfund AnalyticalMethods for Low Concentration Water for Organic Analyses	CLP SAS	18 (3)	1	1	1	2	1/1

TABLE 3-1
SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA
PAGE TWO

Media	Analysis	Data Use[a]	Selected Analytical Option	Target Detection Limit	Proposed Analytical Method	Source of Analyses	Number of Samples	Field Duplicates[b]	Equipment Rinsate Blanks[c]	Field Blanks[d]	Trip Blanks[e]	Matrix Spike/ Matrix Spike Duplicate
Surface Water	TCL Volatiles	1,2,3,4	V	1 µg/L	Draft Superfund AnalyticalMethods for Low Concentration Water for Organic Analyses	CLP SAS	8	1	1	1	2 [4]	1/1
	TCL Base/Neutral and Acid Extractables and Pesticides/PCBs	1,2,3,4	IV	CRDL	CLP Protocol	CLP RAS	8	1	1	1	0	1/1
	TAL Metals/CN-Total	1,2,3,4	IV	CRDL	CLP Protocol	CLP RAS	8	1	1	1	0	1/1
	TAL Metals-Dissolved	1,2,3,4	IV	CRDL	CLP Protocol	CLP RAS	8	1	1	0 [5]	0	1/1
	pH, Eh, Temperature, Conductivity, Dissolved Oxygen	1,2	I	NA	NA	Field Analysis	8	0	0	0	0	0/0
	Alkalinity	1,3,4	III	1 mg/L	EPA 310.1	CLP SAS	8	1	0	0	0	0/0
	Acidity	1,3,4	III	10 mg/L	EPA 305.1	CLP SAS	8	1	0	0	0	0/0
	Hardness	1,2,3,4	III	10 mg/L	EPA 130.2	CLP SAS	8	1	0	0	0	0/0
	Sulfate	1,2,3,4	III	10 mg/L	EPA 375.4	CLP SAS	8	1	0	0	0	0/0
	Total Suspended Solids (TSS)	1,2,3,4	III	4 mg/L	EPA 160.2	CLP SAS	8	1	0	0	0	0/0
	Total Dissolved Solids (TDS)	1,2,3,4	III	10 mg/L	EPA 160.1	CLP SAS	8	1	0	0	0	0/0
Sediments	TCL Volatiles	1,2,3,4	IV	CRDL	CLP Protocol	CLP RAS	9	1	1	1	0[4]	1/1
	TCL Base/Neutral and Acid Extractables and Pesticides/PCBs	1,2,3,4	IV	CRDL	CLP Protocol	CLP RAS	9	1	1	1	0	1/1
	TAL-Metals/CN	1,2,3,4	IV	CRDL	CLP Protocol	CLP RAS	9	1	1	1	0	1/1
	TCLP[6]	1,2,3,4	V	CRDL	Appendix II of 40 CFR 261; CLP Protocol	CLP SAS	2	1	1	1	0	1/1
	Temperature	1,2	I	NA	NA	Field Analysis	9	1	0	0	0	0/0
	Specific Conductance	1,2	III	NA	EPA 120.1	CLP SAS	9	1	0	0	0	0/0
	pH	1,2	III	NA	SW846-9045	CLP SAS	9	1	0	0	0	0/0
	Eh	1,2	III	NA	ASTM D1498	CLP SAS	9	1	0	0	0	0/0
	Cation Exchange Capacity (CEC)	1,3,4	III	1 meq/100 g	SW846-9081	CLP SAS	2	1	0	0	0	0/0

TABLE 3-1
SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA
PAGE THREE

Media	Analysis	Data Use[a]	Selected Analytical Option	Target Detection Limit	Proposed Analytical Method	Source of Analyses	Number of Samples	Field Duplicates[b]	Equipment Rinsate Blanks[c]	Field Blanks[d]	Trip Blanks[e]	Matrix Spike/ Matrix Spike Duplicate
Sediments (Continued)	Moisture Content	1,3,4	III	NA	ASTM D2216-80	CLP SAS	2	0	0	0	0	0/0
	Grain Size	1,3,4	III	NA	ASTM D422-63	CLP SAS	2	0	0	0	0	0/0
	Bulk Density	1,3,4	III	NA	MSA-Chapter 13	CLP SAS	2	0	0	0	0	0/0
	Total Organic Carbon (TOC)	1,3,4	III	10 mg/kg	MSA 29.3.5.2	CLP SAS	9	1	0	0	0	0/0
Soil	TCL Volatiles	1,2,3,4	IV	CRDL	CLP Protocol	CLP RAS	40	3	3	3	10	3/3
	TCL Base/Neutral and Acid Extractables and Pesticides/PCBs	1,2,3,4	IV	CRDL	CLP Protocol	CLP RAS	40	3	3	3	0	3/3
	TAL Metals/CN	1,2,3,4	IV	CRDL	CLP Protocol	CLP RAS	40	3	3	3	0	3/3
	pH	1,2	III	NA	SW846-9045	CLP SAS	40	3	0	0	0	0/0
	Eh	1,2	III	NA	ASTM D1498	CLP SAS	40	3	0	0	0	0/0
	TCLP[6]	1,3,4	V	CRDL	Appendix II of 40 CFR 261; CLP Protocol	CLP SAS	5	1	1	1	0	1/1
	Cation Exchange Capacity (CEC)	1,3,4	III	1 meq/100 g	SW 846-9081	CLP SAS	5	1	0	0	0	0/0
	Total Organic Carbon	1,3,4	III	10 mg/kg	MSA 29.3.5.2	CLP SAS	5	1	0	0	0	0/0
	Grain Size	1,3,4	III	NA	ASTM D422-63	CLP SAS	5	0	0	0	0	0/0
	Moisture Content	1,3,4	III	NA	ASTM D2216-80	CLP SAS	5	0	0	0	0	0/0
	Bulk Density	1,3,4	III	NA	MSA-Chapter 13	CLP SAS	5	0	0	0	0	0/0
	Water Leach Test[7]	1,3,4	V	CRDL	Appendix II of 40 CFR 261; CLP Protocol	CLP SAS	5	1	1	1	0	1/1
Tank, Drum, Piping	TCL Organics	1,2,3,4	IV	CRDL	CLP Protocol	CLP SAS	40	2	0	0	0	2/2
	TAL Metals/CN	1,2,3,4	IV	CRDL	CLP Protocol	CLP SAS	40	2	0	0	0	2/2
	TCLP[6]	1,3,4	V	CRDL	Appendix II of 40 CFR 261; CLP Protocol	CLP SAS	40	0	0	0	0	0/0
	BTu Content	1,3,4	III	NA	ASTM D 3286-85	CLP SAS	40[8]	0	0	0	0	0/0

TABLE 3-1
SUMMARY OF SAMPLING AND ANALYSIS PROGRAM
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA
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Media	Analysis	Data Use[a]	Selected Analytical Option	Target Detection Limit	Proposed Analytical Method	Source of Analyses	Number of Samples	Field Duplicates[b]	Equipment Rinsate Blanks[c]	Field Blanks[d]	Trip Blanks[e]	Matrix Spike/ Matrix Spike Duplicate
Tank, Drum, Piping (Continued)	Chlorine Content	1,3,4	III	NA	ASTM D 808-81/ SW846-9020 (10)	CLP SAS	40	0	0	0	0	0/0
	Ignitability	1,3,4	III	NA	SW846-1010	CLP SAS	40 (9)	0	0	0	0	0/0
	Reactivity	1,3,4	III	NA	SW846 Section 7.3	CLP SAS	40	0	0	0	0	0/0
	Corrosivity	1,3,4	III	NA	SW846-1110	CLP SAS	40 (11)	0	0	0	0	0/0
Building Materials	Asbestos	1,3,4	III	NA	EPA 600/M4-82-020	CLP SAS	14	0	0	0	0	0/0

ASTM American Society for Testing Materials
CLP EPA Contract Laboratory Program
CRDL Contract Required Detection Limit
EPA *Methods for Chemical Analysis of Water and Wastes* (EPA 600/4-79/020)
MSA Methods of Soil Analysis by American Society of Agronomy
NA Not applicable
SM Standard Methods for the Examination of Water and Wastewater
SW846 Test Methods for Evaluation of Solid Waste - Physical/Chemical Methods

(1) Numbers listed include 14 commercial/residential well samples and 17 old and new monitoring well samples, and the Frame well.
(2) These analyses will be run on 10 of the 18 first-round monitoring well samples. (Both wells in each of the 4 two-well clusters to be installed, the shallow well proposed by the former solvent tank location onsite, and the upgradient shallow well proposed along Route 30 east of the site.)
(3) A second sampling round is anticipated. The monitoring/residential wells to be sampled and the target analytes for the second sampling round will be determined based on the results of the residential well sampling. It is anticipated that, at a minimum, groundwater samples will be collected from all 17 monitoring wells and the nearby Frame well, and analyzed for TCL volatiles (Draft Superfund Analytical Methods for Low Concentration Water for Organic Analyses) during the second sampling round.
(4) Trip blanks for sediment samples are included with the surface water samples.
(5) Field blank for TAL metals--total is also applicable for TAL Metals--dissolved.
(6) Compounds listed in Appendix II of 40 CFR261 will be analyzed by CLP Protocols on the extracts obtained from the TCLP extraction procedure.
(7) One soil sample from each test pit will be submitted for analysis. Sample selection will be made in the field based on overall representativeness and presence of contamination.
(8) TCL Organics and TAL Metals/CN will be analyzed by CLP Protocols on the extracts obtained from using only reagent water as the extraction fluid within the TCLP extraction procedure.
(9) Non-aqueous samples only.
(10) Non-aqueous samples - total chlorine analysis by ASTM D808-81; aqueous samples - TOX by SW846-9020.
(11) Aqueous samples only.

(a) 1 - Site Characterization
2 - Risk Assessment
3 - Evaluation of Alternatives
4 - Engineering Design of Alternatives
(b) Field Duplicate - A single sample split into two portions, each of which is submitted blindly to the laboratory. Assesses the overall precision of the sampling and analysis program.
(c) Rinsate Blank - Sample obtained by pouring analyte-free deionized water over sample collection equipment after decontamination. Assesses effectiveness of decontamination procedures.
(d) Field Blank - Generated at time of sampling by filling bottles in the field with analyte-free deionized water. Used to assess contamination from total sampling, sample preparation, and measurement process.
(e) Trip Blank - Prepared in the field using analyte-free deionized water, and accompanies samples at all times.

Accuracy is the comparison between experimental and known or calculated values expressed as a percent recovery (%R). Percent recoveries are derived from analysis of standards spiked into deionized water (standard recovery) or into actual samples (matrix spike or surrogate spike recovery). Recovery is calculated as follows:

$$\%R = \frac{E}{T} \times 100\%$$

where:

E = experimental result

T = true value or theoretical result

$$\text{with} \qquad \text{Theoretical result} = \frac{(\text{Sample aliq.})(\text{Sample conc.}) + (\text{Spike aliq.})(\text{Spike conc.})}{\text{Sample aliquot} + \text{Spike aliquot}}$$

Internal laboratory control limits for accuracy are set at the mean plus or minus three times the standard deviation of a series of %R values. Organic %R values are set at the mean plus or minus two times the standard deviation.

Field and laboratory precision and accuracy performance can affect the attainment of project objectives, particularly when compliance with established criteria is based on laboratory analysis of environmental samples. Such criteria are used in risk assessment and screening of remedial alternatives. Given the uncertainties associated with field work and laboratory activity, the following overall precision and accuracy goals are identified to meet the project objectives:

- Precision: ± 50 percent RPD
- Accuracy: ± 50 percent recovery

Where available, precision and accuracy criteria established by the CLP SOW for data validation or analytical methodology will be used to evaluate and qualify data provided by the analytical laboratory. Overall precision and accuracy will be evaluated based on field duplicates and field blanks (equipment, field, and trip) since both field conditions and laboratory conditions affect the results.

Analytical precision and accuracy will be evaluated upon receipt of the laboratory data. Analytical precision will be measured as the relative standard deviation of the data from the laboratory (internal) duplicates. Analytical accuracy measures the bias as the percent recovery from matrix spike and surrogate spike samples. CLP requirements will be used.

Field sampling precision and accuracy are not easily measured since it is difficult to separate field precision and accuracy from overall precision and accuracy. Field contamination, sample preservation, and sample handling will affect precision and accuracy. By following the appropriate HALLIBURTON NUS ARCS III Program Standard Operating Procedures (SOPs, see Appendix B), precision and accuracy errors associated with field activities can be minimized. As stated above, field duplicates and blanks (equipment, field, and trip) will be used to evaluate overall precision and accuracy.

No project resources will be expended to develop precision and accuracy data for method (field or analytical) validation except those commonly applied in the CERCLA program for collection of routine QA/QC data. Routine QA/QC data will include analyses from field duplicates, equipment rinsate blanks, field blanks, and trip blanks based on the existing guidance that specifies the type and proportion of samples submitted for QA/QC (EPA, March 1987).

Validity of data with respect to its intended use will be assessed based on laboratory-supplied QA/QC data and protocols routinely employed for validation of CLP-RAS/SAS results. In general, results that are rejected by the validation process will be disqualified from application to the intended use. Qualified data will be used to the greatest extent practicable.

3.2.2 Representativeness

Representativeness describes the degree to which analytical data accurately and precisely define the material being measured. Several elements of the sampling and sample handling process must be controlled to maximize the representativeness of the analytical data. Sample collection, preservation, and storage are discussed in Volumes I and II of the POP. Section 4.3 of the Work Plan contains details on the site sampling program and the rationale for sampling locations. The sampling program is designed to ensure that the data obtained during the RI accurately represent the site conditions.

Representativeness of data is also affected by sampling techniques. Sampling techniques are described in Volume II of the POP. To ensure that the data are representative, HALLIBURTON NUS' ARCS III Program Standard Operating Procedures will be used.

To ensure that sample aliquots to be analyzed are representative, all but the TCL VOA samples will be homogenized in the laboratory by removing non-representative materials (e.g., sticks and stones), then stirring, shaking, crushing, and/or blending the sample as appropriate to the matrix. TCL VOA

samples can not be homogenized in the laboratory due to the possibility of losing volatile organic compounds during the homogenization process.

3.2.3 Completeness

Completeness describes the amount of data generated that meets the objectives for precision, accuracy, and representativeness versus the amount of data expected to be obtained. For relatively clean, homogeneous matrices, 100 percent completeness is expected. However, as matrix complexity and heterogenicity increase, completeness may decrease. Where analysis is precluded or where data quality objectives are compromised, effects on the overall investigation must be considered. Whether or not any particular sample is critical to the investigation will be evaluated in terms of the sample location, the parameter in question, the intended data use, and the risk associated with the error.

The sampling and analysis program for the site is sufficiently broad in scope to prevent a single data point or parameter from sacrificing attainment of the RI/FS objectives. Each medium is critical to the site assessment. Consequently, there exists some critical data requirement below which the objectives of the study will be compromised.

Critical data points may not be evaluated until all the analytical results are evaluated. Additionally, several sampling points, in aggregate, may be considered to be critical either by location (e.g., downgradient monitoring wells) or by analysis (e.g., volatile organic chemicals). If in the evaluation of laboratory results it becomes apparent that the data for a specific medium are of insufficient quality, either with respect to the number of samples or an individual analysis, resampling of the deficient data points will be necessary.

3.2.4 Comparability

One of the objectives of the POP is to provide analytical data of comparable quality both between sample locations and with data from previous investigations. Both analytical procedures (i.e., CLP) and sample collection techniques (as defined in HALLIBURTON NUS SOPs) will maximize the comparability of this new data to previous data. Additionally, to enhance comparability between samples, consideration will be given to seasonal conditions, stream flow, or other environmental conditions that could influence the analytical results.

4.0 LABORATORY SAMPLE CUSTODY

To ensure the integrity of a sample from collection through analysis, it is necessary to have an accurate, written record that traces the possession and handling of the sample. This documentation is referred to as the sample chain-of-custody.

A sample is under custody if

- The sample is in the physical possession of an authorized person.
- The sample is in view of an authorized person after being in his/her possession.
- The sample is placed in a secure area by an authorized person after being in his/her possession.
- The sample is in a secure area, restricted to authorized personnel only.

Sample custody during collection and shipping is discussed in Section 5.3 of HALLIBURTON NUS SOP SA-6.1. Laboratory sample custody is discussed in the following sections. Further details are presented in Attachment F of the CLP Statement of Work (EPA, February 1988). All laboratories used in this study must follow these procedures.

4.1 SAMPLE RECEIPT

When samples are received, the shipping manifest is signed and dated to acknowledge sample receipt. The sample custodian must examine the shipping containers and verify that the correct number of containers was received. The shipping containers are then opened and the enclosed sample paperwork is removed.

Samples are removed from the shipping containers and the bottle condition must be noted. The information on the chain-of-custody, the airbill, the packing list, the containers and sample tags, and the laboratory request is reviewed to note any discrepancies. Discrepancies must be resolved through the Sample Management Office (SMO).

4.2 SAMPLE STORAGE

All samples received by the laboratory must be stored at 4°C until analysis. Laboratory holding times are specified by the CLP contract and are presented in Table 2-1 of Volume II of this POP.

4.3 LABORATORY SAMPLE TRACKING

Laboratory sample tracking procedures are discussed in Section F of the CLP Statement of Work (EPA, February 1988). All laboratories used must conform to these requirements.

5.0 CALIBRATION PROCEDURES AND FREQUENCY

Instruments used in the field and in the laboratory will be calibrated according to the procedures described below.

5.1 FIELD INSTRUMENTS

Several monitoring instruments may be used during field activities, including

- Temperature probe
- Specific conductance meter
- pH meter
- Eh meter
- Electronic water-level meter
- Dissolved oxygen meter
- OVD

The electronic water-level meter will be calibrated prior to field use and periodically at the discretion of the Field Operations Leader (FOL). The remaining instruments will be calibrated daily or according to the procedures outlined in HALLIBURTON NUS SOP SF-1.1, using the manufacturer's recommended calibration procedures.

Calibration will be documented on an Equipment Calibration Log (HALLIBURTON NUS SOP SA-6.4, Attachment D-1). During calibration, an appropriate maintenance check will be performed on each piece of equipment. If damaged or defective parts are identified during the maintenance check and it is determined that the damage could have an impact on the instrument's performance, the instrument will be removed from service until the defective parts are repaired or replaced.

5.2 LABORATORY INSTRUMENTS

The laboratory instruments used for the analysis of the TCL organics and TAL metals/cyanide according to the CLP Statements of Work (SOWs) will be calibrated according to the CLP SOWs. These analyses include the TCL VOAs analyzed using the Draft Superfund Analytical Methods for Low Concentration Water for Organic Analyses, and the TCLP extracts analyzed for the TCL organics and TAL metals/cyanide.

The calibration frequency for thr remainer of the environmental measurement parameters is presented in Table 5-1.

5.3 QUALITY CONTROL

The quality control procedures routinely employed in inorganic chemistry analyses are presented below.

5.3.1 Standardization (Initial Calibration)

Precision and accuracy are an integral part of quality control, but they are only effective when instruments, solutions, and procedures have been standardized.

Solutions are standardized by preparing standards of known purity and concentrations and using these standards to evaluate other solutions. Standards are either traceable to the National Bureau of Standards, or they are certified by the manufacturer to contain a known concentration of analyte.

Standardizations of instruments and methods are accomplished by preparing a series of standard solutions and analyzing the standards according to a written procedure. From the results of the standard analyses, standard curves are constructed and used to determine the concentration of the species in each sample.

Standard curves are particularly useful in quantitative analyses using spectrophotometry. Many spectrophotometric methods adhere to Beer's Law, which states that the absorptivity of a substance is constant with respect to changes in concentration. For those colorimetric methods that adhere to Beer's Law and produce repeatable, stable color complexes, complete standard curves are performed at a minimum of once every 6 months. For metals analyses by atomic absorption spectrophotometry, complete standard curves are performed each day that analyses for a particular metal are performed.

5.3.2 Verification Standards (Continuing Calibration)

In general, methods that do not require a complete daily standard curve require the analysis of at least one standard each day to verify instrument and method performance. The result of the daily standard analyses must be within the control limits, which are set at the number of available values ± three times the standard deviation. Appropriate corrective measures must be taken if the acceptance criteria are not met.

TABLE 5-1

STANDARDIZATION AND INTERNAL QUALITY CONTROL REQUIREMENTS FOR NON-TCL ANALYSIS OF SAMPLES AIW FRANK/MID-COUNTY MUSTANG SITE CHESTER COUNTY, PENNSYLVANIA

Parameter	Standardization (Initial Calibration)	Verification Standard (Continuing Calibration)	Method Blank	Laboratory Duplicate	Matrix Spike
Chemical Oxygen Demand (COD)	D	1/20	(1)	1/Batch	NA
Total Organic Carbon (TOC, aqueous)	D	1/20	1/Batch	1/Batch	NA
BOD_5	E	E	NA	1/Batch	NA
TSS/TDS	Scale calibration daily	NA	NA	1/Batch	NA
Alkalinity	E	NA	NA	1/Batch	NA
NO_3/NO_2-Nitrogen	D	1/20	1/Batch	1/Batch	NA
NH_3-Nitrogen	D	1/20	1/Batch	1/Batch	NA
Chloride	D	1/20	1/Batch	1/Batch	NA
Sulfate	D	1/20	1/Batch	1/Batch	NA
Hardness	E	NA	NA	1/Batch	NA
Acidity	E	NA	NA	1/Batch	NA
pH (soil)	D	NA	NA	1/10	NA
Specific Conductance	D	NA	1/10	1/10	NA
Oxidation-Reduction Potential	D	NA	1/10	1/10	NA
CEC	NA	NA	1/Batch	NA	NA
Grain Size	Sieve Calibration E	NA	NA	NA	NA

TABLE 5-1
STANDARDIZATION AND INTERNAL QUALITY CONTROL REQUIREMENTS
FOR NON-TCL ANALYSIS OF SAMPLES
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA
PAGE TWO

Parameter	Standardization (Initial Calibration)	Verification Standard (Continuing Calibration)	Method Blank	Laboratory Duplicate	Matrix Spike
TOC (soil)	D	NA	1/10	1/10	NA
BTu	E	M	NA		NA
Ash Content	NA	NA	NA	1/10	NA
Chlorine Content (non-aqueous)	NA	NA	(2)	1/10	NA
Tox (aqueous waste)	D	1/20	(1)	1/10	NA
Ignitability	D	NA	NA	1/10	NA
Reactivity	1/Batch	1/Batch	1/Batch	1/20	1/20
Corrosivity	NA	NA	NA	1/10	NA

(1) A blank is analyzed daily or with each set of samples, but it is used to zero the analytical system.
D Each day samples are run.
E Eat set of samples prepared.
M Each month samples are run.
NA Not applicable.
1/20 One in 20 samples.
1/10 One in 10 samples.

5.3.3 Preparation Blanks

As a check for glassware and reagent contamination in the laboratory, an aliquot of deionized water is taken through the sample preparation procedure. A preparation blank is required each day that samples are prepared.

5.3.4 Duplicates

One in 20 samples that are analyzed for a specific parameter is run in duplicate. Different aliquots are often used in many instances to conserve samples and to test for matrix interferences. RPD is calculated and compared to the internally established control limits as described in the quality control section of the QA/QC program summary.

5.3.5 Matrix Spikes

One in twenty samples that are analyzed for a specific parameter is spiked with the analyte, for those parameters for which a stable standard is available. An aliquot of standard solution is added to the sample. Percent recovery is calculated and compared to the internally established control limits as described in the quality control section of the QA/QC program summary.

Standardization and internal QC requirements for non-TCL analyses are presented in Table 5-1.

6.0 ANALYTICAL PROCEDURES

Solid and aqueous samples will be collected for both chemical and physical analyses. The analytical procedures to be used are summarized in Table 6-1. Method references are included as footnotes.

SAS Request Forms are presented in Appendix C of this POP.

TABLE 6-1

ANALYTICAL METHODS FOR CHEMICAL AND PHYSICAL PARAMETERS
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

Analytical Parameter	Non-Aqueous Matrix Analytical Method	Aqueous Matrix Analytical Method
TCL Volatiles	CLP Protocol (2/88)	Draft Superfund analytical methods for low concentration water for organic analyses
TCL Base/Neutral and Acid Extractables and Pesticides/PCBs	CLP Protocol (2/88)	CLP Protocol (2/88)
TAL Metals/CN	CLP Protocol (3/90)	CLP Protocol (3/90)
pH	SW846-9045	Field analysis
Eh	ASTM D1498	Field analysis
Temperature	Field Analysis (Sediments)	Field analysis
Specific Conductance	EPA 120.1	Field analysis
Dissolved Oxygen	--	Field analysis
COD	--	EPA 410.2
TOC	MSA 29.3.5.2	EPA 415.1
BOD_5	--	SM 5210B
TSS	--	EPA 160.2
TDS	--	EPA 160.1
Alkalinity	EPA 310.1	EPA 310.1
Acidity	EPA 305.1	EPA 305.1
NO_3/NO_2-Nitrogen	--	EPA 353.3
NH_3-Nitrogen	--	EPA 350.2
Hardness	--	EPA 130.2
Sulfate	--	EPA 375.4
Chlorides	--	EPA 325.2
CEC	SW846-9081	--
Moisture Content	ASTM D2216-80	--

TABLE 6-1
ANALYTICAL METHODS FOR CHEMICAL AND PHYSICAL PARAMETERS
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA
PAGE TWO

Analytical Parameter	Solid Non-Aqueous Matrix Analytical Method	Aqueous Matrix Analytical Method
Grain Size	ASTM D422-63	--
Bulk Density	MSA - Chapter 13	--
TCLP	Appendix II of 40 CFR 261	--
BTU Content	ASTM D 3286-85	--
Ash Content	ASTM D 2974-84	ASTM D 2974-84
Chlorine Content(1)	ASTM D 808-81	--
Ignitability(2)	SW846 - 1010	--
Reactivity	SW846 Section 7.3	SW846 Section 7.3
TOX(1)	--	SW846-9020
Corrosivity(3)	--	SW846 - 1010(2)
Asbestos	EPA 600/M4-82-020	--

ASTM American Society for Testing Materials.
EPA EPA, March 1983. "Methods for Chemical Analysis of Water and Wastes."
MSA American Society of Agronomy, 1986. "Methods of Soil Analysis." Madison, Wisconsin.
SM "Standard Methods for the Examination of Water and Wastewater," 1989.
SW EPA, September 1986. "Test Methods for Evaluating Solid Wastes--Physical/Chemical Methods," Third Edition.

(1) Non-aqueous drum, tank, and building samples will be analyzed for chlorine content by ASTM D 808-81, while aqueous drums, tank, and building samples will be analyzed for TOX by SW846-9020.
(2) Ignitability will only be analyzed on non-aqueous drum, tank, and building samples.
(3) Corrosivity will only be analyzed on aqueous drum, tank, and building samples.

7.0 DATA REDUCTION, VALIDATION, AND REPORTING

Data reduction, validation, and reporting will be conducted as described below.

7.1 DATA REDUCTION

The calculation of final results from raw data varies from parameter to parameter with the calibration approach. The ratio of instrument response to analyte concentration is determined for one or more standards. In general, if the concentration/instrument response ratio is linear, the average of the ratios is used to calculate sample results. If the response is not linear, response is plotted against concentration, and sample results are quantitated from the resultant curve. Each method listed in Table 6-1 provides an equation to be used when calculating concentrations.

Results are generally expressed to two significant figures. Results for aqueous samples are expressed in µg/L. Organic results for solid samples are expressed in µg/kg, whereas inorganic results are expressed in mg/kg.

7.2 DATA VALIDATION AND REPORTING

The results of quality control checks are the primary tools used for data validation. Quality control checks are described in Section 8.0. Acceptance criteria (control limits) are discussed in Section 3.0. Raw data and final results are reviewed by the laboratory group leader on a daily basis. The group leader confirms that documentation is complete and legible; qualitative identifications are accurate; calculations are accurate; results are expressed in the appropriate units and number of significant figures; and the required quality control checks were run and met acceptance criteria. Review and approval of the data is documented by the group leader.

The tabulated chemical-analytical data generated by the CLP and/or other laboratory will be sent to the Regional Laboratory Sample Coordinator (RLSC) who will log it into the validation tracking system. The data will be validated by HALLIBURTON NUS chemistry/toxicology personnel experienced in EPA Region III validation procedures and requirements. Validation of the chemical-analytical data will include a quality assurance assessment to determine whether specified protocols were followed by the laboratory personnel. Results for trip blanks, field blanks and duplicates will be reviewed for consistency (i.e., relative percent difference values) and to identify laboratory artifacts. The CLP and/or other laboratory will provide reagent blank, surrogate spike, and matrix spike results. This

information will also be reviewed through comparison with the specified control limits (see Section 3.0). All RAS data validation will be performed in accordance with the latest EPA Functional Guidelines. The SAS data validation will be performed in accordance with the SAS request and will use the latest EPA Functional Guidelines as guidance. Documentation of the validity of laboratory results will be provided to the EPA in the form of letter reports.

Chemical-analytical data generated during the study will be reduced to a concise form for presentation in the RI Report. The analytical results will be managed using an existing computer program developed by HALLIBURTON NUS specifically for chemical data bases. This program is capable of handling all TCL organic and TAL inorganic chemicals, and will be customized for the AIW Frank Site to accommodate all indicator parameters. Quality assurance procedures will be implemented in an effort to prevent errors occur during data entry. The data entered into the program are checked by the computer operator, and the printouts are checked against the original laboratory sheets by a chemist.

8.0 INTERNAL QUALITY CONTROL CHECKS

Quality Control checks to be implemented in the field and in the laboratory are described below.

8.1 FIELD QUALITY CONTROL CHECKS

In addition to periodic calibration of field equipment and appropriate documentation, quality control samples will be collected or generated during environmental sampling activities. Quality control samples include field duplicates and field blanks. Each type of field quality control sample is defined as follows:

8.1.1 Field Duplicates

Field duplicates are samples that are divided into two portions at the time of sampling. Field duplication provides precision information regarding homogeneity, handling, shipping, storing, preparation, and analysis. Field duplicates will be submitted at a frequency of 1 per every 20 samples, or one per sampling trip if less than 20 samples are collected.

8.1.2 Equipment Rinsate Blanks

Rinsate blanks are obtained under representative field conditions by running analyte-free deionized/distilled water through sample collection equipment (bailer, split-spoon, corer, etc.) after decontamination and placing it in the appropriate sample containers for analysis. Rinsate blanks will be used to assess the effectiveness of decontamination procedures and will be collected for each type of nondedicated sampling equipment used and will be submitted at a frequency of 1 per every 20 samples or 1 per sampling trip if less than 20 samples are collected.

8.1.3 Field Blanks

Field blanks are samples that are prepared in the field under representative field conditions. Analyte-free deionized/distilled water is poured into the laboratory-provided sample bottles and handled as an environmental sample. They are collected at a frequency of 1 per every 20 samples or 1 per sampling trip if less than 20 samples are collected.

8.1.4 Trip Blanks

Trip blanks are also prepared in the laboratory or in field prior to sampling events in a clean area. They are analyzed only for volatile organics. Trip blanks are transported over the site with the sampling teams to evaluate field-derived contamination and accompany samples through the entire shipping process. They are collected at a frequency of 1 per day or 1/20 per shipment for each matrix.

The proposed field quality control samples are included in Table 3-1 (Section 3).

8.2 LABORATORY QUALITY CONTROL CHECKS

Laboratory analysis will be conducted in accordance with the appropriate analytical methods (Table 6-1). Internal laboratory quality control checks include surrogate and matrix spike addition and analysis and reagent blank generation and analysis. Laboratory quality control procedures for organic and inorganic analyses are summarized in the CLP Statement of Work, Attachment E.

9.0 PERFORMANCE AND SYSTEM AUDITS

Audits to be conducted in the field and in the laboratory are described below.

9.1 FIELD AUDITS

A QA performance audit will be performed by the designated ARCS III Quality Assurance Representative (QAR) during the RI. The audit will include checks on adherence to all applicable Standard Operating Procedures as outlined in this POP.

The auditor shall prepare audit checklists or audit guides. The depth and scope of the audit shall be determined and incorporated into the checklist or guidelines. The audit will cover the following items:

- Adherence to sample collection SOPs
- Chain-of-custody
- Documentation of field activities as per SOPs
- Equipment maintenance and calibration
- Training requirements for site workers
- Documentation of variances from field activities and corrective actions

Where an audit team is involved, the audit team leader shall establish the ground rules for the audit and assign to the various team members the specific areas each is to cover in the audit.

The above audit checklist/guide shall be used to guide the audit and to ensure adequate depth, scope, and continuity. However, the auditor shall not restrict the audit when evidence raises questions not specifically addressed in the check lists. The audit activity shall include the review of objective evidence to verify adequate implementation of the Quality Assurance Program.

The auditor shall record each finding of nonconformance to an ARCS requirement (observation or deficiency) on a Quality Notice form. When a finding is identified, sufficient investigation shall be conducted to determine the basic cause of the finding. Findings shall be written only when there is a clear non-compliance with a specific Standard Operating Procedure.

Any identified findings that require immediate corrective action shall be reported immediately to the Project Manager and recorded on a Quality Notice form.

Corrective action is addressed in Section 12.0. Distribution of quality assurance reports is addressed in Section 13.0.

9.2 LABORATORY AUDITS

Blind or double-blind Performance Evaluation (PE) samples are sent to CLP laboratories on a quarterly basis. The CLP Statement of Work, Attachment E, contains specific requirements for performance and systems audits.

If non-CLP laboratories are used for the SAS analyses, they must be fully certified and approved. Quality assurance/quality control procedures must be in use. An internal audit schedule must be available, as well as a record of audits by certification agencies. The results of all audits and the corrective action process must be available.

10.0 PREVENTIVE MAINTENANCE

Measuring equipment used in environmental monitoring or analysis and test equipment used for calibration and maintenance shall be controlled by established procedures. Measuring and test equipment shall have an initial calibration and shall be recalibrated at scheduled intervals against certified standards, according to the CLP Statement of Work, Attachment E, or the procedures for other methods. Equipment will be calibrated periodically. Test equipment used for calibration of sensors shall also be calibrated at least once a year or when maintenance or damage indicates a need for recalibration.

HALLIBURTON NUS maintains a large inventory of ARCS III sampling and measurement equipment at their ARCS III equipment warehouse, which is local to the site. In the event that failed equipment cannot be repaired, replacement equipment can be shipped or carried to the site from the warehouse to minimize downtime.

11.0 DATA ASSESSMENT FOR PRECISION, ACCURACY, AND COMPLETENESS

The procedures used to assess precision, accuracy, and completeness (PAC) of laboratory data are described in Section 3.2. Upon completion of the analytical phases of the project, data will be reviewed and validated as outlined in Section 7.0. In conjunction with the data review and validation, the specific PAC results will be compared with the laboratory quality control criteria and the completeness objective. Discrepancies may affect the usefulness of the data.

12.0 CORRECTIVE ACTION

The need for corrective actions may become apparent during surveillance of field activities, procurement of services and supplies, or other operations that may affect the quality of work. Deficiencies and nonconformances will be promptly identified by the QAR's quality assurance checks in the audit reports outlined in this QAPP. Corrective action will be taken immediately by the Project Manager and/or field personnel.

The identification of significant conditions adverse to quality, the cause of the conditions, and the corrective actions shall be documented by the QAR and reported to the appropriate levels of management. The HALLIBURTON NUS Project Manager will have overall responsibility for implementing corrective actions, and must identify those responsible for initiating corrective action to remedy immediate effects of the problem.

The corrective action program covers the analysis of the cause of any negative audit findings and the corrective actions required. This program includes the investigation of the cause of significant or repetitious unsatisfactory conditions relating to the quality of sampling, service, or the failure to implement or adhere to required quality assurance practices such as SOPs.

Acceptability of laboratory data is defined by the PARCC parameters in Section 3.2 of this QAPP. If the data do not meet these criteria, it may be necessary to resample the locations for which deficiencies were noted. CLP laboratories have audit and corrective action procedures in place that they must follow.

13.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The Quality Assurance Representative (QAR) shall forward to the Quality Assurance Officer a report summarizing the quality assurance and quality control status for the project and any conditions adverse to quality. Topics to be included in the report are as follows:

- Results of any audits
- Results of surveillances
- Any nonconformances initiated
- Training provided to project personnel
- Any significant quality assurance problems, together with recommended solutions

The Quality Assurance Officer will compile the reports from the QAR into a composite report for the Project Manager.

Assessment of the measurement data for precision, accuracy, and completeness is performed by HALLIBURTON NUS chemists/toxicologists and is reported to the Project Manager and CRL in the form of data validation letters.

It is tentatively planned that one field audit and one file audit will be conducted during the RI/FS. The field audit will be performed midway through the field investigation, while the file audit will be performed at a time near the project completion. Audit details will be determined immediately prior to audit performance, to tailor the audits to ongoing project activities. If the planned field audit reveals substantial QA deficiencies, a second field audit may be performed to ensure that corrective measures have been implemented for field activities. If the first field audit reveals few or no substantive QA deficienciess, no further field audits will be needed.

REFERENCES

American Public Health Association, 1980. Standard Methods for the Examination of Water and Wastewater - 15th edition. Washington, D.C.

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EPA, March 1983. Methods for Chemical Analysis of Water and Wastes. EPA 600/4-79/020.

EPA, October 26, 1984. Federal Register.

EPA, September 1986. Test Methods for Evaluation of Solid Waste-Physical/Chemical Methods - SW 846.

EPA, December 1988. User's Guide to the Contract Laboratory Program.

EPA, February 1988. Statement of Work for Organics Analysis, Multi-Media, Multi-Concentration.

EPA, March 1990. Statement of Work for Inorganics Analysis, Multi-Media, Multi-Concentration.

VOLUME II

FIELD SAMPLING PLAN

HALLIBURTON NUS
Environmental Corporation

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R-33-5-91-13

REVISED FINAL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

PROJECT OPERATIONS PLAN

VOLUME II - FIELD SAMPLING PLAN

AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

EPA WORK ASSIGNMENT NUMBER 37-18-3L2S
CONTRACT NUMBER 68-W8-0037

HALLIBURTON NUS PROJECT NUMBER 2753

JANUARY 1992

SUBMITTED FOR HALLIBURTON NUS BY:

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APPROVED:

LEONARD C. JOHNSON
ARCS III PROGRAM MANAGER

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1.0 INTRODUCTION

The field sampling plan (FSP) provides details regarding the performance of field investigation activities at the AIW Frank/Mid-County Mustang Site. This document is to be used in conjunction with the Quality Assurance Project Plan (QAPP) and Health and Safety Plan (HASP) to direct all field activities at the site.

Field activities at the site will consist of the following subtasks:

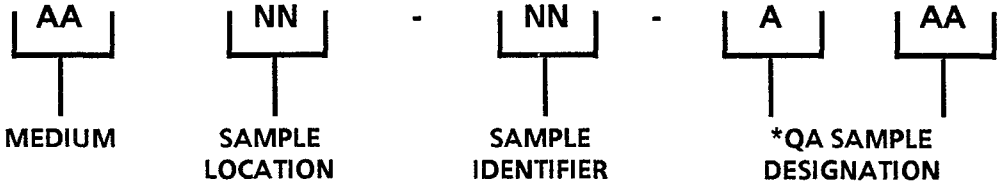
- Mobilization/demobilization
- Residential well sampling
- Geophysical survey
- Soil gas survey/test pit excavation
- Hydrogeologic investigation
- Media sampling
- Drum, tank, and building sampling
- Ecological assessment
- Site survey
- RI waste disposal
- Boundary Fence Completion
- Front building demolition/removal

2.0 GENERAL FIELD GUIDELINES

2.1 SAMPLE IDENTIFICATION SYSTEM

Each sample taken from the AIW Frank/Mid-County Mustang Site will be assigned a unique sample tracking number. The sample tracking number will consist of a three-segment, alpha-numeric code that identifies the sample medium, location, and sample depth (in the case of soil samples) or the sampling event (in the case of monitoring well samples). Any other pertinent information regarding sample identification will be recorded in the field logbooks.

The alpha-numeric coding to be used in the sample numbering system is explained in the following diagram and the subsequent definitions:



*Add an X to the third segment if analyzing for dissolved metals.

Character type:

A = Alpha
N = Numeric

Medium:

MW = Groundwater from monitoring well
RW = Groundwater from residential well
SO = Surface soil
TP = Subsurface soil
SW = Surface water

SD = Sediment

Sample location:

Locations of a given medium will be numbered sequentially beginning with "01." For monitoring well samples, the monitoring well number will be used. Monitoring well numbers for new wells will be assigned sequentially beginning with 07. Onsite monitoring wells will be numbered in sequence from 07 to 10. Offsite monitoring wells will be sequentially numbered 11 to 15.

Sample identifier:

For surface soil samples = 00 for all surface soils
For subsurface soil samples = Sequential number (e.g., 01 or 02 for first versus second sample taken
For other media = Sample round (e.g., 01 or 02)

QA Sample Designation:

X = Filtered Sample (unfiltered samples will not be separately identified)
D = Duplicate
R = Rinsate Blank
F = Field Blank
T = Trip Blank
M = Matrix Spike/Duplicate
XD = Dissolved Metals Duplicate
XR = Dissolved Metals Rinsate Blank
XM = Dissolved Matrix Spike/Duplicate
Omitted for other samples.

For example, a groundwater sample collected during Round 1 from monitoring well 4 would be designated as:

MW04-01

A duplicate sample from that well would be

MW04-01-D

A groundwater sample collected during Round 2 from that well would be:

MW04-02

The first subsurface soil sample taken from Test Pit No. 2 would be:

TP02-01

Information regarding sample labels and tags to be attached before shipment to a laboratory is contained in Section 5.2 of HALLIBURTON NUS SOP SA-6.1. Appendix A contains an example of the sample label, sample tag, and chain-of-custody seal for use in Region III. These documents will contain the designation for filtered and unfiltered groundwater samples.

2.2 SAMPLE HANDLING

Sample handling includes the field-related considerations connected with the selection of sample containers, preservatives, allowable holding times, and the analyses requested. The EPA User's Guide to the Contract Laboratory Program (EPA, December 1986), verbal guidance from the Region III Central Regional Laboratory (CRL), and the Federal Register (EPA, October 26, 1984) address the topics of containers and sample preservation. Table 2-1 provides a site-specific summary of all sample handling considerations.

2.3 SAMPLE PACKAGING AND SHIPPING

Samples will be packaged and shipped in accordance with the EPA User's Guide to the Contract Laboratory Program (EPA, December 1986) and HALLIBURTON NUS SOPs SA-6.2 and SA-6.6. The Field Operations Leader will be responsible for contacting the EPA Sample Management Office (SMO) for each shipment and will report the following:

- Sampler name and telephone number.
- Case number and/or SAS number of the project.
- Site name/code.
- Number(s), matrix(ces), and concentration(s) of samples shipped.

TABLE 2-1

SUMMARY OF ANALYSES, BOTTLE REQUIREMENTS, PRESERVATION REQUIREMENTS AND HOLDING TIME
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

Media	Analysis	Number of Samples[a]	Number of Containers per Sample	Type of Container	Preservation Requirements	Holding Time[b]
Groundwater (1st Round)	TCL Volatiles (Low Concentration)	46	3 (1)	40-mL VOA vial	HCl to pH <2; Cool to 4°C	14 days
	TCL Base/Neutral and Acid Extractables and Pesticides/PCBs	38	2 (1)	80-oz. amber glass	Cool to 4°C	7 days to extract; 40 days after extraction
	TAL Metals-Total	40	1 (2)	1-liter polyethylene bottle	HNO_3 to pH <2; Cool to 4°C	6 months (3)
	Cyanide	40	1 (2)	1-liter polyethylene bottle	NaOH to pH >12; Cool to 4°C	14 days
	TAL Metals-Dissolved	36	1 (2)	1-liter polyethylene bottle	HNO_3 to pH <2; Cool to 4°C	6 months (3)
	pH, Eh, Temperature, Conductivity (field analysis)	32	----	Field Measurement	----	----
	BOD_5	11	1	1-liter polyethylene bottle	Cool to 4°C	48 hours
	COD, TOC, NO_3/NO_2-Nitrogen	11	1	1-liter polyethylene bottle	H_2SO_4 to pH <2; Cool to 4°C	28 days
	Ammonia	11	1	1-liter polyethylene bottle	H_2SO_4 to pH <2; Cool to 4°C	28 days
	TSS, TDS, Alkalinity, Chloride, sulfate	11	1	1-liter polyethylene bottle	Cool to 4°C	TSS, TDS: 7 days Alkalinity: 14 days Chloride, Sulfate: 28 days
Groundwater (2nd Round)	TCL Volatiles (Low Conc.)(4)	23	3 (1)	40-mL VOA vial	HCl to pH <2; Cool to 4°C	14 days

TABLE 2-1
SUMMARY OF ANALYSES, BOTTLE REQUIREMENTS, PRESERVATION REQUIREMENTS AND HOLDING TIME
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA
PAGE TWO

Media	Analysis	Number of Samples[a]	Number of Containers per Sample	Type of Container	Preservation Requirements	Holding Time[b]
Surface Water	TCL Volatiles (Low Concentration)	13	3 (5)	40-mL VOA vial	HCl to pH <2; Cool to 4°C	14 days
	TCL Base/Neutral and Acid Extractables and Pesticides/PCBs	11	2 (5)	80-oz. amber glass	Cool to 4°C	7 days to extract; 40 days after extraction
	TAL Metals-Total	11	1 (6)	1-liter polyethylene bottle	HNO_3 to pH <2; Cool to 4°C	6 months (3)
	Cyanide	11	1 (6)	1-liter polyethylene bottle	NaOH to pH >12; Cool to 4°C	14 days
	TAL Metals-Dissolved	10	1 (6)	1-liter polyethylene bottle	HNO_3 to pH <2; Cool to 4°C	6 months (3)
	pH, Eh, Temperature, Conductivity, Dissolved Oxygen (field analysis)	8	----	Field Measurement	----	----
	Alkalinity, Acidity, Sulfate, TDS, TSS	9	f	1-liter polyethylene bottle	Cool to 4°C	TDS, TSS: 7 days; Alkalinity, Acidity: 14 days; Sulfate: 28 days
	Hardness	9	1	500-mL polyethylene bottle	HNO_3 to pH <2; Cool to 4°C	6 months

TABLE 2-1
SUMMARY OF ANALYSES, BOTTLE REQUIREMENTS, PRESERVATION REQUIREMENTS AND HOLDING TIME
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA
PAGE THREE

Media	Analysis	Number of Samples[a]	Number of Containers per Sample	Type of Container	Preservation Requirements	Holding Time[b]
Sediments	TCL Volatiles	12	3	40-mL VOA vial	Cool to 4°C	14 days
	TCL Base/Neutral and Acid Extractables and Pesticides/PCBs	12	1	8-oz. wide-mouth glass jar	Cool to 4°C	7 days to extract; 40 days after extraction
	TAL Metals/CN	12	1	8-oz. wide-mouth glass jar	Cool to 4°C	6 months (7)
	TCLP(8)	5	2	32-oz. wide-mouth glass jar with teflon-lined cap	Cool to 4°C	(9)
	Temperature	10	----	Field Measurement	----	----
	pH, Eh, specific conductance	10	1	8-oz. wide-mouth glass jar	Cool to 4°C	14 days
	Cation exchange capacity (CEC)	3	1	8-oz. wide-mouth glass jar	None	None
	Moisture content, bulk density	2	1	32-oz. wide-mouth glass jar	None	None
	Grain size	2	1	32-oz. wide-mouth glass jar	None	None
	Total Organic Carbon (TOC)	10	1	8-oz. wide-mouth glass jar	Cool to 4°C	28 days

TABLE 2-1
SUMMARY OF ANALYSES, BOTTLE REQUIREMENTS, PRESERVATION REQUIREMENTS AND HOLDING TIME
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA
PAGE FOUR

Media	Analysis	Number of Samples[a]	Number of Containers per Sample	Type of Container	Preservation Requirements	Holding Time[b]
Soil	TCL Volatiles	59	3	40-mL VOA vial	Cool to 4°C	14 days
	TCL Base/Neutral and Acid Extractables and Pesticides/PCBs	49	1	8-oz. wide-mouth glass jar	Cool to 4°C	7 days to extract; 40 days after extraction
	TAL Metals/CN	49	1	8-oz. wide-mouth glass jar	Cool to 4°C	6 months (7)
	pH; Eh	43	1	8-oz. wide-mouth glass jar	Cool to 4°C	14 days
	TCLP(8)	8	2	32-oz. wide-mouth glass jar with teflon-lined cap	Cool to 4°C	(9)
	Cation exchange capacity (CEC)	6	1	8-oz. wide-mouth glass jar	None	None
	Total Organic Carbon (TOC)	6	1	8-oz. wide-mouth glass jar	Cool to 4°C	28 days
	Grain size	5	1	32-oz. wide-mouth glass jar	None	None
	Moisture content, bulk density	5	1	32-oz. wide-mouth glass jar	None	None
	Water Leach Test (10)	8	2	32-oz. wide-mouth glass jar	Cool to 4°C	(9)
Tank, Drum, Piping Aqueous Samples	TCL Volatiles	42	2	40-ml VOA vial	None	14 days
	TCL Base/Neutral and Acid Extractables and Pesticides/PCBs	42	1	8-oz. wide-mouth glass jar(11)	None	7 days to extract; 40 days after extraction
	TAL Metals/CN	42	1	8-oz. wide-mouth glass jar(11)	None	6 months (7)
	TCLP (8)	40	2	32-oz. wide-mouth glass jar(11)	None	(8)
	BTU Content, Ash Content, Chlorine Content/TOX, Ignitability, Reactivity, Corrosivity	40	2	8-oz. wide-mouth glass jar(11)	None	None
Building Materials	Asbestos	14	1	Plastic bag	None	None

TABLE 2-1
SUMMARY OF ANALYSES, BOTTLE REQUIREMENTS, PRESERVATION REQUIREMENTS AND HOLDING TIME
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA
PAGE FIVE

(a) The number of samples include actual environmental samples, field duplicates, equipment rinsate blanks, field blanks, and trip blanks.
(b) Holding times begin at the time of sample collection.
(1) Triple volume will be collected for two samples for the matrix spike/matrix spike duplicate.
(2) Double volume will be collected for two samples for the matrix spike/matrix spike duplicate.
(3) The holding time for mercury analysis is 28 days.
(4) A second sampling round is anticipated. The monitoring/residential wells to be sampled and the target analytes for the second sampling round will be determined based on the results of the residential well sampling. It is anticipated that, at a minimum, groundwater samples will be collected from all 17 monitoring wells and the nearby Frame well, and analyzed for TCL volatiles (Draft Superfund Analytical Methods for Low Concentration Water for Organic Analyses) during the second sampling round.
(5) Triple volume will be collected for one sample for the matrix spike/matrix spike duplicate.
(6) Double volume will be collected for one sample for the matrix spike/matrix spike duplicate.
(7) The holding time for mercury analysis is 28 days and for cyanide analysis is 14 days.
(8) Compounds listed in Appendix II of 40 CFR 261 will be analyzed by CLP protocols and SW-846 Methanol 8150 on the extracts obtained from the TCLP extraction procedure.
(9) Holding times for TCLP analysis:
VOAs - 14 days to TCLP extraction; 14 days from TCLP extraction to analysis
BNAs/Pesticides/Herbicides - 14 days to TCLP extraction; 7 days from TCLP extraction to preparative extraction; 40 days to analysis
Metals - 180 days to TCLP extraction; 180 days from TCLP extraction to analysis
Mercury - 28 days to TCLP extraction; 28 days from TCLP extraction to analysis.
(10) TCL organics and TAL metals/CN will be analyzed by CLP protocol on the extracts obtained from using only reagent water as the extraction fluid within the TCLP extraction procedure.
(11) All tank, drum, and piping samples must be placed in paint cans for shipment.

- Laboratory(ies) to which samples were shipped.
- Carrier name and air bill number(s) for the shipment.
- Method of shipment (e.g., overnight, 2-day).
- Date of shipment.
- Suspected hazards associated with the samples or site.

All samples collected from the buildings, drums, and underground storage tanks will be handled as medium concentration samples. These samples (all analytes for all labs) will be placed in their normal containers, which will then be packed in sealed paint cans for shipment to the laboratories.

2.4 DOCUMENTATION

Custody of samples must be maintained and documented at all times. Chain-of-custody begins with the collection of the samples in the field. Section 5.3 of HALLIBURTON NUS SOP SA-6.1 (see Appendix B) provides a description of the chain-of-custody procedures to be followed. An example of the chain-of-custody record is included in Appendix A.

In addition to the EPA-required CLP documentation (e.g., traffic reports) and Quality Assurance (QA) of samples, certain standard forms will be completed for sample description and documentation. These shall include the sample log sheet (for groundwater, surface water, and sediment samples) and project sample shipping logs. An example of these forms can be found in Appendix A and in HALLIBURTON NUS SOP SA-6.6 (see Appendix B). The type of preservative(s) used for each sample will be noted on the sample log sheet. The source of the preservatives and any other reagents will be documented in the site log book.

A bound/weatherproof field notebook shall be maintained for each field activity and/or sampling event (e.g., drilling field notebook maintained by site geologist) and the Site Safety Officer (SSO). The field team leader for drilling, sampling, etc., or his designee, shall record all information related to sampling or field activities. This information will include sampling time, weather conditions, unusual events (e.g., well tampering), field measurements, description of photographs, etc.

A site logbook shall be maintained by the Field Operations Leader (FOL). The requirements of the site logbook are outlined in HALLIBURTON NUS SOP SA-6.3, Sections 5 and 7. This book will contain a summary of the day's activities and will reference the field notebooks when applicable.

Each field team leader who is supervising a drilling subcontractor activity must complete a Daily Record Subsurface Investigation Report. A Weekly Field Summary Report will be completed for all

subcontractor activities. The Daily Record Subsurface Investigation Report documents the activities and progress of the daily drilling activities. The information contained within this report is used for billing verification and progress reports. The driller's signature is required at the end of each working day to verify work accomplished, hours worked, standby time, and material used. The Weekly Field Summary Report summarizes the major subcontractor activities on site for a particular week. The Daily Record Subsurface Investigation Report and Weekly Field Summary Report will be sent to the Project Manager at the end of the week. Examples of both forms are provided in Appendix A and in HALLIBURTON NUS SOP SA 6.5 (Appendix B).

The calibration of monitoring, measuring, or test equipment is necessary to ensure the proper operation and response of the equipment; to document the accuracy, precision, or sensitivity of the measurements; and determine if correction should be applied to the readings. Each instrument requiring calibration shall have its own equipment calibration log documenting the calibration of the equipment including the frequency and type of standard or calibration procedure. An example of this form is found in Appendix A.

At the completion of field activities, the FOL shall submit to the Project Manager all field records, data, field notebooks, logbooks, chain-of-custody receipts, sample log sheets, drilling logs, daily logs, etc. The Project Manager shall ensure that these materials are entered into the ARCS Program document control system in accordance with appropriate administrative guidelines.

Changes in project operating procedures may be necessary as a result of changed field conditions or unanticipated events. The sequence of events associated with field changes is as follows:

- The FOL notifies the Project Manager of the need for the change.

- If necessary, the Project Manager will discuss the change with the pertinent individuals (e.g., EPA Region III RPM) and will provide a verbal approval or denial to the FOL for the proposed change.

- The FOL will document the change on a Task Modification Request form (see Appendix A, page A-24) and forward the form to the Project Manager at the earliest convenient time (e.g., end of the workweek).

- The Project Manager will sign the form and distribute copies to the RPM, Quality Assurance Manager, Field Operations Leader, and the project file.

- A copy of the completed Task Modification Request form will also be attached to the field copy of the affected document (i.e., Work Plan and Project Operations Plan).

3.0 GENERAL FIELD OPERATIONS

3.1 MOBILIZATION/DEMOBILIZATION

Following approval of the Work Plan and this POP, HALLIBURTON NUS will begin mobilization activities. All field team members will review the Work Plan and the POP. The emergency response section of the HASP will be copied and posted separately from the HASP (Volume III of the POP) within the field trailer for ease of access in the event of an emergency. A field team orientation meeting will be held to familiarize personnel with the scope of the RI field activities.

Equipment mobilization may include, but will not be limited to, the mobilization and set-up of the following equipment:

- Field office
- Sanitary facilities
- Utility hook-ups
- Sampling equipment
- Hydrogeologic monitoring equipment
- Health, safety, and decontamination equipment (HALLIBURTON NUS personnel only)
- Subcontractor equipment

The FOL will coordinate the mobilization of the field office, sanitary facilities, and utility hook-ups with the necessary vendors prior to arriving on site. The FOL will also make any necessary equipment purchases in order to conduct the field investigation. The equipment for the various field tasks along with health, safety, and decontamination equipment will be transported to the site by HALLIBURTON NUS field personnel. The HALLIBURTON NUS personnel will supervise the locating of the field office and sanitary facilities, and the installation of electric and telephone utilities. Appropriate local utilities will be notified to clear planned drilling locations prior to the onset of drilling activities. After field activities have been completed, all equipment will be demobilized and returned to the ARCS III equipment warehouse. The field office, sanitary facilities, and utilities will be demobilized and disconnected under the supervision of the FOL.

The subcontractors who are awarded contracts to perform the drilling, surveying, fence construction, building demolition, and waste disposal will begin to mobilize equipment immediately after

receiving notice to proceed. The subcontractors will be responsible for mobilizing and demobilizing the necessary equipment in order to perform the work outlined in the bid specifications.

3.2 RESIDENTIAL WELL SAMPLING

HALLIBURTON NUS may sample a number of residential and business wells which are used for drinking water supplies to help characterize the local groundwater quality and to confirm the results of recent EPA sampling of local residential wells. This selection of the wells to be sampled will be made upon receipt and evaluation of EPA's sampling results. A well survey has already been conducted for the local area as part of the work plan development process. Based on the residential well survey, 12 to 14 wells are available for sampling within an approximate 1/2-mile radius of the site (see Table 3-1). These well locations are shown in Figure 3-1. A standard well survey form will be filled out for each well sampled.(A copy of the form is provided in Appendix A). Owners who give permission to have their wells sampled will be asked to provide, if possible, well construction details such as depth, construction materials, screen interval, well water usage, etc. Details of the residential well sampling procedures are discussed in Section 4.5.2.

3.3 GEOPHYSICAL SURVEY

A geophysical survey will be conducted in the former production area of the AIW Frank/Mid-County Mustang Site to check for buried metal pipes, drums,etc. (Figure 3-2). Specifically, the geophysical survey will be used to locate and determine the number of large underground fuel storage tanks. Three to six tanks are believed to be present near the onsite buildings. The contents of any underground storage tanks discovered onsite will be sampled. Details of the sampling procedure are discussed in Section 4.1. Additionally, any area that may have been used for burial of wastes in the past will be surveyed to check for the potential presence of buried drums.

A grid will be established over the designated area(s) using a surveyor's tape, compass, and pin flags. The nodes of the grid will be spaced 25 feet apart with local adjustments for cultural obstacles (buildings, etc.). The grid will be tied into local features such as building corners so that data points can be quickly relocated at some point in the future after the grid has been removed.

The geophysical survey will be conducted using an electromagnetic conductivity meter (EM-31). Both bulk terrain conductivity and in-phase readings will be taken at each station. The terrain conductivity data will be used to generate an overall terrain conductivity map for the surveyed area, while the in-phase data will be used to identify buried magnetic anomalies. At each station, a total of four readings will be obtained and recorded (two each for both the terrain conductivity and in-phase

TABLE 3-1

RESIDENTIAL, COMMERCIAL, AND MUNICIPAL WELLS PROPOSED FOR SAMPLING
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

Well Owner	Well Location	Resident	Contact	Other Residences Served
Church Farm School	Route 30	Main School Well	Ray Coer	
Church Farm School	11A N. Ship Road	M. Taylor	Ray Coer	113 N. Ship Road (Ruble) 115 N. Ship Road (Young)
Joseph DiAmbrosio, CDS Investments	891 E. Lincoln Highway	Rex Carle	J. D. Ambrosio	713 Exner Lane (Gatlas & Cline) 721 Exner Lane (Reeser) Pipe Maintenance Services Company
St. Paul's Church	E. Lincoln Highway	N/A	Lori Grasoff	
Meridian Bank	E. Lincoln Highway	N/A	Tony Patricco	
R. Hedberg	208 N. Ship Road	Hedberg	R. Hedberg	
R. Hedberg	230 N. Ship Road	Unknown	R. Hedberg	
W. Scudder	116 N. Ship Road	Scudder	W. Scudder	
J. Caraville	117 N. Ship Road	Caraville	J. Caraville	
Entenmann's (2 to 4 wells)	E. Lincoln Highway	N/A	Frank Giuty	
John Castle, Drexel Heating	741 E. Lancaster Avenue	N/A	John Castle	One home, 4 apartments (residents currently unidentifed)

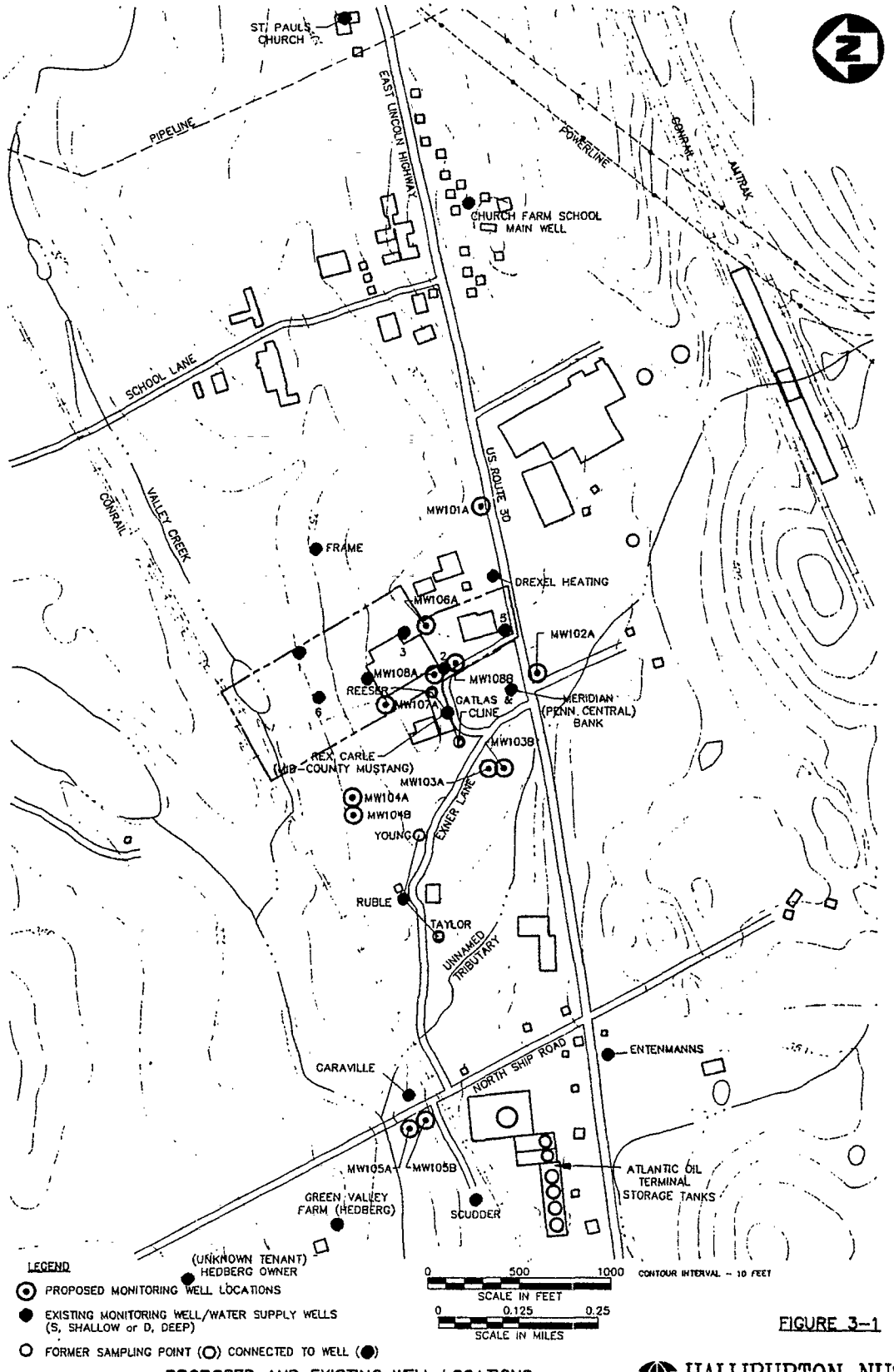


FIGURE 3-1

PROPOSED AND EXISTING WELL LOCATIONS
AIW FRANK/MID COUNTY MUSTANG SITE, CHESTER COUNTY, PA

HALLIBURTON NUS
Environmental Corporation

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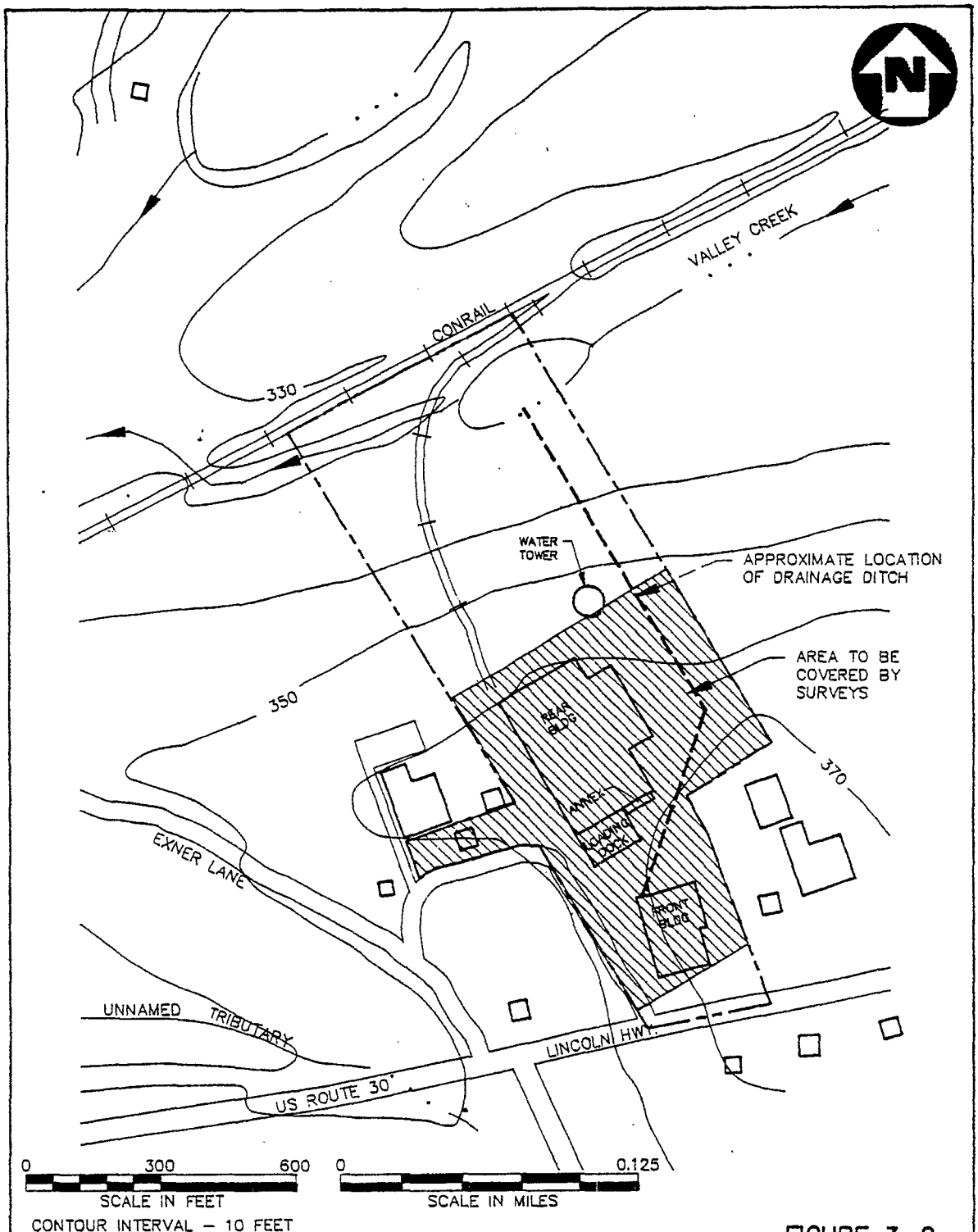

FIGURE 3–2

SOIL GAS AND GEOPHYSICAL SURVEY AREA
AIW FRANK/MID COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

HALLIBURTON NUS
Environmental Corporation

modes). One reading for each mode will be taken with the instrument aligned parallel to the traverse direction, with the other reading for each mode taken with the instrument aligned perpendicular to the traverse direction. In addition, the EM-31 will be continuously monitored in the in-phase mode between stations, to provide more complete coverage of the area. Any conductivity anomalies detected between stations will be marked and the locations/readings recorded.

Instrument readings will be recorded in a field logbook dedicated to the geophysical survey. In addition to the instrument readings, pertinent observations regarding local conditions will be noted. Of particular importance will be the recording of the presence of nearby metallic objects, buildings, electric lines, etc. which may affect instrument responses. In areas of anomalous readings, the grid spacing will be reduced to more precisely define the configuration of the magnetic anomaly.

The data generated by the geophysical survey will be evaluated to identify potential areas of buried magnetic/electrical materials and determine possible locations of the underground storage tanks. Monitoring well and test pit locations will be adjusted to avoid drilling through buried lines and other objects that may be identified. If requested by EPA, additional test pits may be excavated to further investigate subsurface anomalies.

3.4 SOIL GAS SURVEY

A soil gas survey will be performed across the facility to identify potential areas of past discharges of volatile organic compounds (Figure 3-2). These areas may be acting as continuing sources of groundwater contamination. Results of the soil gas survey will be used to locate surface soil sampling points and test pit locations. The results will also be used to modify proposed drilling locations as needed to investigate areas of anomalously high soil gas readings. All unpaved areas within the designated survey area will be investigated. Attempts will also be made to take soil gas readings through some of the paved portions of the survey area. Soil gas locations will be cleared prior to the initiation of boring activities, based on the results of the geophysical survey. Particular care will be taken in areas of known or suspected buried tanks/lines/drums.

Soil gas readings will be taken at 25-foot intervals using the same grid system established for the geophysical survey. Based on recent field experience, HALLIBURTON NUS plans to conduct the soil gas survey as described below. It is the opinion of HALLIBURTON NUS that this approach results in the best combination of cost effectiveness and survey results of the various methods available for soil gas surveys. The soil gas borings will be completed in most instances using an electric-powered demolition hammer attached to a 1/2-inch-diameter steel rod that will be advanced into the subsurface to an average depth of approximately 3 to 4 feet. The rod will then be extracted from the

boring with a mechanical lifting jack. In areas of suspected buried objects, hand augers will be used to advance the boring. A steel or copper tube of the same diameter as the pilot hole will be lowered into the boring to a standard probe depth of approximately 3 feet and any annular space around the tube at ground surface sealed using a flexible gasket. The tube will be attached to an organic vapor detector, and a measurement taken to determine the qualitative presence of total volatile organic compounds. The tube will be purged of residual gas prior to sample collection at each sample location. Readings will be obtained continuously until instrument readings begin to decrease. The highest reading obtained on the organic vapor detector at each grid node will be recorded.

The soil gas survey results will be plotted on a site map in the field, while the survey is in progress, to evaluate and modify the survey as it progresses. The daily soil gas data will be analyzed to determine the mean value and standard deviation for each day. Any readings more than 2 standard deviations above the mean will be considered "hot spot" readings and these areas will be more thoroughly investigated. Areas of relative high soil gas readings will be investigated in greater detail by locally reducing the grid size to further delineate the extent of the soil gas plume(s). At each hot spot identified, a subsurface soil sample will be obtained for laboratory analysis using a hand-operated soil coring device. The results of the soil gas survey will be discussed with EPA project personnel and appropriate modifications to subsequent field activities will be made to investigate suspected areas of subsurface volatile organic contamination. The soil gas survey will provide qualitative data regarding the presence of volatile compounds. Later sampling and laboratory analyses will provide quantitative data regarding subsurface contamination.

3.5 TEST PIT EXCAVATION

Up to five test pits will be excavated to obtain subsurface soil samples at locations where significant contamination is detected by the soil gas survey. The number and location of the test pits will be based on the results of the soil gas survey. The areas with the highest soil gas readings will be targeted for test pit excavation. EPA and PADER will be involved in the decision-making process regarding locations of test pits. Prior to excavation, each proposed location will be checked for the presence of underground utilities. Test pit excavations will be performed according to HALLIBURTON NUS SOP GH-1.8 (see Appendix B).

Actual excavation of test pits will be performed by a subcontractor using a backhoe. The field geologist will log each test pit. Soil/bedrock characteristics will be described as per GH-1.8, along with descriptions of any wastes encountered. A sketch will be prepared and photographs will be taken of each pit. Test pits will be excavated to either the maximum observed waste depth, bedrock, or the maximum reach of the backhoe (12 to 14 feet), whichever is the least.

As excavation activities proceed, soils will be piled up next to the test pit. These excavated soils will be used as backfilling material upon the completion of sampling of the test pit. Test pits will be backfilled to the ground surface.

The test pits will be screened with an organic vapor detector to delineate areas of highest organic vapor readings. Two samples will be collected for analysis from the areas of highest organic vapor readings in each test pit. Exact sampling intervals will be determined in the field by the field geologist, based upon the measured organic vapor levels. If elevated organic vapor readings are not measured within a pit, two samples will be obtained for analysis from stained soils or representative subsurface materials, as determined by the field geologist. Sampling procedures for subsurface soils will be discussed in Section 4.4.1.

3.6 SURVEYS AND INVENTORIES

3.6.1 Building Survey and Inventory

Two large buildings are currently located on the AIW Frank property. Both buildings are warehouse-type structures. During the initial ARCS III site visit, some miscellaneous debris was noted in both buildings. In addition, approximately 30 drums containing unknown materials are located in the rear of the back building. The front building, which initially was observed to only contain some miscellaneous rubble, has been destroyed by a fire which occurred on August 15. An EPA inspection of the building after the fire did not find any evidence of contamination or contaminant releases due to the fire; however, the building shell is currently structurally unstable. A building survey, along with representative sampling of the building contents, is needed to determine whether hazardous materials are present in the back building, and verify the nonhazardous nature of the residual contents of the burned-out front building.

The building survey will be conducted over a 1- to 2-day period. This survey will be a walk-through activity to document the building contents and identify potential sampling locations. The sampling locations may include waste piles, stained soils or granular materials, process lines, liquid wastes, etc. Building contents and the conditions of materials will be recorded in the field notebook with supporting photographs as appropriate. The interiors of the buildings will be surveyed both visually and with an organic vapor detector. Waste materials that register elevated levels of organic vapors or appear suspicious will be noted and marked with flagging tape or pin flags for sampling. Up to 20 miscellaneous waste samples will be taken, not including those to be taken from the 55-gallon

drums in the back of the larger building. Details of both the drum and waste sampling procedures are discussed in Sections 4.2 and 4.3, respectively.

An asbestos inspection/sampling survey will also be conducted in the onsite buildings. The building materials/contents will be visually inspected for potential presence of asbestos, with suspect materials sampled and analyzed for bulk asbestos content. Sampling procedures are described in Section 4.3. A total of approximately 14 grab samples is anticipated for asbestos analysis.

3.6.2 55-Gallon Drum Inventory

The estimated thirty 55-gallon drums in the larger of the two onsite buildings will be inventoried and categorized as empty, partially full, or full. Any markings or labels on the drums will be recorded in the field notebook. All full or partially full drums will be sampled. Where appropriate, drum samples will be composited for analysis in order to reduce the number of samples analyzed. For planning purposes, it is estimated that the contents of the 30 drums can be composited into a maximum of 15 samples for analysis. Details of the drum sampling procedures will be presented in Section 4.2.

3.7 MONITORING WELL DRILLING/INSTALLATION

3.7.1 Number and Location of Wells

A total of 12 monitoring wells will be installed at the AIW Frank/Mid-County Mustang Site to investigate the impacts of past plant activities on groundwater quality in the plant area and to define the overall local hydrogeologic conditions (Figure 3-1). In addition to the five existing onsite wells, there will be four new onsite monitoring wells. Three of the new monitoring wells will be shallow bedrock wells. One will be a deep bedrock well. The deep bedrock well will be paired with one of the shallow wells.

Eight new monitoring wells will be installed offsite. Of these, five will be shallow wells. Three will be deep wells, paired with three of the offsite shallow wells.

Proposed offsite wells include one shallow upgradient well (MW101A) to be installed between AIW Frank and Church Farm School. This well will be used in conjunction with the other proposed and existing wells to confirm local groundwater flow directions, and further test for the presence of upgradient sources of contamination.

A shallow well (MW102A) will be installed on the south side of Route 30, across from the Meridian Bank, to investigate whether the high levels of contamination detected in the bank well could be due to groundwater contamination sources originating on the south side of Route 30.

A shallow and deep well cluster (MW103A, MW103B) will be installed downgradient of the site, on the south side of the groundwater divide. These wells will be used to help delineate the groundwater flow direction and rate, the lateral and vertical extent of contamination, and more accurately define the orientation of the groundwater divide.

A deep/shallow well pair (MW104A, MW104B) will be located offsite northwest of the production area onsite. These wells are also located immediately downgradient of the Pipe Maintenance Services facility. They will help to determine groundwater flow directions and rates, and the vertical and lateral extent of groundwater contamination. The analytical data may provide evidence to determine whether Pipe Maintenance Services is an additional source of contamination in the area.

A final deep/shallow well pair (MW105A, MW105B) will be located on the south side of Valley Creek near North Ship Road and Exner Lane. These wells will help determine the downgradient extent of the plume.

Four onsite wells are proposed. One shallow well (MW106A) will be installed near the former location of the above-ground solvent storage tank. Historically, this is the location of the greatest surface soil contamination. The exact location of this well will be based upon the results of the proposed soil gas survey. The well will be installed over the area with the highest soil gas readings.

A second shallow well (MW107A) will be located immediately downgradient of the larger of the two onsite buildings. This will effectively test for contamination between the AIW Frank Site and the Mid-County Mustang and Pipe Maintenance Service facilities, as well as delineate physical aquifer characteristics on site.

Finally, a deep/shallow well pair (MW108A, MW108B) will be installed close to existing monitoring well No. 2. The deep/shallow pair will be set in bedrock instead of in the overburden (well No. 2 is an overburden well). This will enable better comparison of contaminant levels between onsite and offsite wells, especially the Mid-County Mustang well, since all of the samples will be obtained from the same formation (bedrock). The deep/shallow pair will also be used to determine the vertical and lateral extent of contamination and vertical flow gradient within the aquifer.

Final well locations will be adjusted based on the results of an EPA fracture trace analysis of the local area. Well locations will be shifted as necessary to intersect fracture traces identified near the proposed well locations. Well locations will be checked for the presence of underground utilities prior to beginning drilling operations, and the locations modified as necessary to avoid any utilities present. The shallow wells will be installed across the first significant water-bearing fracture zone (estimated 2 to 3 gpm yield) encountered in bedrock at each drilling location. These wells are estimated to be drilled to a depth between 30 and 80 feet below the ground surface, on average. The deep wells will monitor selected water-yielding fracture zones encountered at greater depths within the bedrock aquifer (estimated average 150-foot depth). The four deep wells will be paired with four adjacent shallow wells to evaluate vertical trends in contaminant levels and identify hydraulic head differentials with depth within the aquifer.

3.7.2 Drilling Procedures

Drilling operations for the overburden portions of monitoring well borings will be conducted using any combination of drilling methods needed to drill through the sediments. The only requirement is that only potable water may be used if a drilling fluid is required. The preferred method of drilling is the air rotary method. The upper portion of the borehole must be of sufficient diameter to install and grout in place a 6-inch-diameter steel casing into bedrock, as per each well requirement.

The boring will be continued into bedrock to the final desired depth, using air rotary drilling methods. The borehole diameter in bedrock will be a minimum 6 inches.

HALLIBURTON NUS will maintain a boring log for each well boring in accordance with HALLIBURTON NUS SOP GH-1.5. These logs will contain descriptions of cuttings only, as split-spoon samples will not be taken. At a minimum, each boring log will contain, where applicable, the following information:

- Soil and bedrock descriptions (cuttings only)
- Depths of changes in lithology
- Moisture observations
- Depths and approximate yields of water bearing (fracture) zones
- Depth to water
- Drilling method
- Changes in drilling rate
- Drill stem chatter
- OVD (MicroTip) readings
- Well construction details

- Total boring depth
- Job name and number
- Well number
- Date

Geologic/hydrogeologic observations will be made and recorded for the entire borehole, including cased sections. Cuttings generated during drilling will be screened with an OVD. Cuttings with elevated organic vapor readings will be containerized in 55-gallon drums and stored onsite for later disposal. Cuttings from onsite borings with organic vapor levels equivalent to background readings will be spread around the borehole. Cuttings from offsite borings with organic vapor levels equivalent to background levels will be transported onsite and placed in a designated area.

3.7.3 Monitoring Well Construction

All shallow monitoring wells will have 6-inch-diameter steel casing set and grouted through the overburden and into the top 5 to 10 feet of underlying bedrock. Deep monitoring wells will have 6-inch steel casing set and grouted into bedrock to a depth of approximately 10 feet below the bottom of the adjacent shallow monitoring well. The annular space around the steel casing will be grouted using cement-bentonite grout (5 percent bentonite, 95 percent cement, maximum of 8.5 gallons of water per 94 pounds of cement). The grout will be emplaced using either the displacement method (preferred method) or by using pressure grouting methods. For the displacement grouting method, the estimated volume of grout required to fill the borehole annulus is placed into the borehole, then the steel casing (with the bottom plugged using a drillable plug) is lowered to the bottom of the borehole, displacing an equivalent volume of grout. Any annular space not filled with grout through the casing displacement will be backfilled with grout from the surface. After allowing the grout to cure, the plug is drilled out from the bottom of the casing and the hole advanced into the target zone for monitoring.

Once the grout has been allowed to set up and cure for 24 hours, the borings will be advanced into the underlying bedrock. Shallow monitoring well borings will be extended to the first significant water bearing fracture zone (estimated 2-3 gpm yield) below the casing as determined by the field geologist. The monitoring well will be left as an open borehole below the casing.

Deep wells will be completed by drilling and setting pressure grouting 6-inch steel casing as described above, then advancing the deep well boring to an estimated average total depth of about 100 feet below the base of the steel casing. The drilling depth may be reduced somewhat, if numerous high-yielding fracture zones are encountered, or extended deeper if no significant water-yielding fracture

zones are encountered in the first 100 feet. Upon reaching the selected final depth, the United States Geological Survey (USGS) will geophysically log the hole. A final selection of the desired monitored interval for the deep well will then be made based on the results of the borehole logging and on observations made during drilling operations. EPA will coordinate geophysical logging activities with the drilling operations at the site. Upon selection of the desired monitoring interval, the deep well will either be completed as a 2-inch-diameter PVC well or as an open borehole well, depending on borehole conditions (i.e., the number and locations of water-yielding fractures intersected). For PVC well completions, the well screen (10 feet long, .020-inch slot size) will be installed across the selected water bearing fracture zone, and a sand pack installed around the screen to approximately 1 to 3 feet above the screen. A minimum 2 foot thick bentonite seal will be installed above the sand pack, then the remainder of the borehole annulus backfilled with cement-bentonite grout, emplaced using a tremie pipe.

Locking steel caps will be installed on the steel well casings. The caps will be of adequate construction to prevent unauthorized access to the well. Casings will have stickups of 2 feet above ground surface. A cement apron will be built up around the casing to prevent ponding of water around the well. All locks supplied for the wells will be keyed alike. After installation, the ground surface, the top of the PVC riser pipe (if any), and the top of the steel well casing will be surveyed to within 0.01-foot vertical accuracy. In addition, the well will be surveyed to a 0.1-foot horizontal accuracy.

In some cases, flush-mounted protective casings may be required. These casings will have an inner locking well cap. Construction details for these casings were provided in the drilling specification developed for the project. Alternative designs may be used upon approval by HALLIBURTON NUS and EPA. It is estimated that two of the wells installed will require flush-mounted protective casings. Well construction details are shown on Figure 3-3.

3.7.4 Well Development

Monitoring wells will be developed after installation to remove fines, sediments, and drill cuttings from the monitored interval of the boring. Wells will be developed by air lift, bailing and surging, or by pumping, as determined by the field geologist. Development methods are described in HALLIBURTON NUS SOP GH-1.7. Wells will be developed until water removed is visibly clear of suspended solids or until approved by the field geologist. Development water will be containerized in an onsite tank for later offsite disposal.

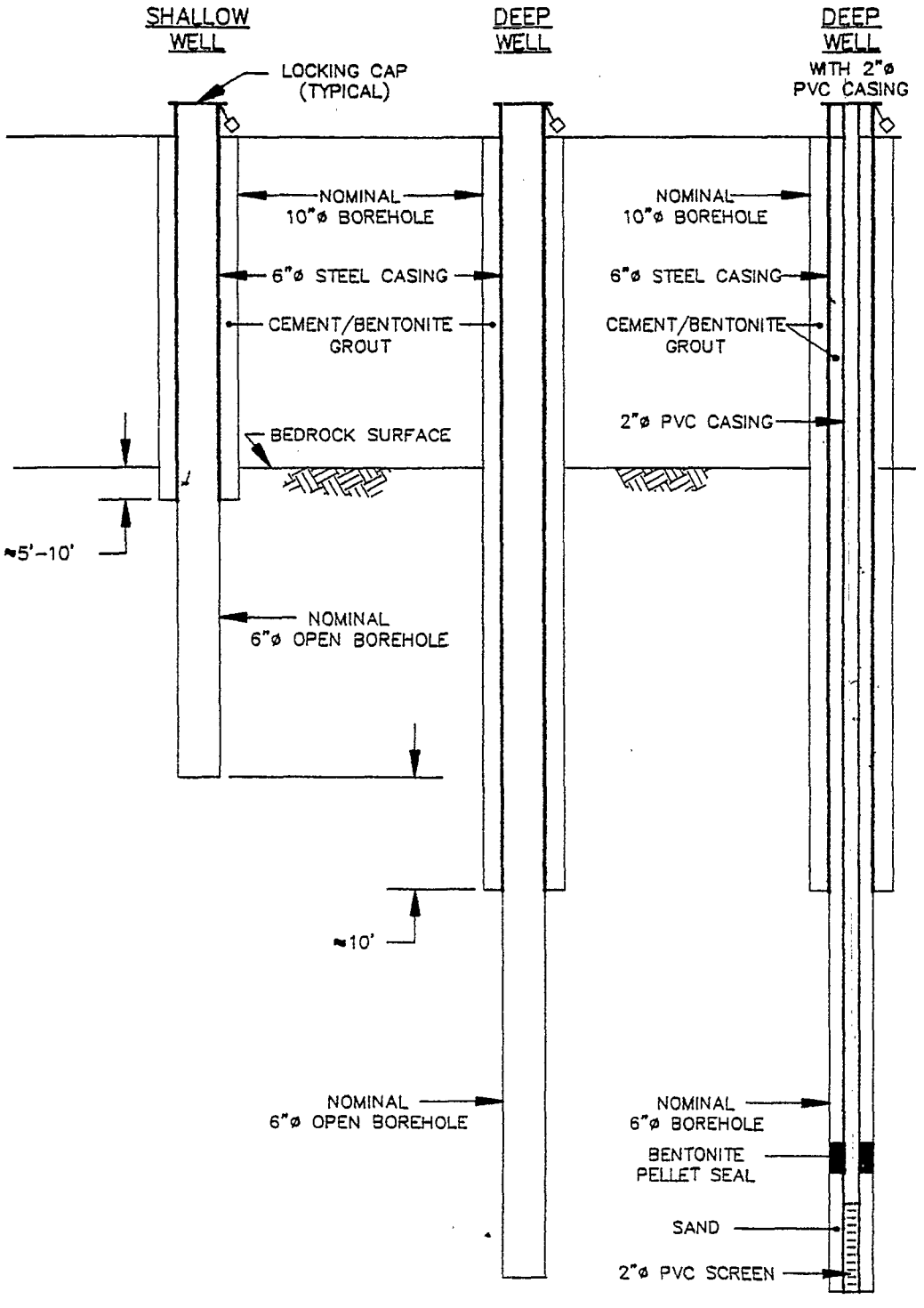

FIGURE 3-3

PROPOSED WELL CONSTRUCTION DETAILS
AIW FRANK/MID COUNTY MUSTANG SITE
CHESTER CO., PA

HALLIBURTON NUS
Environmental Corporation

AR300218

3.8 AQUIFER TESTING

Monitoring wells will be used for aquifer testing to determine the groundwater flow conditions in the water-bearing zones monitored by each well. The data generated from these tests will be used to define the water-yielding characteristics of each formation, develop groundwater velocity values, and estimate the rate of groundwater movement throughout the site. Slug tests will be performed at all 12 newly-installed and all five existing onsite monitoring wells. The results of the tests will be evaluated using the most appropriate evaluation technique for the existing hydrogeologic conditions. Pressure transducers and data loggers will be used for data collection, where appropriate, to obtain sufficiently accurate yield data. Slug tests will be performed in accordance with HALLIBURTON NUS SOP GH-2.4.

At a minimum, the following information will be collected (when applicable) for each well during the performance of slug tests:

- Well number/depth/screened or cased interval/inside diameter of screen or casing/diameter of sand pack
- Static water level
- Method of inducing water-level change (for slug tests)
- Time/recovery data for test
- Total time of test
- Date

Data generated by the tests will be documented on the appropriate data sheets and analyzed for the determination of aquifer characteristics. A sample data sheet is provided in Appendix A.

Additionally, pumping tests will be performed on two onsite monitoring wells. The wells to be pumped will be selected through consultations between HALLIBURTON NUS and EPA. These tests will be performed in accordance with HALLIBURTON NUS SOP GH-2.3. Pumping tests will be conducted until steady-state conditions are achieved or for a maximum duration of 24 hours. Prior to the pumping tests, step-drawdown tests will be performed in order to determine appropriate pumping rates for the pumping tests. The water pumped during the tests will be temporarily stored in onsite tanks, then disposed of later at an offsite treatment facility, or by discharging the treated water to the local sanitary sewer system after treating the water using a portable air stripping or carbon adsorption unit, if necessary.

3.9 WATER LEVEL MEASUREMENTS

Five staff gauges will be located along Valley Creek and its unnamed tributary (Figure 3-4). The staff gauges will consist of marked points (with fluorescent paint) on the tops of culvert pipes, bridge decks, or other permanent features which cross over the stream in the desired areas for the staff gauges. At least three comprehensive rounds of water levels will be taken from the new monitoring wells, the existing onsite wells, and the staff gauges. All measurements for each collection round shall be collected within a 4-hour period of consistent weather conditions to minimize atmospheric/ precipitation effects on groundwater levels. Each round of water level measurements will also be at least 7 days apart and will be obtained at a minimum of 12 to 24 hours after a significant rainfall event. Measurements will be taken with an M-scope (electric water-level indicator) or popper, using the top of the well casing as a reference point for determining depths of water. These water levels will be used to determine groundwater flow directions and to identify any variations in flow directions which may occur throughout the study area over time. A detailed description of measuring water levels is presented in HALLIBURTON NUS SOP GH-2.5 (Appendix B).

3.10 GROUND SURVEYING

After the 12 monitoring wells and five staff gauges have been installed, ground surveying will be performed by a subcontractor. The 12 new wells, five existing onsite wells, the Frame well, and five staff gauges will be surveyed horizontally to the nearest 0.01 foot. Vertical measurements will be referenced to mean sea level (msl).

3.11 ECOLOGICAL ASSESSMENT

A preliminary ecological assessment of the AIW Frank/Mid-County Mustang Site area will be performed during the RI/FS. Currently, there is no evidence to suggest that local ecosystems have been impacted by the site, therefore, the proposed assessment is limited in extent. Should the media sampling results and/or ecological assessment indicate that a potential problem may exist, a more in-depth study will be developed and initiated upon EPA approval of the scope of work and funding. The current project budget estimate does not include costs for an additional expanded assessment.

The preliminary ecological assessment will include a literature review to identify habitats, delineate wetlands, and identify potential aquatic and terrestrial receptors. The literature search will be followed up by a maximum 2-day onsite survey to verify the findings of the literature review, including habitat evaluation and verification of the presence or absence of hydric soils (associated

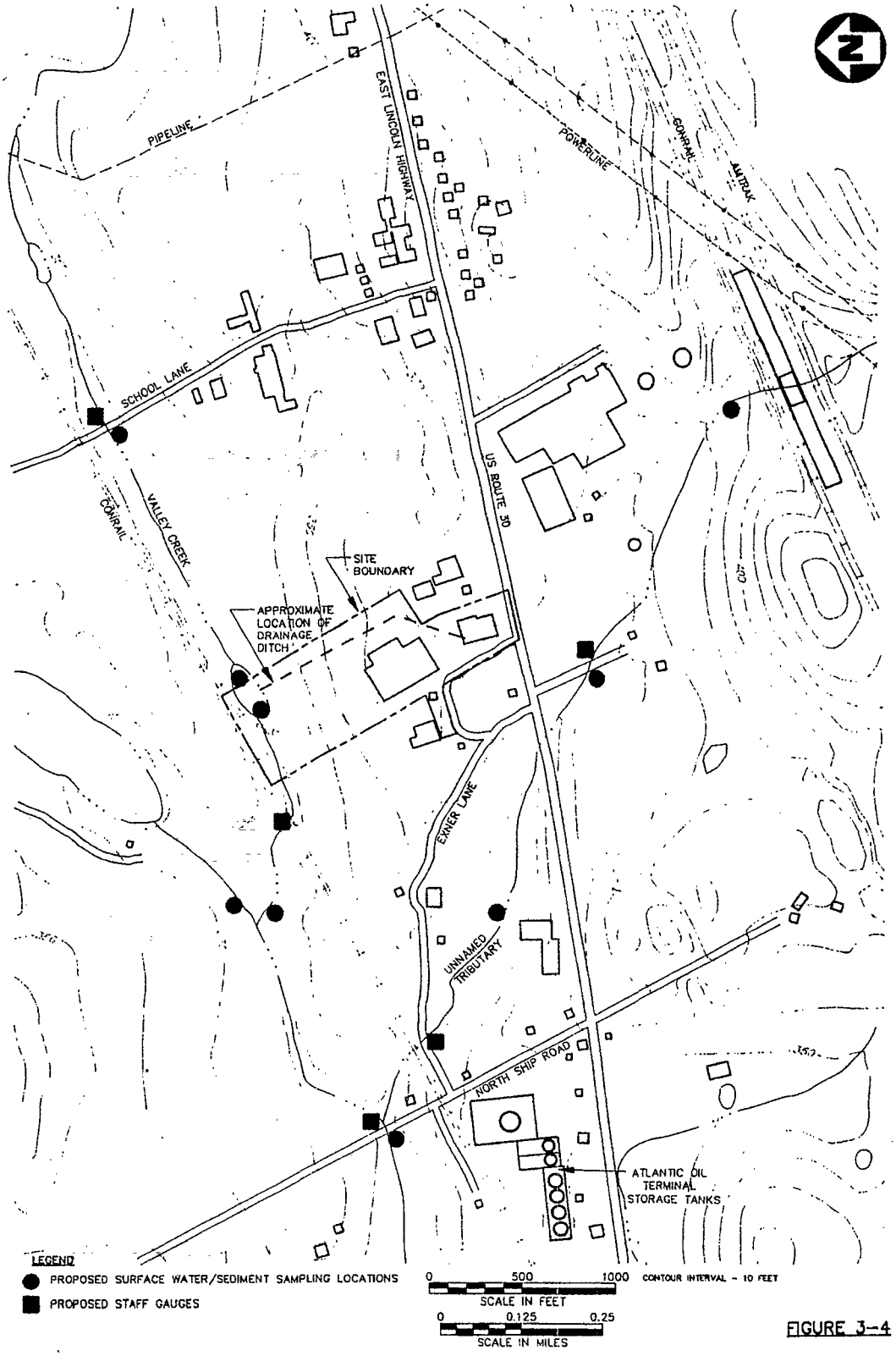

FIGURE 3-4

PROPOSED SURFACE WATER, SEDIMENT AND STAFF GAUGE LOCATIONS
AIW FRANK/MID COUNTY MUSTANG SITE, CHESTER COUNTY, PA

HALLIBURTON NUS Environmental Corporation

AR300221

with wetlands). The onsite survey will be conducted during the growing season. At this time, no sampling is proposed for the assessment.

The ecological assessment shall be performed in accordance with the following two guidance documents:

- U.S. Environmental Protection Agency, 1989. Risk Assessment Guidance for Superfund (Volume 2): Environmental Evaluation, EPA/540/1-89/001.

- U.S. Environmental Protection Agency, 1989. Rapid Bioassessment Protocols for Use in Streams and Rivers, EPA 444/4-89/001.

3.12 RI WASTE DISPOSAL

RI field activities will generate wastes that may or may not be contaminated with hazardous constituents. These wastes would include drill cuttings, used protective clothing and equipment (gloves, boot covers, Tyvek suits, sample scoops, decontamination materials), well development waters, and pumping test waters. Drill cuttings and excavated soils will be screened with an OVD. Drilling cuttings exhibiting elevated levels of organic vapors will be containerized onsite in 55-gallon drums for later disposal as part of the selected remedial action for the site. Drums will be labeled as to their contents and boring number. Drill cuttings without elevated levels of organic vapors from offsite locations will be transported onsite and placed in a designated area. Drill cuttings without elevated levels of organic vapors from onsite locations will be spread around the boreholes. Excavated soils from test pits will be used as backfilling material for the test pits. Used protective clothing and equipment will be containerized in labeled 55-gallon drums and stored onsite for later disposal as part of the selected remedial action for the site. Well development water, purge water, pumping test water, and decontamination water will be containerized in an onsite storage tank for later disposal offsite via discharge to the local sanitary sewer system (after carbon adsorption treatment), and by hauling to an approved wastewater disposal facility, if short term wastewater production exceeds sanitary sewer system discharge limits (450 gallons per day).

3.13 BOUNDARY FENCE COMPLETION

A fence will be installed at the site to limit casual access to the property. The initial fence installation will be a short length of single chain and post fencing installed to eliminate vehicular access to the site through the western portion of the property. Later fencing at the site (to be installed after the front building demolition is completed) may consist of chain-link fencing encompassing the bulk of

the property. The need for, design of, and extent of this fence will be determined after completion of demolition activities. All fencing will be completed by a subcontractor in conformance to specifications developed by HALLIBURTON NUS.

3.14 BUILDING DEMOLITION

The burned out building will be demolished and residual debris removed from the site as part of the RI/FS. A subcontractor will be procured to perform the building demolition, as per the specs produced for the project. A HALLIBURTON NUS onsite representatrive will be assigned to oversee demolition/removal activities to ensure that the activities are performed as per project requirements. A dedicated daily logbook will be kept, detailing demolition/removal activities, recording waste quantities removed, and any other pertinent data.

3.15 REPORTING

The following reports and documentation will be the responsibility of the field geologist during the drilling activities. Copies of applicable forms that will be used by the site geologist are located in Appendix A.

Site Logbook	See NUS ARCS III Program SOP SA-6.3
Daily Activities Record--Field Investigation Report	See Appendix A
Boring Log	See Appendix A
Bedrock Monitoring Well Sheet - Cased Well	See Appendix A
Bedrock Monitoring Well Sheet - Open Borehole Well	See Appendix A
Data Sheet for Slug Test	See Appendix A
Water Level Measurement Sheet	See Appendix A
Weekly Field Summary Report	See Appendix A
Pumping Test Data Sheet	See Appendix A
Hydraulic Conductivity Testing Data Sheet	See Appendix A

The field geologist's logbook shall contain information about the drilling activities such as start/finish times, standby times, and problems or changes encountered during drilling. Drilling/monitoring well construction information (e.g., footage drilled, depth of casing, etc.) will be recorded daily on the boring log and the monitoring well construction sheet. The boring log, along with the geologist's logbook, will be used to prepare the Daily Activities Record-Field Investigation Report. This report

will identify drilling activity and quantities of material used on a daily basis, and shall be signed by the drilling contractor foreman (or equivalent) and the site geologist. The reports shall be submitted to the Project Manager at the end of each week. These reports will also be used to fill out the Daily Activities Record.

4.0 GENERAL SAMPLING OPERATIONS

4.1 UST SAMPLING

Background information indicates the presence of an unknown number of large underground fuel storage tanks located onsite. It is estimated that there are three to six 20,000-gallon underground storage tanks (USTs) at the AIW Frank/Mid-County Mustang Site. The geophysical survey, discussed in Section 3.3, is expected to delineate the number and location of these tanks. Several large diameter pipes sticking up out of the ground between the two onsite buildings are suspected to be access pipes for the tanks.

All identified USTs will be sampled according to HALLIBURTON NUS SOP SA-5.3.

Samples from underground storage tanks will be analyzed for the parameters presented in Table 2-1. Performing additional waste characterization analysis on samples may be necessary in order to facilitate cost-effective disposal. Provisions for such a situation will be explored upon direction from EPA.

4.2 DRUM SAMPLING

Approximately thirty 55-gallon drums occupy the back portion of the larger of the onsite buildings. As discussed in Section 3.6.2, drums will be counted and categorized as full, partially full, or empty. All labels or markings will be recorded in the field notebook, with supporting photographs as appropriate.

All full or partially full drums will be sampled according to HALLIBURTON NUS SOP SA-5.1. Where possible, drum samples will be composited to reduce the total number of samples. Samples from those drums that have similar wastes will be combined in the field to produce samples that are representative of the contents of multiple drums. Onsite compatability testing will be performed on the drum wastes by mixing small quantities from separate drums and observing for a reaction. Only compatible wastes will be composited together for shipping and analysis. HALLIBURTON NUS SOP SF-1.4, Section 5.2.8 describes onsite compatibility testing methods. Specific safety considerations for drum sampling will be addressed in the HASP.

Samples obtained from drums will be analyzed for the parameters presented in Table 2-1. Performing additional waste characterization analysis on samples may be necessary in order to facilitate cost-effective disposal. Provisions for such a situation will be explored upon direction from EPA.

4.3 BUILDING SAMPLING

Up to 20 samples of waste or contaminated materials inside the onsite buildings will be collected and submitted for laboratory analysis. As discussed in Section 3.6.1, the number and location of samples will be determined in the field based on OVD readings and observations by the field geologist. The sampling media involved might include liquids, sludges, or solids. Samples will be collected using stainless steel sampling equipment appropriate to the media (e.g., trowels and bowls for solids).

Waste samples obtained from inside the onsite buildings will be analyzed for the parameters presented in Table 2-1. Performing additional waste characterization analysis on samples may be necessary in order to facilitate cost-effective disposal. Provisions for such a situation will be explored upon direction from EPA.

Samples will also be obtained from the materials used to construct the onsite buildings, to check for the presence of asbestos. The asbestos samples will be grab samples of representative media, placed in labeled plastic ziploc bags and submitted for analysis. Approximately 14 asbestos samples are anticipated.

4.4 SOIL SAMPLES

4.4.1 Subsurface Soil Samples

The subsurface soil sampling program will consist of the collection of two grab samples from each of up to five test pit locations, and the acquisition of a subsurface soil sample from each soil gas hot spot location identified. It is anticipated that a maximum of 15 samples will be collected. At each test pit, two soil samples will be collected from the unsaturated zone. The soil samples will be collected from the excavated soils that produce high organic vapor detector readings during the excavation of the test pit and based on visual observations of potential contamination.

It should be noted that each test pit location will also be a surface soil sampling location. Consequently, three samples (one surface soil and two subsurface soils) will be collected from each

test pit location. Subsurface soils will be collected according to HALLIBURTON NUS SOP GH-1.3, Section 5.2.

Subsurface soil samples obtained from soil gas hot spot locations (estimated 5 total) will be obtained from the same depth interval as the soil gas sample (3-4 feet), using a hand-operated soil coring device or other approved method.

All subsurface soils will be analyzed for the parameters presented in Table 2-1. Only one sample from each test pit will be analyzed for TCLP, CEC, TOC, grain size, moisture content, bulk density, and water leach test.

4.4.2 Surface Soil Samples

Approximately 25 surface soil samples will be collected. Two samples will be collected from offsite to serve as background samples. Five samples will be collected from the drainage ditch that, in the past, directed discharge waters from plant boilers to Valley Creek Pond. The locations of the remaining 18 samples will be selected based on available historical information identifying potential waste source areas (e.g. the former TCE storage tank), visual inspection of the site, and the results of the soil gas survey described in Section 3.4. Surface soils will be collected according to HALLIBURTON NUS SOP GH-1.3, Section 5.2.

Samples will be collected using stainless steel trowels. All surface soils samples will be grab samples. Representative samples will be obtained by collecting material from adjacent to the soil gas sampling point, with an emphasis on sampling soils that visibly appear to be stained. Material will be collected from the 0- to 1-foot depth interval and placed directly into the appropriate sample containers.

All surface soil samples will be analyzed for the parameters presented in Table 2-1.

4.5 GROUNDWATER SAMPLING

Groundwater sampling activities have been separated into two tasks; monitoring well sampling and residential well sampling.

4.5.1 Monitoring Well Sampling

Two rounds of groundwater samples will be collected from the 12 newly-installed monitoring wells, the nearby abandoned well (Frame well), and the five existing onsite wells. Groundwater samples

from monitoring wells will be analyzed for parameters presented on Table 2-1. The non-TCL/TAL parameters will only be analyzed for in samples from the four shallow/deep monitoring well clusters and two proposed onsite shallow monitoring wells. The target analytes for the second round will be determined based on the results of the first round. At this time, it is anticipated that groundwater samples will be collected and analyzed for TCL volatiles during the second round.

Groundwater samples will be collected in accordance with HALLIBURTON NUS SOP SA-1.1, Section 5. Prior to obtaining samples, water levels will be measured and the wells will be purged using a dedicated stainless steel bailer, a suction pump, or a submersible pump. Three to five well volumes will be purged. If the wells are purged dry with less than three well volumes removed, the water level in the well will be allowed to recover at least 70 percent, then a sample will be collected. In the event that recovery is slow, samples will be collected the following day. Field measurements including pH, Eh, temperature, and specific conductance will be taken after each well volume is purged in accordance with HALLIBURTON NUS SOP SF-1.1 (Section 5). Both filtered and unfiltered samples will be obtained for metals analysis. Filtering of samples shall be conducted in accordance with HALLIBURTON NUS SOP SF-1.2 (Section 5.2.5).

Dedicated stainless steel bailers will be used for sample collection. Bailers will be left in the wells between sampling rounds. The sample will be poured directly from the bailer into the appropriate sample bottles for analysis.

All pertinent field data shall be recorded using Attachment A of HALLIBURTON NUS SOP SA-1.1 (Sample Log Sheet in Appendix A) and the site log book.

Samples will be analyzed through the Contract Laboratory Program. At this time, samples from all 17 wells are planned to be analyzed using the Draft Superfund Analytical Methods for Low Concentration Water for Organic Analyses to achieve a lower detection limit (1 µg/L) for volatile organics and standard CLP methods for other organics. Miscellaneous geochemical parameters will be analyzed through CLP-SAS. Table 2-1 lists analytical parameters for monitoring wells.

4.5.2 Residential Well Sampling

To help characterize the local groundwater quality and to determine if there has been a change since the last analyses, HALLIBURTON NUS may resample a number of local residential and business wells as one of the media sampling activities. Up to 14 residential and business wells may be sampled within an approximate 1/2-mile radius of the site. A decision regarding the sampling of some or all of the nearby private wells will be made upon receipt and evaluation of the results of recent EPA sampling

in the area. The decision regarding which wells to sample will be made between EPA, the State, and HALLIBURTON NUS. Wells being considered for sampling are listed in Table 3-1 and shown in Figure 3-1. One round of sampling and analysis will be completed for the full Target Compound List (TCL)/Target Analyte List (TAL) of chemicals. Routine Analytical Services (RAS) will be used through the EPA's Contract Laboratory Program (CLP), except for volatile organics, which will be analyzed by the Draft Superfund Analytical Methods for Low Concentration Water for Organic Analyses (Special Analytical Services). Table 2-1 lists analytical parameters for residential wells.

Wells will be sampled from the first spigot encountered while tracing the discharge line from the well to the residence, prior to any filtration or treatment, if possible. If the sample is obtained from a point after the filtration or treatment unit, it should be noted in the site logbook. If the volume of the well system cannot be estimated, water will be allowed to run for approximately 15 minutes. If the volume of the water system can be determined, three volumes will be purged. The individual sample bottles will be filled directly from the spigot. One set of field measurements for pH, Eh, temperature, and specific conductance will be taken in accordance with SF-1.1 (Section 5).

All pertinent field data shall be recorded using Attachment A of SA-1.1 (Sample Log Sheet in Appendix A) and the site log book.

4.6 SURFACE WATER/SEDIMENT SAMPLING

A surface water and sediment investigation will be performed for the AIW Frank RI/FS in order to evaluate present stream quality and sediment conditions. The proposed investigation will include the acquisition of samples upgradient and downgradient of the site from Valley Creek and its nearby unnamed tributary at a total of eight locations, as indicated in Figure 3-4. Within the onsite pond, an additional sediment sample will be acquired to produce a total number of eight surface water and nine sediment samples. Sampling procedures will be conducted in accordance with HALLIBURTON NUS SOP SA-1.2.

One round of surface water/sediment samples will be collected from nine locations along the Valley Creek, the ponded area of Valley Creek north of the onsite buildings, and the unnamed tributary of Valley Creek. These samples will be used to investigate potential contamination of Valley Creek surface water/sediments as a result of contaminant migration from the AIW Frank/Mid-County Mustang Site.

The proposed sampling locations displayed on Figure 3-4 are tentative only. Final sampling locations will be selected after a site inspection of the Valley Creek to identify depositional areas versus

erosional areas. The sampling program will focus on depositional areas as contaminants are most likely to accumulate in these areas. Two samples will be collected from background locations. Per EPA guidance, surface water/sediment samples will be collected where the onsite drainage ditch discharges to the onsite pond and where the creek exits the ponded area north of the onsite buildings. Stream flow rates will be measured at each sampling location at the time of sampling, except within the onsite pond. Stream flow rates will be determined using a current meter as described in HALLIBURTON NUS SOP GH-2.7. Information concerning stream flow rates will be recorded in the field logbook.

The sampling and analytical program for surface water/sediments is presented in Table 2-1. The sediment samples from the onsite pond and the nearest downstream sample location to the pond will be analyzed for TCLP, CEC, moisture content, bulk density, and grain size. In order to characterize contamination potentially present in the surface waters/sediments, all samples will be analyzed for TCL/TAL parameters. Filtered and unfiltered surface water samples will be collected for metals analyses to distinguish metals contamination present in the dissolved form versus the particulate form. The analytical results for the first round of samples will be evaluated to determine if a second sampling round is necessary and, if so, to select analytical parameters for the second sampling round.

5.0 SAMPLE ANALYSIS

Samples collected at the AIW Frank/Mid-County Mustang Site will be submitted for the laboratory analyses presented in Table 3-1 of the QAPP. This table indicates the analytical parameters and analytical methods for each sample. Table 2-1 of this FSP summarizes the analyses, bottle requirements, preservation requirements, and holding times for each sample.

6.0 DECONTAMINATION

The equipment involved in field sampling activities will be decontaminated prior to and during drilling and sampling activities. Such equipment includes drilling rigs, downhole tools, augers, pumps, well casing and screens, soil and water sampling equipment, and water level measurement devices.

6.1 MAJOR EQUIPMENT

All downhole drilling equipment shall be steam cleaned prior to beginning work, between the drilling of separate boreholes, any time the drilling rig leaves the drill site prior to completing a boring, and at the conclusion of the drilling program.

Decontamination operations will consist of washing equipment using a high-pressure steam wash. All decontamination activities will take place over an onsite area to be designated during mobilization. Additional guidance for drilling equipment decontamination can be found in HALLIBURTON NUS SOP GH-1.6, Section 5.

6.2 SAMPLING EQUIPMENT

All sampling equipment used for collecting samples will be decontaminated both prior to sampling in the field and between samples. The following decontamination steps will be taken:

- Potable water rinse
- Alconox or liquinox detergent wash
- Potable water rinse
- Distilled/deionized water rinse
- Methanol rinse
- Distilled/deionized water rinse
- Air dry
- Wrap in aluminum foil if not used immediately

Field analytical equipment such as instrument probes will be rinsed first with distilled/deionized water then with sample.

6.3 PERSONNEL

Personnel decontamination is discussed in the Health and Safety Plan (Volume III).

REFERENCES

U.S. Environmental Protection Agency, 1989. Risk Assessment Guidance for Superfund (Volume 2): Environmental Evaluation, EPA/540/1-89-001.

U.S. Environmental Protection Agency, 1989. Rapid Bioassessment Protocols for Use in Streams and Rivers, EPA 444/4-89/001.

VOLUME III

HEALTH AND SAFETY PLAN

HALLIBURTON NUS
Environmental Corporation

661 ANDERSEN DRIVE PITTSBURGH, PENNSYLVANIA 15220 (412) 921-7090

R-33-5-91-13

REVISED FINAL
REMEDIAL INVESTIGATION/FEASIBILITY STUDY

PROJECT OPERATIONS PLAN

VOLUME III - HEALTH AND SAFETY PLAN

AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

EPA WORK ASSIGNMENT NUMBER 37-18-3L2S
CONTRACT NUMBER 68-W8-0037

HALLIBURTON NUS PROJECT NUMBER 2753

JANUARY 1992

SUBMITTED FOR HALLIBURTON NUS BY:

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PROJECT MANAGER

APPROVED:

LEONARD C. JOHNSON
ARCS III PROGRAM MANAGER

APPROVED:

JOHN D. MIKAN, CIH
ARCS III HEALTH AND SAFETY OFFICER

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1.0 INTRODUCTION

This Health and Safety Plan (HASP) is designed to provide minimum practices and procedures for HALLIBURTON NUS Environmental Corporation (HALLIBURTON NUS) and subcontractor personnel engaged in Remedial Investigation/Feasibility Study (RI/FS) activities at the AIW Frank/Mid-County Mustang Site located in West Whiteland Township, Chester County, Pennsylvania under EPA Work Assignment (W.A.) Number 37-18-3L25, Contract Number 68-W8-0037. This plan has been developed to conform to the requirements of OSHA Standard 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response: Final Rule" and 40 CFR 300.150. This plan is based on available information regarding possible contaminants and physical hazards that may exist on the site. If more information concerning the nature and/or concentrations of contaminants becomes available, this HASP will be modified accordingly. It will be the HALLIBURTON NUS Project Manager's responsibility to communicate any such information to the ARCS III Health and Safety Officer (HSO) and the HSO's responsibility to determine the need for modifying the HASP.

1.1 KEY PROJECT PERSONNEL AND ORGANIZATION

This section refers to Figure 1-1 and establishes responsibility for site safety and health. The HALLIBURTON NUS Project Manager (PM) is responsible for the overall direction and implementation of Health and Safety for the project. The HALLIBURTON NUS Field Operations Leader (FOL) is responsible for implementation of this HASP with the assistance of the appointed Site Safety Officer (SSO). The activities of the SSO are monitored by the ARCS III Health and Safety Officer (HSO) for compliance with the HASP and the ARCS III Health and Safety Program Plan. Overall interagency coordination and organizational structure can be found in Figure 1-2.

1.1.1 Subcontractor Responsibilities

It is the responsibility of each HALLIBURTON NUS subcontractor to ensure compliance with all applicable Federal and State Occupational Safety and Health regulations including Title 29 of the Code of Federal Regulations (CFR), Parts 1900 through 1910, Part 1296, and the contents of this HASP. Specifically contained within these OSHA regulations is 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response: Final Rule," which includes requirements for training and medical surveillance for employees engaged in certain hazardous waste operations.

	Title
Jeffrey Orient	HALLIBURTON NUS Project Manager
Paul Persing	Field Operations Leader (FOL)
TBA	Site Safety Officer (SSO)
John Mikan	ARCS III Health and Safety Officer (HSO)
TBA	Alternate Site Safety Officer

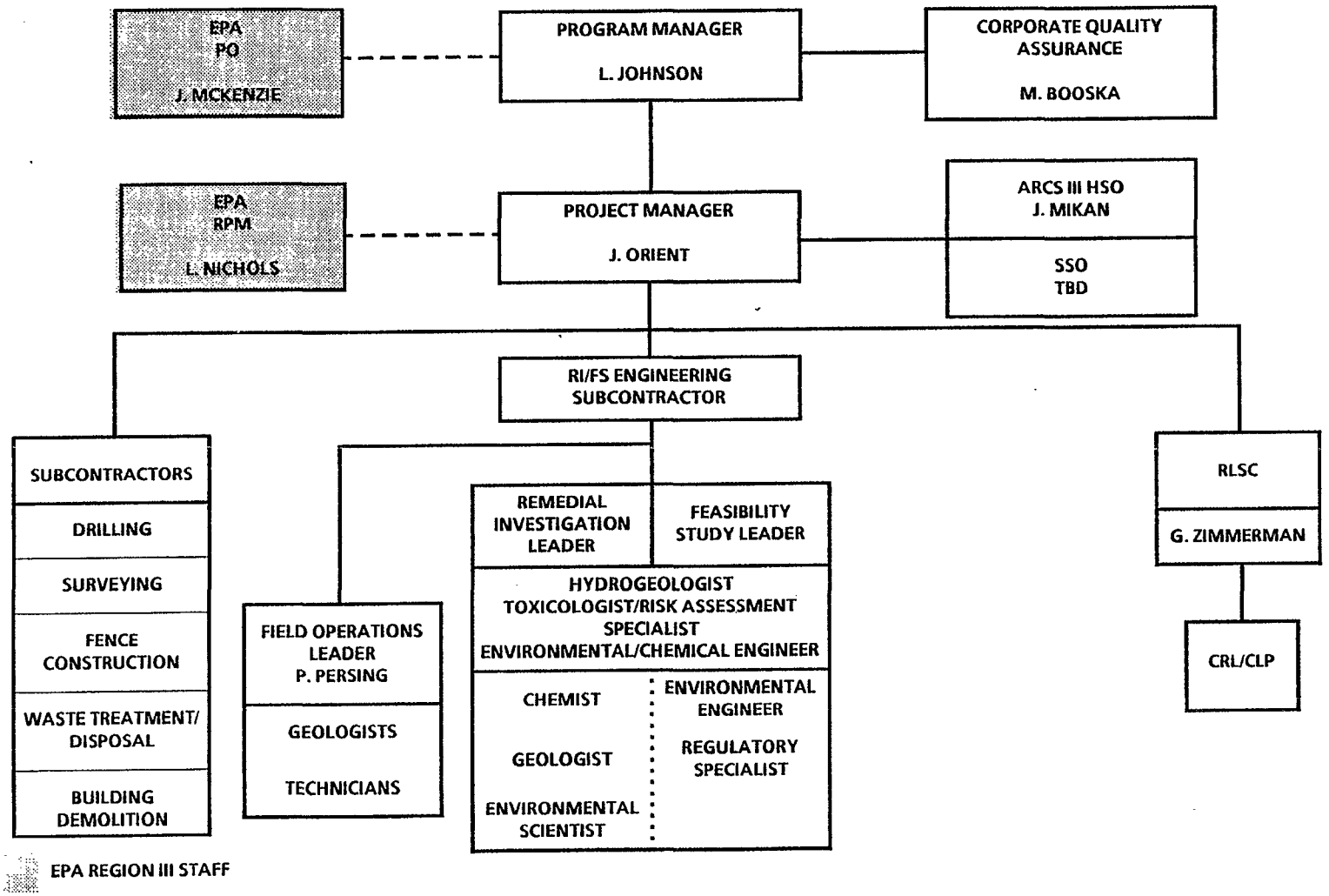
FIGURE 1-1

KEY PERSONNEL AND PROJECT ORGANIZATION
AIW FRANK SITE
CHESTER COUNTY, PENNSYLVANIA

HALLIBURTON NUS
Environmental Corporation

FIGURE 1-2

PROJECT ORGANIZATION
AIW FRANK/MID-COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA



2.0 SITE BACKGROUND INFORMATION

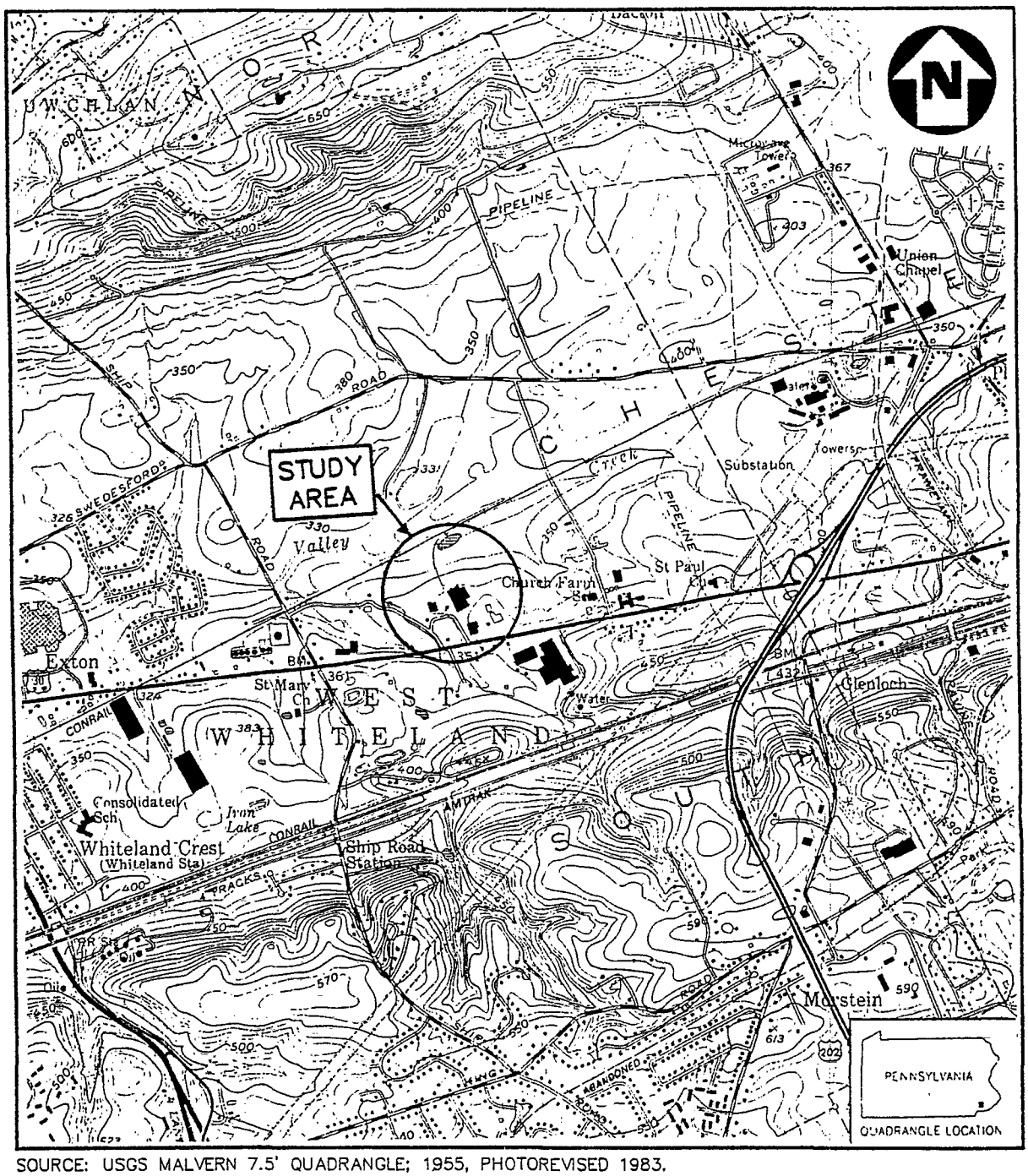
2.1 SITE LOCATION AND DESCRIPTION

The study area is located approximately 1 mile east of Exton, in West Whiteland Township, Chester County, Pennsylvania (Figure 2-1). The AIW Frank/Mid-County Mustang Site consists of two adjoining properties. The AIW Frank Property is located at 717 East Lincoln Highway (Route 30). The Mid-County Mustang property (presently Rex Carle Automotive) is located at 891 East Lincoln Highway. The 16-acre study area combining AIW Frank and Mid-County Mustang is bounded to the north-northwest by Conrail property (Reading Railroad); to the south by Lincoln Highway; by open fields to the northwest, northeast and east-northeast; by Meridian (formerly Penn Central) Bank to the west-southwest; and by the Apple Press/Drexel Heating property to east-southeast. The planned RI/FS will extend beyond the site boundaries, as there is substantial evidence indicating that site contamination has migrated offsite.

2.1.1 AIW Frank Description

The AIW Frank Property is a small inactive manufacturing facility used in the past for the manufacture of styrofoam products and commercial refrigeration units. The former production areas of the facility are located in the southern half of the property. There are two abandoned buildings, two parking areas, associated roadways, and loading docks (Figure 2-2). One parking area is adjacent to Lincoln Highway. Immediately north of this parking area is a building 180 feet by 160 feet in dimensions. The second building lies 200 feet to the north-northwest of the first building. This rear building measures 175 feet by 250 feet. The front building was used for manufacturing by AIW Frank, and as an office by Continental Refrigerator Corporation. The rear building was used for warehousing when AIW Frank operated the facility and for manufacturing by Continental Refrigerator Corporation.

Both buildings have been gutted. On August 15, 1991, a fire of unknown origin destroyed the front building. Currently, parts of some of the concrete block walls remain standing, along with some metal beams and roof trusses that have been twisted and/or warped by the fire and subsequent building collapse. The rear building presently contains only some miscellaneous debris, a number of water/gas lines used for manufacturing operations and for fire protection, and approximately 30 empty to partially filled 55-gallon drums. The contents of the drums are unknown. Attached to the front of the rear building is a small annex containing numerous decomposed concrete blocks. The



SOURCE: USGS MALVERN 7.5' QUADRANGLE; 1955, PHOTOREVISED 1983.

0 1
SCALE IN MILES

0 2000 4000
SCALE IN FEET

FIGURE 2-1

SITE LOCATION MAP
AIW FRANK/MID COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

HALLIBURTON NUS
Environmental Corporation

AR300244

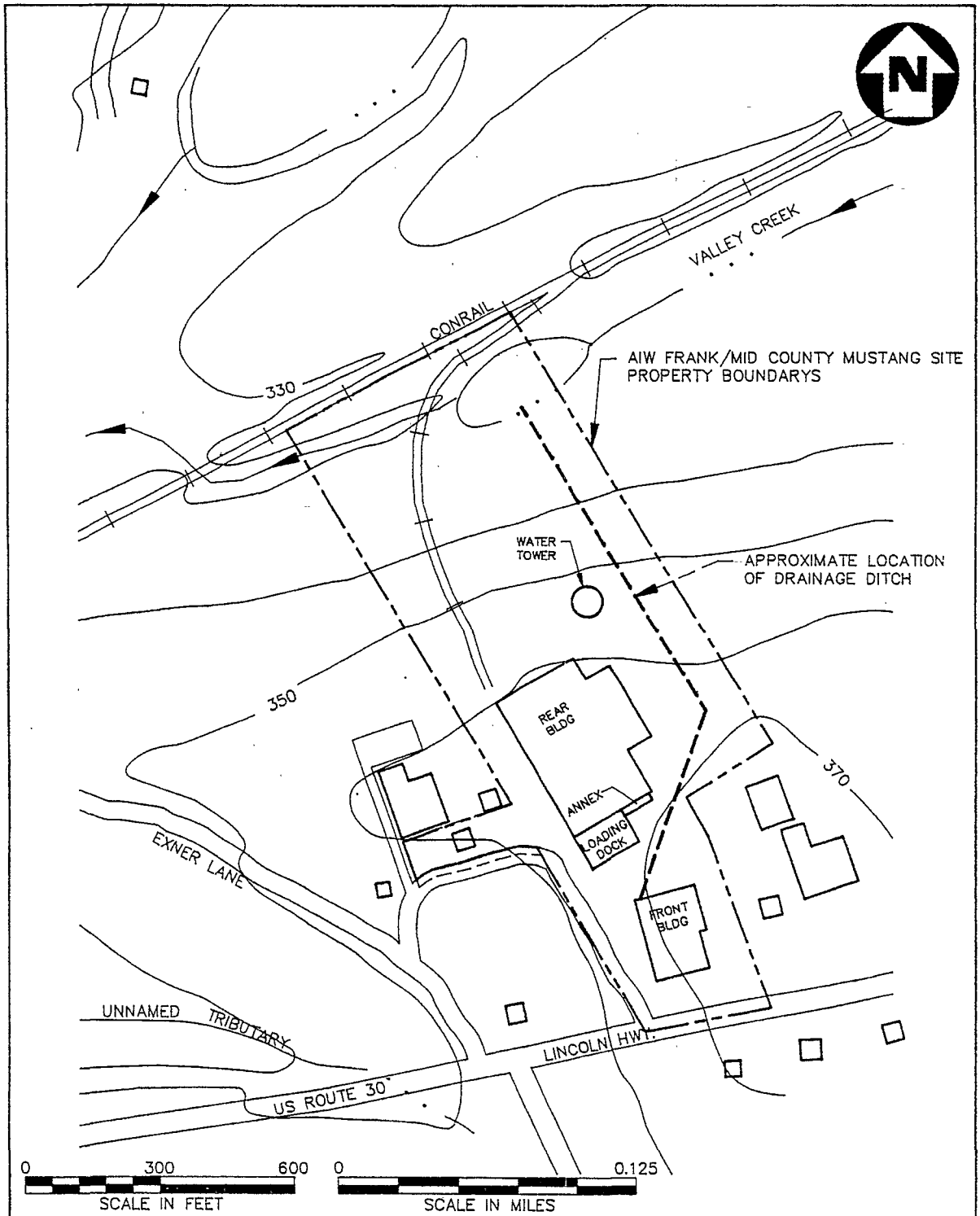


FIGURE 2-2

SITE LAYOUT MAP
AIW FRANK/MID COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

HALLIBURTON NUS
Environmental Corporation

AR300245

decomposition of the blocks is believed to be associated with some sort of acid leaching related to process operations in the annex.

Along the southern side of the second building is a loading dock area. East of the second building is the back parking area. In the southern corner of this parking area is the former location of an onsite waste solvent tank. The space between the two buildings comprises a driveway and an area where part of the office/manufacturing building has been demolished. In the paved area between the buildings are approximately 5 to 10 above-ground tank pedestals. Nearby, several large (approximately 8-inch-diameter) pipes were observed sticking up out of the ground. These pipes may access underground storage tanks, including three 20,000-gallon tanks known to be present at the facility outside of the boiler room door of the front building. The total number and volumes of tanks at the site is unclear. Liquid can be seen at depth in the tank standpipes. The tanks are believed to have been used for fuel oil storage in the past. A drainage ditch crosses through this area, heading into the area north of the buildings. The drainage ditch was used to discharge boiler water to Valley Creek during the period of time that AIW Frank operated at the site.

The northern half of the facility is an open area overgrown with brush and small trees. Valley Creek flows east to west, through the northernmost portion of the property, just south of the Reading Railroad and the property line. This creek is a cold water fishery, protecting trout fishing. Valley Creek has been impounded on the site to form a pond measuring roughly 310 feet by 60 feet (0.4 acres). Approximately 100 feet north of the back building there is a short, steep dropoff in elevation in the direction of Valley Creek. A 300,000-gallon water tower, used in the past as a fire water supply for the facility, is also located in the overgrown area near the rear of the back building. A small drainage ditch extends northward from near the water tower toward the pond (Figure 2-2). The site is partially fenced in across the front but is accessible to casual access through the open sides and back, and through gaps in the fence.

The Mid-County Mustang property is less than 1 acre in size and consists of an auto garage, a parking lot, and a small lawn area (Figure 2-2). The site is bordered by AIW Frank to the east; Pipe Maintenance Service to the north and west; and a small open field, Meridian Bank, and Lincoln Highway to the south. The area of concern at Mid-County Mustang is a septic field, located in the lawn area near the garage.

2.2 SITE HISTORIES

2.2.1 AIW Frank

Prior to the use of the property for manufacturing purposes, the site was utilized as a milk transfer station. In 1962, AIW Frank Corporation first leased the property from Louis Frame, the property owner. In 1975, AIW Frank bought the property from Mr. Frame. AIW Frank operated the facility as a styrofoam products (cups and plates) manufacturing plant from 1962 until they declared bankruptcy in 1981. Manufacturing operations were mostly confined to the front (closest to Route 30) building, with the rear building used for cold storage and for a small machine shop. AIW Frank reportedly used trichloroethene (TCE) and 1,1,1-trichloroethane (1,1,1-TCEA) to clean various equipment. Following the bankruptcy of AIW Frank Corporation, the site was bought and operated by Continental Refrigerator Corporation (CRC). From 1983 to approximately 1988, they manufactured refrigerators, freezers, and warming cabinets for institutional and food service industries. The rear building was used during this time period for manufacturing operations with the front building used for office space. Solvents may have been used during this time period to clean metal components of the refrigeration units. CRC is the current property owner. They no longer operate at the facility and have declared bankruptcy.

Based on sampling of local private water supply wells in 1982, the Pennsylvania Department of Environmental Resources (PADER) determined a pattern of elevated TCE levels. These levels indicated a source area at or near the AIW Frank property. PADER's subsequent investigations continued into 1984 and indicated that improper handling and disposal of solvents during the active life of the AIW Frank facility had resulted in onsite groundwater and soil contamination. Groundwater and soil sampling conducted by Betz, Converse, and Murdoch (BCM) in 1983 showed the groundwater and soil at the site to be contaminated with TCE, tetrachloroethene (PCE), and 1,1,1-TCEA.

An NUS FIT Team conducted a multi-media investigation of the AIW Frank property and some of the surrounding industrial sites in 1985 (NUS, 1986). This study also found elevated levels of the previously mentioned contaminants in the groundwater and soils. In 1987, NUS performed a hazard ranking system scoring of the site, with the site receiving a score of 42.40 (NUS, 1987). The site was subsequently placed on the National Priorities List as a final site in October 1989.

2.2.2 Mid-County Mustang

The Mid-County Mustang site is currently owned by CDS Investments of Paoli, Pennsylvania, and is leased by Rex Carle Automotive Service. The property was leased from CDS by Mid-County Mustang from the summer of 1982 until December 1984. Prior ownership has not been determined.

The facility is currently utilized as an automobile repair shop. It has been reported that the facility has been used as either an automobile repair shop or auto body shop since the 1940s. It has also been reported that previous operators had cleaned automobile engines with steam and solvents. This material was disposed into floor drains in the garage. At this point it was discharged into an onsite septic field which consisted of a stone bed located in the grassy area east-southeast of the garage.

Prior to the 1940s, it is believed that the site was a dairy (NUS, 1986).

In 1982, groundwater sampling activities conducted by PADER revealed the presence of TCE in the Mid-County Mustang well. As a result, CDS Investments retained Applied Geotechnical and Environmental Services Corporation (AGES) to conduct an investigation of both the Pipe Maintenance Service Facility and Mid-County Mustang in 1984 (AGES, 1984). The investigation discovered the presence of several volatile organic compounds.

Remedial activities at Mid-County Mustang were completed in the fall of 1984. This work included the excavation of the contaminated tile field and the contaminated soils to a depth of 2 to 3 feet below the tile field. In addition, the floor drains in the garage were cemented to prevent future problems of a similar nature. The excavated material, which reportedly contained elevated levels of 1,1,1-TCEA, was placed on plastic sheeting and surrounded by bales of hay to prevent runoff from the area. The latter measures were taken at the recommendation of PADER so that contaminants present would volatilize. FIT III analytical results for samples obtained from the excavated material did not reveal the presence of solvents. The excavated material has subsequently been removed from the site.

3.0 SCOPE OF WORK

This section identifies, defines and summarizes the activities that will be conducted at the AIW Frank/Mid-County Mustang Site and nearby community.

The specific objectives of the RI/FS are to:

- Determine the lateral and vertical extent of groundwater contamination, particularly with respect to downgradient receptor wells and surface water discharge.
- Identify sources of groundwater contamination.
- Determine the extent of soil contamination.
- Investigate surface water/sediment contamination.
- Determine public health risks associated with groundwater contamination by evaluating potential domestic use.
- Evaluate the risks posed by wastes within the onsite buildings, and underground storage tanks.
- Determine appropriate remedial responses for groundwater, soils, and wastes.

To accomplish these objectives the field investigation for the AIW Frank/Mid-County Mustang Site will be broken into 10 subtasks, which are listed below. However, it should be noted they may not be carried out in the order presented.

- Mobilization/Demobilization
- Residential Well Sampling
- Soil Gas Survey
- Test Pit Excavation
- Geophysical Survey
- Hydrogeologic Investigation
- Media sampling

- Drum, Tank, and Building Sampling
- Site Survey
- RI Waste Characterization/Disposal

3.1 MOBILIZATION/DEMOBILIZATION

Site mobilization will consist of preparation for field activities, which include:

- Assisting EPA in obtaining site access. HALLIBURTON NUS will provide names, addresses, and phone numbers of appropriate property owners, and contact owners as requested by EPA. Written access agreements if needed, will be obtained by EPA.

- Establishment of an onsite base station (site trailer), with sanitary facilities.

- Coordination with the Contract Laboratory Program (CLP) laboratory for sample types, analyses, and throughput.

- Establishment of health and safety requirements and personnel clearances.

- Identification of locations for monitoring wells, staff gauges, and surface water and sediment sampling points.

- Establishment of secure areas for sample documentation and equipment decontamination.

- Arranging for, and obtaining the necessary onsite utilities.

- Arranging of utility clearance for intrusive activities.

- Arrangements for, and providing all necessary equipment required on site.

Since the majority of field activities will be conducted on site, a base station will be established on site for its central location and moderate level of security. This station will be used as the focal point of RI field activities and the storage and distribution of field equipment and auxiliary supplies.

Site demobilization will consist of removing from the site all facilities and equipment no longer needed at the end of field work and securing and/or properly disposing of the material generated

during the study. Arrangements will also be made for discontinuation of utilities and for the disposal of RI wastes.

3.2 RESIDENTIAL WELL SAMPLING

As one of the media sampling activities, HALLIBURTON NUS may sample a number of residential business, and municipal wells which are used for drinking water supplies to help characterize the local groundwater quality and to determine if there has been a change since the last analyses. A well survey has already been conducted for the local area as part of the work plan development process. It is anticipated that approximately 14 wells will be sampled within an approximate 1/2-mile radius of the site.

3.3 SOIL GAS SURVEY

A soil gas survey will be performed across the production area of the facility to identify potential areas of past discharges of volatile organic compounds. These areas may be continuing sources of contamination to groundwater. Results of the soil gas survey will also be used to identify surface soil sampling locations and test pit locations. Unpaved areas within the property boundaries of the site will be investigated during the soil gas survey. Attempts will be made to take soil gas measurements in some paved areas, as well. Particular areas of emphasis will include the former solvent tank area, and underground storage tank area at AIW Frank and the former tile field at the Mid-County Mustang Site (Figure 3-1).

An unbiased grid pattern will be established across the area to be covered in the soil gas survey, using a tape and transit. Survey points will be spaced approximately 25 feet apart throughout the gridded area. Local adjustments will be made to avoid obstructions such as buildings, sidewalks, parking lots, and utilities, etc.

3.4 TEST PIT EXCAVATION

Up to five test pits will be excavated at locations where significant contamination is detected by soil gas survey. The location of these test pits will be determined in the field. Two subsurface soil samples will be taken for analysis from each test pit. Sampling intervals will be determined in the field, based on readings from an organic vapor detector. The purpose of these test pits is to characterize the nature and extent of areas where volatile contaminants are present.

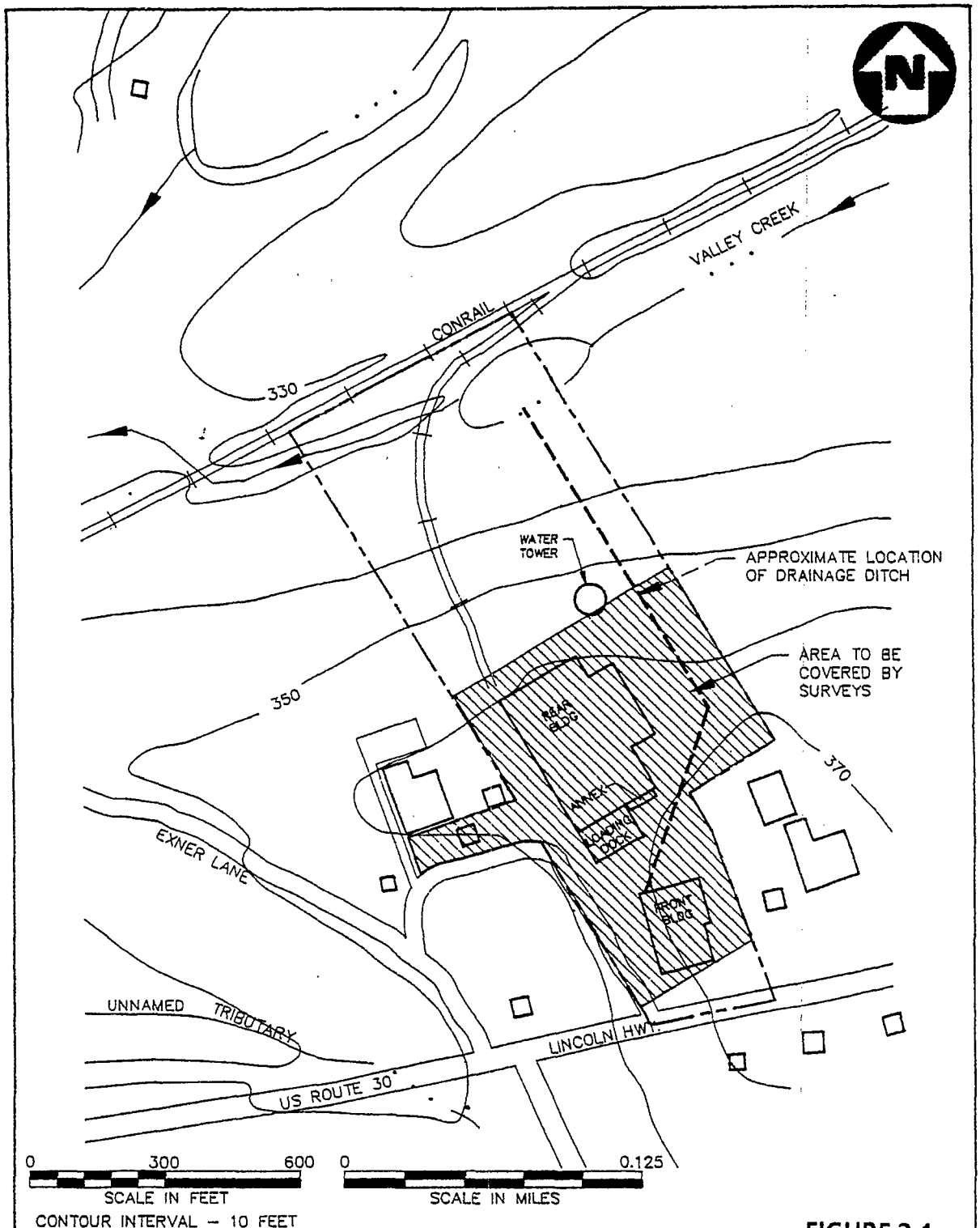


FIGURE 3-1

SOIL GAS AND GEOPHYSICAL SURVEY AREA
AIW FRANK/MID COUNTY MUSTANG SITE
CHESTER COUNTY, PENNSYLVANIA

HALLIBURTON NUS
Environmental Corporation

AR300252

3.5 GEOPHYSICAL SURVEY

A geophysical survey will be performed in the former production areas of the site to check for underground storage tanks and other buried wastes. The proposed area for the survey is shown in Figure 3-1. The geophysical survey is needed to determine the number and location of underground storage tanks at the site. Between three and six tanks are believed to be present in the area near the onsite buildings.

An electromagnetic (EM) conductivity survey will be conducted over the selected area. Based on site visit observations and past experience, HALLIBURTON NUS is of the opinion that there is too much magnetic interference at the site to make a radiometer/total field magnetometer survey useful. Accordingly, the EM conductivity survey will be conducted, using the same 25-foot grid patterns that are proposed for the soil gas survey. Specifically, an EM-31 conductivity meter will be used for this survey.

The data generated from the geophysical survey will be evaluated to identify potential areas of buried magnetic/electrical anomalies. The anomaly shapes will be evaluated to determine the probable anomaly type (tank, buried pipeline, etc.). Maps will be generated showing the anomaly locations. Proposed drilling locations will be adjusted as necessary to avoid drilling through buried lines and other objects that may be identified. If requested by EPA, subsurface anomalies may be further investigated through the excavation of additional test pits.

3.6 HYDROGEOLOGIC INVESTIGATION

The primary purpose of the hydrogeologic investigation is to characterize the onsite and offsite (horizontal and vertical) groundwater contamination. Results of previous investigations at the site indicate that groundwater contamination is present at several onsite, downgradient monitoring wells. Samples from offsite residential wells have been analyzed and indicate contaminants are present above the method detection levels. The horizontal and vertical extent of contamination at the site has not, however, been fully determined.

Information concerning the geology and aquifer characteristics will also be collected and interpreted for the area onsite, immediately offsite, and in the downgradient direction as part of the investigation. The proposed hydrogeologic investigation consists of the following activities:

- Fracture trace analysis (EPA-lead)

- Drill and install 12 monitoring wells at eight locations.
  - One onsite deep well; three onsite shallow wells
  - Three offsite deep wells; five offsite shallow wells

- Collect two rounds of groundwater samples from all five currently existing onsite wells [it is believed that one of the six onsite wells (monitoring well No. 4) is no longer usable], the well northeast of the site in the adjacent field (Frame well), and all newly installed monitoring wells.

- Collect one round of groundwater samples from selected commercial and domestic wells located within an approximate 1/2-mile radius of the site.

- Perform slug tests on the 12 newly installed wells, and the five existing onsite monitoring wells.

- Conduct pumping tests on two selected onsite monitoring wells.

- Install five staff gauges along Valley Creek and its unnamed tributary.

- Obtain a minimum of three rounds of water level measurements at each monitoring well (existing and new) and staff gauge location (discussed in Section 3.7).

3.6.1 Aquifer Testing

Aquifer characteristics will be determined through the performance of appropriate tests, both slug tests and short- or long-term pumping tests. Aquifer tests will include:

- Slug tests will be performed at all 12 newly installed and all 5 existing onsite monitoring wells to determine the local (close to the well bore) permeability characteristics.

- Step-drawdown tests will be performed on the two onsite wells selected for pumping tests.

- Pumping tests will be performed on two onsite wells.

- At least three comprehensive rounds of water levels will be taken from the new monitoring wells, the existing onsite wells, and the staff gauges.

3.7 MEDIA SAMPLING

Media sampling to be performed during the field investigation is designed to identify hazardous waste source areas, to characterize the extent of contamination, and to evaluate alternatives for remediation. Media sampling will include the following:

- Sampling to characterize the occurrence and distribution of contaminants in the onsite surface soils and to evaluate potential risks posed by incident contact with surface soils.

- Sampling of the soils/sediments in the drainage ditch north of the onsite buildings to evaluate if contaminants are migrating to Valley Creek via surface water runoff.

- Onsite subsurface soil sampling to investigate potential contaminant source areas and the potential contribution of subsurface soil contamination to groundwater contamination.

- Groundwater sampling of local residential and commercial wells along with monitoring wells to determine the vertical and horizontal extent of groundwater contamination.

- Surface water and sediment sampling of Valley Creek, the ponded area of Valley Creek (north of the onsite buildings), and the unnamed tributary of Valley Creek to characterize any contaminant migration to the creek from onsite source areas/soils and/or the groundwater and to evaluate risks to human or environmental receptors exposed to the surface waters and sediments.

- Underground storage tank (UST) and drum sampling to characterize tank/drum contents, to assess their potential as contaminant sources, and to evaluate remedial alternatives (e.g., disposal) for the wastes/materials present in the tanks/drums.

- Sampling of miscellaneous wastes/materials within the onsite buildings (e.g., residues within process lines, debris/waste piles) to investigate their potential contribution to onsite/offsite contamination and to collect information for the evaluation of remediation alternatives.

Media to be sampled for laboratory analysis include surface/subsurface soils, groundwater, surface water and sediments, and process materials/wastes remaining in drums, USTs, and the onsite buildings. Specific media sampling requirements are described in the following paragraphs.

3.7.1 Surface Soil Sampling

Limited data currently exists regarding surface soil contamination at the site, as described in Section 3.1.5 of the Draft Work Plan. In order to determine the risks posed by surficial soils at the site, a surface soil sampling activity is planned for the field investigation.

Approximately 25 surface soil samples will be collected to determined the occurrence and distribution of contaminants (if any) in surficial soils. Two samples will be collected from offsite background sample locations. Five samples will be collected from the drainage ditch which, in the past, directed discharge waters from plant boilers north to Valley Creek. The remaining sample locations (approximately 18) will be selected based on the available historical information identifying potential waste source areas (e.g., the location of the TCE storage tank), a visual inspection of the site, and results of the soil gas survey described in Section 3.3.

3.7.2 Subsurface Soil Sampling

Subsurface soil contamination will be investigated using onsite test pit excavations. The test pits will be located based upon the available historical knowledge of the site waste source areas (e.g., the location of the TCE storage tank), a site inspection, and the results of the soil gas survey detailed in Section 3.3.

It is anticipated that two subsurface soil samples will be collected from the unsaturated zone soils in each test pit. The soil samples will be collected from excavated soils that produce high organic vapor detector readings during the excavation of the test pit and based on visual observations of contamination. Each test pit location will also be a surface soil sampling location. Thus, three soil samples will be collected from each test pit location.

3.7.3 Surface Water/Sediment Sampling

Limited historic surface water and sediment sampling data has not indicated any impacts to these media from the site. A surface water and sediment investigation is proposed for the AIW Frank RI/FS in order to evaluate present stream quality and sediment conditions. The proposed investigation

includes the acquisition of samples upgradient and downgradient of the site in Valley Creek and its nearby unnamed tributary at a total of eight locations. Within the onsite pond, an additional sediment sample will be acquired to produce a total number of eight surface water and nine sediment samples.

3.7.4 Groundwater Sampling

As discussed, volatile organic chemicals (VOCs) are the principal contaminants detected in the groundwater at the AIW Frank/Mid-County Mustang Site. However, it should be noted that semivolatile organic and metals analyses were rarely included in previous groundwater investigations.

Two rounds of groundwater samples will be collected from five existing monitoring wells, the Frame well, and the 12 proposed wells to be installed. Additionally, 1 round of groundwater samples may be collected from some or all of the 14 existing residential/commercial wells in the vicinity and downgradient of the site.

3.8 DRUM, TANK, AND BUILDING SAMPLING

Two large buildings are currently located on the AIW Frank property. Both buildings are warehouse-type structures. During the initial ARCS III site visit, some miscellaneous debris was noted in both buildings. In addition, approximately 30 drums containing unknown materials are located in the rear of the back building. The front building, which initially was observed to only contain some miscellaneous rubble, has been destroyed by a fire which occurred on August 15. An EPA inspection of the building after the fire did not find any evidence of contamination or contaminant releases due to the fire; however, the building shell is currently structurally unstable. A building survey, along with representative sampling of the building contents, is needed to determine whether hazardous materials are present in the back building, and verify the nonhazardous nature of the residual contents of the burned-out front building. At least three, and possibly as many as six, underground storage tanks are believed to be on site. The tanks were allegedly used for fuel oil storage; however, they have not been sampled to date.

The primary objectives of the drum, tank, and building sampling investigation are as follows:

- Inventory the number of full and partially full drums/underground storage tanks (USTs) and the contents of the two onsite buildings.

- Physically/chemically characterize the liquid/solid/sludge materials or wastes within the drums, USTs, and buildings.

- Develop disposal options for materials/wastes present within the drums, USTs, and buildings.

- Provide data for demolition/removal of the remaining buildings on site.

The building survey will be conducted over a 1- to 2-day period. This survey will be a walk-through activity to document the building contents and identify potential sampling locations. The sampling locations may include waste piles, stained soils or granular materials, liquid wastes, etc. Approximately 20 samples of the building contents will be obtained upon completion of the survey. In addition, samples will be obtained from the estimated 30 drums present in the rear building. It is assumed that the samples from separate drums can be composited in some instances for analysis. The drums will be inventoried to categorize the wastes present, onsite compatibility testing of wastes will be performed as appropriate, and selected samples will be composited.

3.9 SITE SURVEY

The survey services required for this work assignment will be subcontracted and consist of the following tasks:

- Survey the horizontal location and vertical elevation of the ground surface, the uncapped well riser, and the top of the protective casing of each of the nine monitoring wells to be installed during this investigation, the five existing onsite wells, the Rex Carle well, and the Frame well.

- Survey the horizontal and vertical elevation of the five staff gauges installed during this investigation.

- Survey measurements will be made relative to mean sea level (msl).

3.10 RI WASTE DISPOSAL

RI field activities will generate wastes that may or may not be contaminated with hazardous constituents. These wastes would include drill cuttings, used protective clothing and equipment (gloves, boot covers, Tyvek suits, sample scoops, decontamination materials), well development waters, and pumping test waters. All solid and liquid wastes generated shall be containerized, labeled according to their contents, and returned to the site. Solid waste consisting of paper towels, Tyvek, gloves, used respirator cartridges, etc., will be stored on site in 55-gallon drums for disposal as part of any future remedial action at the site. Well development water, and pumping test water will be stored in an onsite tank for later disposal off site via discharge to the local POTW after carbon adsorbtion treatment and, during times of peak wastewater generation, via supplemental wastewater hauling/disposal at an approved wastewater treatment and disposal facility. Drill cuttings will be screened with an organic vapor detector during drilling. All contaminated cuttings will be containerized in 55-gallon drums and stored onsite. Uncontaminated cuttings generated on site will be spread around the borings. Uncontaminated cuttings generated off site will be transported to the site and placed in a designated area.

4.0 HAZARD ASSESSMENT

This section identifies and evaluates potential site hazards which may be encountered during execution of the activities outlined in Section 3.0 of this HASP. Control measures, to protect site personnel from these potential hazards, are incorporated throughout this HASP but are mainly contained in the following sections:

- Section 5.0, Air Monitoring
- Section 6.0, Personal Protective Equipment
- Section 10.0, Standard Work Practices

4.1 SITE CONTAMINANTS

Based upon the data obtained from previous site investigations, it appears as though site contamination consists of volatile organic compounds (VOCs), trichloroethene (TCE), 1,1,1-Trichloroethane (TCEA), Tetrachloroethene (PCE), 1,1-dichloroethene (DCE), and chloroform. Specific contaminants and their associated chemical, physical, and toxicological properties are presented in Table 4-1.

4.1.1 Primary Chemical Hazard

The primary concerns, from a chemical exposure standpoint, are inhalation exposure to VOCs (Table 4-1) and direct skin contact with site contaminants during execution of the following activities. These activities were selected as tasks involving the highest potential for exposure because they will be performed on site at a point expected to be a source of groundwater contamination.

- Monitoring Well Installation (on site).
- Soil Sampling during drilling activity (on site).
- Well Development, Sampling, Pump Tests, and Slug Tests (on site).
- Soil Gas Survey.
- Test Pit Excavation.
- Media Sampling (on site)
- Drum Tank and Building Sampling
- RI Waste Disposal

TABLE 4-1

CHEMICAL DATA/TOXICOLOGICAL INFORMATION
AIW FRANK SITE
CHESTER COUNTY, PENNSYLVANIA

Substance	CAS Number	OSHA PEL (ppm)	Air Monitoring Instruments		Warning Property Rating	Chemical Cartridge	Health Effects		Physical Properties
			Flame Ionization Detector	Photo-Ionization Detector			Routes of Exposure	Signs and Symptoms	
1,1,1 Trichloroethane (1,1,1-TCEA) Synonyms: Methyl chloroform	71-55-6	350	High response (105%)	I.P.: 11.25	Adequate odor threshold: 120 ppm. However, not considered unpleasant to discourage exposure	Organic vapor	Inhalation Ingestion Skin Contact Eye Contact	• Headaches • Lassitude • CNS depression • Poor equilibrium • Irritation to eyes • Skin-reddening, scaliness • Anesthesia • Cardiac arrhythmia	MW: 133 BP: 74.1° FP: -32.5° Fl P.: None UEL: 16 LEL: 7% D: 1.3376 VP: 100 mm @ 20° Sol.: 0.07% Colorless Chloroform odor
Tetrachloroethene (PCE) Synonyms: Perchloroethylene Perk Tetrachloroethylene	127-18-4	25	Moderate (70%)	I.P.: 9.47	Poor odor threshold: 50 ppm to the unacclimated	Organic vapor	Inhalation Ingestion Skin Contact Eye Contact	• Irritation - Eyes - Nose - Throat - Skin • Nausea • Flush face, neck • CNS depression - Vertigo - Dizziness - Incoordination - Somnia - Hallucinations • Headaches • Erythema--this component has been listed as a suspected animal carcinogen in MAK, NIOSH, and NTP	MW: 166 BP: 250°F MP: -8°F VP: 14 mm Fl.P.: None Sol.: 0.015% Colorless liquid Ethereal or aromatic odor

TABLE 4-1
CHEMICAL DATA/TOXICOLOGICAL INFORMATION
AIW FRANK SITE
CHESTER COUNTY, PENNSYLVANIA
PAGE TWO

Substance	CAS Number	OSHA PEL (ppm)	Air Monitoring Instruments		Warning Property Rating	Chemical Cartridge	Health Effects		Physical Properties
			Flame Ionization Detector	Photo-Ionization Detector			Routes of Exposure	Signs and Symptoms	
1,1-Dichloroethene Synonyms: Vinylidene chloride	75-35-4	5	Low Response (40%)	High I.P.: 9.83	Poor	Organic Vapor	Inhalation Ingestion Skin Contact Eye Contact	• Irritation - Eyes - Nose - Throat - Skin • Nausea • Flush face, neck • CNS depression - Vertigo - Dizziness - Incoordination - Somnia - Hallucinations • Headaches • Erythema--this component has been listed as a suspected animal carcinogen in MAK, NIOSH, and NTP	MW: 96.94 BP: 31.6°C MP: NL LEL: 7.3% UEL: 16.0% Fl.P.: 0°F VP: NL
Trichloroethene (TCE) Synonyms: Acetylene terchloride	79-01-6	50	Moderate (70%)	I.P.: 9.47	Poor odor threshold: 100 ppm; barely perceptible to the unacclimated	Organic vapor	Inhalation Ingestion Skin Contact Eye Contact	• Headaches • CNS depression - Vertigo - Tremors - Somnolence - Paresthesia • Nausea • Vomiting • Irritation - Eyes - Skin • Cardiac arrythmia • This component has been listed as a suspected animal carcinogen in IARC, MAK, NIOSH	MW: 131 BP: 188°F MP: -123°F VP: 58 mm Fl.P.: None UEL: 41% LEL: 11% Sol.: 0.17%

TABLE 4-1
CHEMICAL DATA/TOXICOLOGICAL INFORMATION
AIW FRANK SITE
CHESTER COUNTY, PENNSYLVANIA
PAGE THREE

Substance	CAS Number	OSHA PEL (ppm)	Air Monitoring Instruments		Warning Property Rating	Chemical Cartridge	Health Effects		Physical Properties
			Flame Ionization Detector	Photo-Ionization Detector			Routes of Exposure	Signs and Symptoms	
Chloroform Synonyms: Trichloromethane	67 66-3	2	Moderate (65%)	I.P : 11.42	Poor odor threshold: 200-300 ppm	Organic vapor	Inhalation Ingestion Skin Contact Eye Contact	• CNS depression - Narcosis - Mental dullness/confusion - Anesthesia • Nausea • Vomiting • Irritation - Eyes - Skin • Headaches • Liver/spleen enlarged	MW: 119 BP: 142°F MP: -82°F VP: 160 mm Fl.P.: None Colorless liquid Sweet odor

D: Density
BP Boiling Point
FP Freezing Point
Fl.P.: Flash Point
MP Melting Point
MW Molecular Weight

VP Vapor Point
LEL Lower Explosive Limit
UEL Upper Explosive Limit
Sol.: Solubility

4.1.2 Secondary Chemical Hazard

Secondary concerns, but not to be disregarded, are inhalation exposure to VOCs (Table 4-1) and direct skin contact with site contaminants during execution of the following activities:

- Monitoring Well Installation (off site).
- Well Development, Sampling, Pump and Slug Tests (off site).
- Construction of Staff Gauges.
- Surface Water and Sediment Sampling (off site).
- Sampling Equipment Decontamination.
- Heavy Equipment Decontamination.
- Site Supervision.

These activities were selected as tasks involving a lesser potential for exposure because site personnel will not likely encounter contaminant concentrations as high as that which could be encountered while executing activities previously mentioned under Section 4.1.1. This assumption is particularly valid for offsite activities which do not involve contact with soils/equipment that have become saturated with groundwater.

Of least concern, from a chemical exposure standpoint, are activities that are nonintrusive and do not involve contact with groundwater or onsite soils. Such activities include site walk-throughs, surveying, and mobilization/demobilization of equipment and personnel.

4.2 DECONTAMINATION SOLUTIONS AND PRESERVATIVES

Chemicals used to decontaminate sampling equipment and to preserve environmental samples also present hazards to the site personnel who use them. The chemicals likely to be brought to the site for use in this manner include:

- Nitric Acid
- Sulfuric Acid
- Hydrochloric Acid
- Sodium Hydroxide
- Methanol
- Detergents (Alconox)

In order to communicate the hazards of these chemicals to site personnel, Material Safety Data Sheets (MSDSs), for each of these chemicals used, will be maintained on site and presented as part of the site-specific training (Section 9.0).

4.3 PHYSICAL HAZARDS

Aside from the hazards presented by chemical substances, physical hazards must also be addressed. The physical hazards which could be encountered by site personnel include, but are not limited to, the following:

- Noise Sources.
- Raised Work Surfaces.
- Electrical Energy/Energy Control.
- Falling Objects and Overhead Bump Hazards.
- Flammable/Explosive Atmospheres (bore holes).
- Hot or Cold Work Environments.
- Dilapidated Structures.
- Heavy Equipment/Vehicular Activity

Control measures to help protect site personnel from these potential hazards are incorporated throughout this Health and Safety Plan and specifically in Section 9.0, "Standard Work Practices."

4.4 ASBESTOS-CONTAINING MATERIALS

Lastly, as a precautionary measure based on the age of the building, it has been determined that some of the building material, process pipe, or underground storage tank insulation may contain asbestos-containing material (ACM). For this reason care should be taken so as not to disturb any suspected or unidentified material while involved in RI/FS activities. Questionable or suspect material interfering with proposed activities may be brought to the attention of the HSO for sampling, validation, and precautionary guidelines.

5.0 AIR MONITORING

This section presents requirements for the use of real-time air monitoring instruments during site activities involving potential for exposure to site contaminants. It establishes the types of instruments to be used, the frequency of which they are to be used, techniques for their use, action levels for upgrading/downgrading levels of protection, and methods for instrument maintenance and calibration.

5.1 INSTRUMENTS AND USE

A Photovac MicroTip equipped with an 11.7 eV lamp will be used to detect the presence or absence of airborne chemical emissions. Additionally, an LEL/O_2 meter will be used during certain drilling activities to detect the presence of flammable/explosive atmospheres. Visual observation will be used to detect the presence of airborne particulates.

MicroTips will be used throughout execution of these activities:

- Monitoring Well Installation (on site).
- Monitoring Well Installation (off site).
- Soil Sampling during drilling activity (on site).
- Soil Sampling during drilling activity (off site).
- Well Development, Sampling, Pump Tests, and Slug Tests (on site).
- Well Development, Sampling, Pump Tests, and Slug Tests (off site).
- Sampling Equipment Decontamination/Equipment (Heavy) Decontamination.
- Surface Water and Sediment Sampling (off site).
- Drum Tank and Building Sampling.
- Test Pit Excavations.
- RI Waste Characterization and Disposal.

LEL/O_2 Meters will be used throughout execution of these activities:

- Monitoring Well Installation (on site).
- Monitoring Well Installation (off site).

- Soil gas survey.
- In conjunction with the MicroTips.

5.2 AIR MONITORING REQUIREMENTS

5.2.1 MicroTips

Air monitoring, with the PhotoVac MicroTip, will be initiated at potential sources of vapor emissions (source monitoring) at specified frequencies. The following potential sources and monitoring frequencies are anticipated:

Drill Cuttings	Every 5-foot depth
Bore Holes	Every 5-foot depth
Open Well Heads	Upon initial opening
Environmental Samples	Every sample set
Drum Tank Building Sampling	Upon initial opening
Test Pit Excavation	Every 5-foot depth
RI Waste Characterization	Every container

If source monitoring indicates the presence of airborne emissions, air monitoring will then be initiated in the breathing zones of those workers who could be affected by the emissions. **The presence of elevated readings in the worker's breathing zone requires that personnel don pressure-demand supplied-air respirators until readings subside.** Air-purifying respirators are not acceptable due to the fact that the contaminants of concern have poor warning properties and/or are unable to be filtered from inspired air with chemical cartridges.

5.2.2 LEL/O_2

Air monitoring, with the LEL/O_2 meters, will be conducted during all drilling activities within bore holes and immediately over drill cuttings at every 5-foot depth interval. **If elevated (above background) LEL readings are observed, drillers must be advised of the potential explosive nature of the bore hole and must initiate the use of spark proof tools. LEL readings in excess of 20 percent requires cessation of drilling activity or abandonment of the drilling location until readings subside.**

5.2.3 OVA (FID)

Air monitoring with the OVA will be conducted during the soil gas survey at the frequencies specified below. As the information is to be used to determine past discharge locations and test pit locations it is not anticipated based on the method of use to present a potential exposure point. In regards to this the instrument's primary use is as a sampling apparatus. Additionally, this instrument will be used to validate or characterize information obtained through use of the MicroTip. The FID may be used in conjunction with or alone for the determination of airborne emissions generated through the previously established activities. The presence of elevated readings in the workers' breathing zones requires that personnel don pressure-demand supplied-air respirators until the readings subside. Due to the poor warning properties of the contaminants involved, air-purifying respirators are not acceptable for use.

Soil gas survey	Every 2 to 4 feet

5.2.4 Visual Observations

If airborne particulates are perceived during drilling on site, personnel must don air-purifying respirators equipped with organic vapor cartridges and High Efficiency Particulate Air (HEPA) filters. If such an observation is coupled with elevated MicroTip or RID readings in the worker's breathing zone, personnel must don pressure-demand supplied-air respirators.

5.3 MODIFICATION OF AIR MONITORING REQUIREMENTS

The action levels presented in Section 5.2 are based upon the assumption that the contaminants listed in Table 4-1 are the only contaminants which pose a reasonable health risk to site workers covered by this HASP. In the event that this assumption is found to be invalid through GC analysis of samples collected, or by some other means, the action levels will be modified as necessary.

5.4 INSTRUMENT MAINTENANCE AND CALIBRATION

Air monitoring instruments are maintained and prefield-calibrated at the HALLIBURTON NUS warehouse in Pittsburgh, Pennsylvania. Field maintenance will consist of daily cleaning of the instruments using a damp towel or rag to wipe off the instrument's outer casing, overnight battery recharging, and cleaning or replacing of the MicroTip lamp whenever calibration cannot be attained. Procedures for accomplishing instrument maintenance is contained in Section 4 of the MicroTip User's Manual which will be provided with each instrument.

WARNING: DO NOT USE METHANOL TO CLEAN 11.7 eV LAMPS.
CERIUM (IV) OXIDE (IN POWDER FORM) SHOULD BE USED.

MicroTip field calibrations will also be performed. The MicroTip User's Manual provided with each instrument will be followed to field calibrate the instruments prior to each day of use under the environmental conditions (temperature and humidity) that sampling will occur (i.e., outside of the site trailer).

5.5 RECORDKEEPING

MicroTip calibrations and readings will be recorded on the Air Monitoring Log Sheet provided as Figure 5-1 in this HASP. Copies of these log sheets will be maintained on site until field activities covered by this HASP have been completed at which time the log sheets will be transmitted to the ARCS III HSO and to the project file.

LEL/O_2 readings will not be recorded unless flammable/explosive or oxygen deficient/enriched atmospheres are detected in which case entries will be made in the Health and Safety Log Book.

LEL/O_2 and the OVA will undergo daily operational checks. These checks will be recorded in the Health and Safety Logbook and Field Calibration Checksheet (Figure 5-2).

Instrument Identification Number: _____ Lamp Energy: 10.6 eV or 11.7 eV

Span Gas Concentration: Isobutylene _____ ppm in air

Calibration Achieved: Yes or No Calibrated by: _____

Calibration Date: ____/____/____ Time: _____

Samples/Readings By: _____ Date: ____/____/____

Event Number	Time	Event Description	Minimum	Avg.	Maximum
Example	16:40	Well No. 12, Head Space, 20-foot depth	1.0	5.0	20.0
----		Span Gas Concentration After Sampling	----		----

- Calibrations must be performed as per User's Manual.
- Validate readings daily by measuring span gas concentrations at the end of each day's use.
- Event descriptions must be detailed, especially with regards to breathing zone or not.

FIGURE 5-1

PHOTOVAC MICROTIP
AIR MONITORING LOG SHEET

HALLIBURTON NUS
Environmental Corporation

Instrument	ID Number	Operational/Calibration Check	Users Name	Date

FIGURE 5-2

FIELD CALIBRATION CHECKLIST

HALLIBURTON NUS
Environmental Corporation

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

This section presents requirements for the use of personal protective equipment for each of the activities being conducted as defined in Section 3.0 of this HASP. This section includes anticipated levels of protection for each of the activities, the criteria used for selecting various levels of protection, and criteria for modifying levels of protection based on monitoring instrument readings and personal observations.

6.1 ANTICIPATED LEVELS OF PROTECTION

All work is anticipated to be performed in a Level D Protection, as defined in Appendix B of OSHA Standard 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response: Final Rule." Many activities will require the use use of chemical resistant coveralls, gloves, and boot covers as presented in the task breakdown presented in Figure 6-1. Additionally, it is possible that work will be upgraded to Level B protection (pressure-demand, supplied-air respirators) depending on the results of air monitoring as discussed in Section 5.0 of this HASP.

The items of PPE anticipated to be used for each activity, as defined in Section 3.0 of this HASP are presented in Figure 6-1. Where overlap in activities occur, the more protective requirement will apply.

6.2 PPE SELECTION CRITERIA

Respiratory protection was not selected for use during initial stages of work due to the detectability of site contaminants with monitoring instruments and warning properties. See Section 6.3 for modification criteria of respiratory protection.

Hard hats, safety glasses, and steel toe work boots were selected as minimum protection to reduce the potential for injury resulting from exposure to the physical hazards associated with onsite operations.

Boot covers, nitrile gloves, and Tyvek coveralls were selected to minimize contamination of work clothes and to prevent direct skin contact with low level contamination. Viton gloves were selected for activities that may involve direct contact with appreciable concentrations of the chlorinated solvents thought to be present as site contaminants.

Activity*	PPE Anticipated
A1	Hard hats, safety glasses, steel-toe hard sole work boots, and chemical resistant boot covers. Hard hats are not required in open areas away from drilling or heavy equipment operation.
A2	Same as "A1" plus Tyvek, latex inner gloves, nitrile outer gloves with taped ankle and wrist seams. In the event of free-phase or saturated natural or elevated readings on the MicroTip, Viton will replace the nitrile outer gloves and PVC will replace the Tyvek.
A3	Same as "A2" except when drilling in unsaturated zones Tyvek can be used in place of PVC and Saranex, and nitrile outer gloves in place of Viton.
A4	Same as "A2" except Tyvek coveralls may be substituted PVC and Saranex.
A5	Same as "A4" except when handling unsaturated material Tyvek and outer gloves are not required.
A6	Same as "A2."
A7	Same as "A2."
A8	Same as "A2" except nitrile can substitute Viton.
A9	Same as "A2" except nitrile can substitute Viton.
A10	Same as "A1" plus nitrile or Viton outer gloves. Avoid breathing vapor and/or mist.
A11	Same as "A2," except nitrile gloves can replace Viton and Silvershield after equipment is visibly clean; hoods and face shields must also be worn.
A12	Same as "A1."
A13	Same as "A8." Perform work outdoors and avoid breathing vapor and/or mist.
A14	Same as "A2."
A15	Same as "A1."

Anticipated levels of protection:

- A1, Mobilization, Demobilization, Site Visits, Surveying, and Walk-throughs
- A2, Monitoring Well Installation (on site)
- A3, Monitoring Well Installation (off site)
- A4, Soil Sampling during drilling activity (on site)
- A5, Soil Sampling during drilling activity (off site)
- A6, Well Development, Sampling, Pump Tests, and Slug Tests (on site)
- A7, Well Development, Sampling, Pump Tests, and Slug Tests (off site)
- A8, Construction of Staff Gauges
- A9, Surface Water and Sediment Sampling (off site)
- A10, Sampling Equipment Decontamination
- A11, Heavy Equipment Decontamination
- A12, Site Supervision
- A13, Sample Preservation and Packaging
- A14, Drum, Tank, and Building Sampling
- A15, RI Waste Characterization/Disposal

FIGURE 6-1

ANTICIPATED LEVELS OF PROTECTION
AIW FRANK SITE
CHESTER COUNTY, PENNSYLVANIA

HALLIBURTON NUS
Environmental Corporation

PVC or Saranex coveralls, hoods, and/or splash shields were selected to prevent saturation of work clothes during activities involving large volumes of liquids and/or saturated soils/equipment. Saranex may be preferred by the drillers due to increased durability.

6.3 PPE MODIFICATION CRITERIA

This section presents criteria for upgrading and downgrading chemical protective clothing (CPC) and/or respiratory protection. Where uncertainties arise, the more protective requirement will apply.

6.3.1 CPC Modification Criteria

Tyvek coveralls and boot covers must be worn anytime there is a reasonable potential for contamination of street clothes.

Nitrile gloves must be worn anytime there is a reasonable potential for contact with unsaturated soils or equipment which may contain trace contamination.

Viton gloves must be worn anytime there is a reasonable potential for contact with groundwater, saturated soils, and/or soils producing elevated MicroTip readings.

Polyvinyl chloride (PVC) or Saranex coveralls must be worn anytime there is a reasonable potential for saturation of work clothes.

6.3.2 Respiratory Protection Modification Criteria

Pressure-demand, supplied-air respirators (airline or SCBA) must be worn whenever any one or a combination of the following conditions prevail:

- Elevated MicroTip/OVA readings in the worker's breathing zone, including intermittent readings that persist for greater than 15 minutes.
- Chemical odors present in the work space, including intermittent odors that persist for greater than 15 minutes.
- Worker complaints of adverse heath effects that indicate possible overexposure (refer to Table 4-1).

Air-purifying respirators must be worn when both of the following criteria exist:

- If dusty conditions become evident and cannot be controlled via other methods (e.g., wetting down areas of concern).

- None of the criteria for the use of air-supplied respirators are met.

7.0 DECONTAMINATION

This section describes the steps site personnel will follow to prevent the spread of site contaminants into areas that may affect unprotected, unsuspecting site personnel or the public. It includes requirements for decontamination of personnel, sampling equipment, and drilling equipment.

7.1 PERSONNEL DECONTAMINATION

The decontamination of personnel and their protective clothing will be performed in three stages.

- Stage 1 includes removing contamination from reusable protective clothing and/or clothing that will be disposed of at sanitary landfills.

- Stage 2 will include removal of protective clothing, discarding disposable clothing and storing reusable protective clothing in the contamination reduction zone.

- Stage 3 will consist of workers washing their hands with potable water and soap each time they leave the exclusion zone.

All decontamination fluids generated will be contained and disposed of as specified in the Project Operations Plan. The decontamination area will be physically identified with rope or flagging and will by sufficiently equipped to be conducive for completion of the three stages listed above.

7.2 SAMPLING EQUIPMENT DECONTAMINATION

Decontamination of sampling tools may involve the use of deionized water, detergents (Alconox), methanol, and/or nitric acid. Requirements for decontaminating sampling equipment is presented in the Project Operations Plan.

Methanol and nitric acid will only be used outdoors and personnel will position themselves such that they can avoid breathing vapor and/or mist. Material Safety Data Sheets for the decontamination solutions will be presented during site specific training and maintained on site for reference upon request.

7.3 HEAVY EQUIPMENT DECONTAMINATION

Decontamination of drilling tools and other heavy equipment will be accomplished through the use of a high pressure steam system. The HALLIBURTON NUS Field Operations Leader (FOL) will inspect all heavy equipment prior to the equipment being released from the site. All decontamination fluids generated will be contained and disposed of as described in the Project Operations Plan.

8.0 MEDICAL SURVEILLANCE

8.1 REQUIREMENTS FOR HALLIBURTON NUS PERSONNEL

All HALLIBURTON NUS personnel participating in site activities will have had a physical examination meeting the requirements of HALLIBURTON NUS's medical surveillance program and will be medically qualified to perform hazardous waste site work under respiratory protection.

Documentation for medical clearances will be maintained in the HALLIBURTON NUS Pittsburgh office and made available as necessary.

8.2 REQUIREMENTS FOR SUBCONTRACTORS

Subcontractors are also required to obtain a certificate of their ability to perform hazardous waste site work and to wear respiratory protection. The "Subcontractor Medical Approval Form" (Figure 8-1) can be used to satisfy this requirement providing it is properly completed and signed by a licensed physician.

Subcontractors, who have a company medical surveillance program meeting the requirements of paragraph (f) of OSHA Standard 29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response: Final Rule," can substitute Figure 8-1 with a letter, on company letterhead, containing all of the information in the example letter presented as Figure 8-2. Figures 8-2 and 9-1 can be combined into one letter.

For employees of _____
Company Name

Participant Name: _____ Date of Exam: _____

Part A

The above-named individual has:

1. Undergone a physical examination in accordance with OSHA Standard 29 CFR 1910.120, paragraph (f) and found to be medically

   ( ) qualified to perform work at the _____ work site
   ( ) not qualified to perform work at the _____ work site,

   and

2. Undergone a physical examination as per OSHA 29 CFR 1910.134 (b)(10) and found to be medically

   ( ) qualified to work in respiratory protection
   ( ) not qualified to work in respiratory protection

My evaluation has been based on the following information, as provided to me by the employer.

( ) A copy of OSHA Standard 29 CFR 1910.120 and appendices.
( ) A description of the employee's duties as they relate to the employee's exposures.
( ) A list of known/suspected contaminants and their concentrations (if known).
( ) A description of any personal protective equipment used or to be used.
( ) Information from previous medical examinations of the employee which is not readily available to the examining physician.

Part B

I, _____, have examined _____
Physician's Name (Print) Participant's Name (Print)

and have determined the following information:

1. Results of the medical examination and tests (excluding findings or diagnoses unrelated to occupational exposure):

_____

_____

_____

FIGURE 8-1

PHYSICIAN'S STATEMENT

HALLIBURTON NUS
Environmental Corporation

2. Any detected medical conditions which would place the employee at increased risk of material impairment of the employee's health:

_____

_____

_____

3. Recommended limitations upon the employee's assigned work:

_____

_____

_____

_____

I have informed this participant of the results of this medical examination and any medical conditions which require further examination or treatment.

Based on the information provided to me, and in view of the activities and hazard potentials involved at the _____ work site, this participant

( ) may
( ) may not

perform his/her assignment task.

Physician's Signature _____

Address _____

Phone Number _____

NOTE: Copies of test results are maintained and available at:

_____
Address

FIGURE 8-1

PHYSICIAN'S STATEMENT (CONTINUED)

HALLIBURTON NUS *Environmental Corporation*

The following statements must be typed on company letterhead and signed by an officer of the company:

LOGO
XYZ CORPORATION
555 East 5th Street
Nowheresville, Kansas 55555

Month, day, year

Mr. Jeffrey Orient
Project Manager
HALLIBURTON NUS Environmental Corporation
Foster Plaza VII
661 Andersen Drive
Pittsburgh, Pennsylvania 15220

Subject: Medical Surveillance
AIW Frank Site

Dear Mr. Orient:

As an officer of XYZ Corporation, I hereby state that the persons listed below participate in a medical surveillance program meeting the requirements contained in paragraph (f) of Title 29 of the Code of Federal Regulations (CFR), Part 1910.120 entitled "Hazardous Waste Operations and Emergency Response: Final Rule." I further state that the persons listed below have had physical examinations under this program within the past 12 months and that they have been cleared, by a licensed physician, to perform hazardous waste site work and to wear respiratory protection. I also state that, to my knowledge, no person listed below has any medical restriction that would preclude him/her from working at the AIW Frank Site.

- List Full Names of Employees Here

Should you have any questions, please contact me at (555) 555-5555.

Sincerely,

(Name of Company Officer)

Initials

Enclosures

FIGURE 8-2

MEDICAL SURVEILLANCE LETTER

HALLIBURTON NUS
Environmental Corporation

9.0 TRAINING REQUIREMENTS

9.1 INITIAL TRAINING

9.1.1 Requirements For HALLIBURTON NUS Personnel

All HALLIBURTON NUS employees must complete a 40-hour introductory hazardous waste site training class prior to performing work at the AIW Frank/Mid-County Mustang Site. Additionally, HALLIBURTON NUS personnel who have had introductory training more than 12 months prior to site work must have completed 8 hours of refresher training within the past 12 months before being cleared for site work.

Documentation of HALLIBURTON NUS introductory and refresher training will be maintained in the site trailer. Copies of certificates or other official documentation will be used to fulfill this requirement.

9.1.2 Requirements For Subcontractors

All HALLIBURTON NUS subcontractor personnel must also have completed 40 hours of introductory hazardous waste site training or equivalent work experience as defined in OSHA Standard 29 CFR 1910.120(e), "Hazardous Waste Operations and Emergency Response: Final Rule," prior to performing work at the AIW Frank/Mid-County Mustang Site. HALLIBURTON NUS subcontractor personnel who have had introductory training more than 12 months prior to site work must also have had 8 hours of refresher training meeting the requirements of 29 CFR 1910.120(e)(8) prior to performing work at the AIW Frank/Mid-County Mustang Site.

HALLIBURTON NUS Subcontractors must certify that each subcontractor employee, who will perform work at the AIW Frank/Mid-County Mustang Site, has had training meeting the requirements of OSHA Standard 29 CFR 1910.120(e), "Hazardous Waste Site Operations and Emergency Response: Final Rule." This certification can be accomplished by sending HALLIBURTON NUS a letter, on company letterhead containing the information in the example letter provided as Figure 9-1. Figures 8-2 and 9-1 can be combined into one letter.

The following statements must be typed on company letterhead and signed by an officer of the company:

LOGO
XYZ CORPORATION
555 East 5th Street
Nowheresville, Kansas 55555

Month, day, year

Mr. Jeffrey Orient
Project Manager
HALLIBURTON NUS Environmental Corporation
Foster Plaza VII
661 Andersen Drive
Pittsburgh, Pennsylvania 15220

Subject: OSHA Compliance
AIW Frank Site

Dear Mr. Orient:

As an officer of XYZ Corporation, I hereby state that I am aware of the potential hazardous nature of the subject project. I also understand that it is our responsibility to comply with all applicable occupational safety and health regulations including those stipulated in Title 29 of the Code of Federal Regulations (CFR), Parts 1900 through 1910 and Part 1926.

I also understand that Title 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response: Final Rule, requires medical surveillance, for applicable employees, and appropriate level of training as required in paragraph (e) of 29 CFR 1910.120 for employees engaged in certain hazardous waste operations. In this regard, I hereby state that I have reviewed these requirements and that XYZ Corporation and all of its employees who will perform work at the AIW Frank Site are in full compliance.

The following employees have had 40 hours of introductory hazardous waste site training or equivalent work experience as required by 29 CFR 1910.120(e) and have had 8 hours of refresher training as required by 29 CFR 1910.120(e)(8).

List full names of employees here

Should you have any questions, please contact me at (555) 555-5555.

Sincerely,

(Name of Company Officer)

FIGURE 9-1

OSHA COMPLIANCE LETTER

HALLIBURTON NUS
Environmental Corporation

9.1.3 Requirements for Visitors

No person will be allowed beyond the support zone unless they have completed the necessary health and safety training as required by 29 CFR 1910.120(e) and are wearing the necessary protective equipment as required by this HASP.

9.2 SITE-SPECIFIC TRAINING

HALLIBURTON NUS will provide site-specific training to all HALLIBURTON NUS employees and subcontractor personnel who will perform work at the AIW Frank/Mid-County Mustang Site. This training will only be provided once and personnel who do not have the training will not be permitted to perform work at the site. Site-specific training will include:

- Names of personnel and alternates responsible for site safety and health.
- Safety, health and other hazards present on the site.
- Use of personal protective equipment.
- Work practices by which the employee can minimize risks from hazards.
- Safe use of engineering controls and equipment on the site.
- Medical surveillance requirements, including recognition of symptoms and signs which might indicate overexposure to hazards.
- The contents of the site safety and health plan.

9.2.1 Site-Specific Training Documentation

HALLIBURTON NUS and subcontractor personnel will be required to sign a statement indicating receipt of site-specific training and understanding of site hazards and control measures. Figure 9-2 will be used in this capacity.

My signature below indicates that I am aware of the potential hazardous nature of working at the AIW Frank Site and that I have received site-specific training at a level sufficient to enable me to safely carry out my job functions. My signature below further indicates that the elements covered in the site-specific training included:

- Names of personnel and alternates responsible for site safety and health.
- Safety, health and other hazards present on the site.
- Use of personal protective equipment.
- Work practices by which the employee can minimize risks from hazards.
- Safe use of engineering controls and equipment on the site.
- Medical surveillance requirements, including recognition of symptoms and signs which might indicate overexposure to hazards.
- The contents of the site safety and health plan.

Name (Print)	Signature	Date

FIGURE 9-2

SITE-SPECIFIC TRAINING DOCUMENTATION

HALLIBURTON NUS *Environmental Corporation*

10.0 STANDARD WORK PRACTICES

All site investigation activities will follow the appropriate Health and Safety Standard Operating Procedures.

The following safe working procedures are to be applied in addition to the Health and Safety Standard Operating Procedures.

- Eating, drinking, chewing gum or tobacco, taking medication, and smoking are prohibited in the exclusion or decontamination zones, or any location where a possibility for contact with site contaminants exists.

- Upon leaving the exclusion zone, hands and face must be thoroughly washed. Any protective outer clothing is to be decontaminated and removed as specified in this HASP, and left at a designated area prior to entering the clean area.

- Contact with potentially contaminated substances must be avoided. Contact with the ground or with contaminated equipment must also be avoided. Monitoring equipment must not be placed on potentially contaminated surfaces.

- No facial hair, which interferes with a satisfactory fit of the mask-to-face seal, is permitted on personnel required to wear respiratory protective equipment.

- All personnel must satisfy medical monitoring procedures.

- No flames or open fires will be permitted on site.

- No drilling within 20 feet in any direction of overhead power lines will be permitted. The locations of all underground utilities must be identified and marked prior to initiating any subsurface activities.

- All personnel must be aware of and follow the action levels presented in this HASP for upgrading respiratory protection.

- Any new analytical data must be promptly conveyed via telephone to the project Health and Safety Officer by the laboratory technician or Field Team Leader.

- Personnel must develop hand signals with the driller.

- A copy of the attached OSHA poster must be prominently posted at each site.

- All drill rigs and other machinery with exposed moving parts must be equipped with an operational emergency stop device. Drillers and geologists must be aware of the location of this device. This device must be tested prior to job initiation, and periodically thereafter. The driller and helper shall not simultaneously handle moving augers or flights unless there is a standby person to activate the emergency stop.

- The driller must never leave the controls while the tools are rotating unless all personnel are clear of the rotating equipment.

- Drillers must wear hearing protection unless the employer can provide documentation that noise exposures are less than a dose of 50 percent as required by OSHA 29 CFR 1910.95.

- A long-handled shovel or equivalent must be used to clear drill cuttings away from the hole and from rotating tools. Hands and/or feet are not to be used for this purpose.

- A remote sampling device must be used to sample drill cuttings if the tools are rotating. Samplers must not reach into or near the rotating equipment. If personnel must work near any tools which could rotate, the driller must shut down the rig prior to initiating such work.

- Drillers, helpers, and samplers must secure all loose clothing when in the vicinity of drilling operations.

- Only equipment which has been approved by the manufacturer may be used in conjunction with site equipment and specifically to attach sections of drilling tools together. Pins that protrude from augers shall not be allowed.

- No person shall climb the drill mast while tools are rotating.

- No person shall climb the drill mast without the use of ANSI approved fall protection (i.e., approved belts, lanyards, and a fall protection slide rail) or portable ladder which meets the requirements of OSHA standards.

- "All" compressed gas cylinders (empty or full) must be stored and used in an upright position, properly secured and protected from damage.

- The SSO must make an entry into the site health and safety logbook at least daily, to include:

  - Weather conditions
  - Site Personnel
  - New arrivals and "clearance for site work"
  - Air monitoring data summary
  - Monitoring instrument calibration
  - Indications of inhalation exposure
  - PPE used per task
  - Deviations from HASP
  - Inspection and cleaning of respiratory equipment
  - General H&S problems/corrective actions

- All sites must have a copy of the HALLIBURTON NUS Personal Protective Equipment Program, a Hazard Communication Program, and a Hearing Conservation Program. Sites requiring the use or potential use of respiratory protection must have a copy of the HALLIBURTON NUS Respiratory Protection Program.

- A copy of the appropriate Health and Safety Standard Operating Procedures must be present on site.

- Appropriate training and medical monitoring records must be maintained on site for all site personnel including subcontractors.

- All site personnel including subcontractors must complete a medical data sheet, to be maintained on site.

- Site personnel must immediately notify HALLIBURTON NUS Health Sciences (the OHSS or HSO) of all incidents for OSHA recordkeeping purposes.

- If personnel note any warning properties of chemicals (irritation, odors, symptoms, etc.) or even remotely suspect the occurrence of exposure, they must immediately notify the HSO for further direction.

- Site personnel are not to undertake any activity which would be considered a confined-space entry without first being trained in the proper procedures by the HSO, and obtaining a Confined Space/Limited Egress Permit.

For test pitting operations:

- No one, under any circumstances, shall enter a test pit. Personnel must use remote samplers to collect samples from test pits or collect the samples from the backhoe bucket. The latter is recommended.

- No sampling of drums is to occur during test pitting operations without prior approval and written procedures from the HSO.

- Before commencement of excavation, where there is a potential for contact with buried drums, all test pit locations will require that clean (virgin) fill be located by the area in question. This soil can be used to cover any ruptured drums to reduce potential emissions.

- Personnel must not lean over test pits.

- Personnel must stand upwind from the test pits and away from the reach of the backhoe, tires, and outrigger.

- Personnel must stand a minimum of 2 feet from the edge of any test pit. Unstable pits must be sloped at the sides to prevent cave-in.

- Personnel must develop hand signals with the backhoe operator.

- No open pits will be left unattended, under any circumstances.

- The backhoe operator shall not undermine the excavation.

- The SSO shall frequently inspect the test pits for slide or cave-in potential.

- All work areas must be kept free of ground clutter.

- Areas must be designated for chemical storage. Acids, bases and flammables shall all be stored separately. Storage areas must be labeled as to the contents within the storage area.

10.1 CONFINED SPACE ENTRY

If confined space entry becomes necessary for this project, the Project Manager shall notify the ARCS III HSO prior to authorizing entry. The procedure outlined in Attachment 1 will then be implemented.

11.0 SITE CONTROL

Each drilling and test pit location will be physically barricaded with rope, flagging, or cones to control entry and exit into and from the area. These barricaded areas will be referred to as the exclusion zones. Each person leaving an exclusion zone will proceed directly to the decontamination area which will also be identified by physical barriers. Only personnel who are cleared by the HALLIBURTON NUS FTL and SSO will be permitted in the exclusion zones and/or decontamination areas. Clearance for accessing these areas will only be given to personnel who meet the training and medical surveillance requirements of OSHA Standard 29 CFR 1910.120.

The support zone, where the administrative, communications, and other support services will be based, will be in a controlled area off the site or on the far end away from site contamination or areas of potential exposure. Only persons and equipment that are free of contamination will be permitted in the support zone.

12.0 EMERGENCY RESPONSE

HALLIBURTON NUS will evacuate their employees and subcontractors from the workplace if an emergency involving chemical spills, chemical fires, chemical exposure, and/or chemical emissions occurs. For this reason, Emergency Response planning will be in accordance with OSHA 29 CFR 1910.38(a).

12.1 PREPLANNING

Upon initial arrival at the AIW Frank/Mid-County Mustang Site, the HALLIBURTON NUS FTL and SSO will visit the local fire department to determine the status of emergency response services. This meeting will include a determination as to the need for further coordination with local rescue and police services.

Another aspect of preplanning for emergencies includes completion of the medical data sheet (Figure 12-1). This sheet must be completed by all HALLIBURTON NUS personnel and subcontractors so that, in the event of personal injury or illness, the examining physician has background information readily available on the injured/ill party.

12.2 EMERGENCY ESCAPE PROCEDURES AND ASSIGNMENTS

Upon notification of a site emergency requiring evacuation, all HALLIBURTON NUS personnel and subcontractors will proceed directly to the support trailer. If personnel cannot reach the support trailer without endangering life or health, an alternate meeting point will be specified by the HALLIBURTON NUS FTL or SSO.

12.3 PROCEDURES FOR PERSONNEL REMAINING ON SITE

No HALLIBURTON NUS personnel or subcontractors will remain on site to operate critical site operations.

Medical Data Sheet and Field Team Review

This brief Medical Data Sheet will be completed by all onsite personnel and will be kept in the command post during the conduct of site operations. This data sheet will accompany any personnel when medical assistance is needed or if transport to hospital facilities is required.

Project _____

Name _____ Home Telephone _____

Address _____

Age _____ Height _____ Weight _____

Name of Next of Kin _____

Drug or other Allergies _____

Particular Sensitivities _____

Do You Wear Contacts? _____

Provide a Checklist of Previous Illnesses or Exposure to Hazardous Chemicals.

_____

_____

What medications are you presently using? _____

_____

_____

Do you have any medical restrictions? _____

_____

_____

Name, Address, and Phone Number of personal physician: _____

_____

_____

_____

_____

I am the individual described above. I have read and understand this HASP.

_____ _____

Signature Date

FIGURE 12-1

MEDICAL DATA SHEET

HALLIBURTON NUS
Environmental Corporation

12.4 PROCEDURE TO ACCOUNT FOR SITE PERSONNEL

The HALLIBURTON NUS and subcontractor work force will be small enough so that accounting for site personnel will not be a problem. The HALLIBURTON NUS FTL and SSO will ensure that the whereabouts of all personnel are known.

12.5 RESCUE AND MEDICAL DUTIES

Only those persons who have been trained by the American Red Cross, or equivalent, will be permitted to perform rescue, first aid, and/or CPR treatment. Outside emergency services and medical facilities will be the primary providers of such services. A "physicians approved" first aid kit, an ANSI approved eye wash station, and a Class ABC fire extinguisher will be readily available on site.

Any HALLIBURTON NUS employee who shows signs or symptoms of overexposure must immediately be examined by a licensed physician. The physicians evaluation must be forwarded to the University of Pittsburgh's Occupational Medical Program for review. Figure 12-2 provides information for 24-hour access to the HALLIBURTON NUS medical consultant. Subcontractor personnel who show signs or symptoms of overexposure will be encouraged to visit a licensed physician as well. Figure 12-3 describes the directions to the nearest medical facility.

12.6 EMERGENCY COMMUNICATION PROCEDURE AND PHONE NUMBERS

Persons who observe an emergency situation must immediately notify the HALLIBURTON NUS FTL and/or SSO. The FTL or SSO will then immediately assess the emergency and appoint someone to telephone appropriate outside emergency services and will coordinate site evacuation. Emergency telephone numbers are included as Figure 12-3, a copy of which will be posted at the nearest telephone.

12.7 INCIDENT FOLLOW-UP

On receiving a report of incident (or near-incident) occurrence, the SSO shall immediately investigate the circumstances and shall make appropriate recommendations to prevent recurrence. The OHSS shall also participate in the investigation of more serious accidents and incidents. The HSO shall also be immediately notified by telephone on occurrence of a serious accident or incident. At his discretion, he may also participate in the investigation.

(1) MONDAY THROUGH FRIDAY, 8:00 A.M. - 4:00 P.M. (Central Standard Time):

Dial the (412) 648-3240 number. When answered state that:

(a) you are calling from HALLIBURTON NUS;

(b) this is an emergency call.

Program staff will be alerted how to contact the physician designated to provide emergency coverage on that day. Collect calls will be accepted.

(2) EVENINGS, WEEK-ENDS AND HOLIDAYS:

Dial the (412) 648-3240 number. An operator from the answering service will answer the telephone. Do the following.

(a) Tell the operator that you are calling from HALLIBURTON NUS.

(b) Tell the operator that this is an emergency call.

(c) Give her your name.

(d) Give her the telephone number where the physician is to call. Be certain that she has written the correct number (area code and seven digits).

(e) If you do not receive a call back within 15 minutes, place a second call to (412) 648-3240.

Collect calls will be accepted.

(3) SITUATIONS WHERE EMPLOYEE REQUIRES IMMEDIATE TRANSPORT TO A HOSPITAL:

If the situation is life-threatening, i.e., cardiac arrest or person not breathing, call the emergency medical services system and transport the person to the nearest hospital with advanced life support capabilities.

- Report the accident to the Site Safety Officer, and the Office Health and Safety Supervisor
- Develop safe operating procedures to prevent a recurrence
- File incident report with Manager of Health and Safety Department in Pittsburgh, Pennsylvania

FIGURE 12-2

EMERGENCY PHYSICIAN'S ACCESS PLAN

HALLIBURTON NUS Environmental Corporation

Listed below are the emergency telephone numbers for the various agencies in the Exton areas. HALLIBURTON NUS personnel will contact the appropriate agency for any potential emergencies that may occur onsite. The FTL will be the focal point for any site emergencies. In the event that any emergencies would occur the FTL will notify the appropriate agency from the listing below.

Type	Name	Telephone Numbers
Police:	Chester County Dispatch	(215) 692-5100
Ambulance/Fire/Rescue:		(215) 436-4700
Hospital:	Paoli Memorial Hospital	(215) 648-1043
Rescue Service:	See Fire & Ambulance	
Poison Control Center:	Poison Control	(215) 386-2100
HSO:	John Mikan	(412) 921-8724
Site Manager:	Jeffrey Orient	(412) 921-8778
Manager, Health Sciences:	Rick Gerlach	(412) 921-8549
OHSS:	Matthew Soltis	(412) 921-8912

Hospital Route:

The route to the hospital will be verified by the site health and safety officer upon arrival onsite. The directions to the hospital are given below:

From the AIW Frank Site, travel east on Route 30 (Lincoln Highway) approximately 5 miles. Paoli Memorial Hospital is located on the left-hand side. approximately 1/2 mile past Route 29. Follow the signs to the emergency entrance.

FIGURE 12-3

EMERGENCY PHONE NUMBERS
ROUTE TO HOSPITAL

HALLIBURTON NUS
Environmental Corporation

12.7.1 Incident Report

Details of the incident shall be documented on the ARCS III Incident Report Form within 24 hours of the incident and shall be distributed to the Project Manager, the OHSS, and the HSO. A copy of this report shall also be sent to the appropriate administrative contact for inclusion into the OSHA Form 101 and 200 log. Incident report forms will be available at the site support facilities.

13.0 DOCUMENTATION AND EQUIPMENT

This section summarizes the documentation and equipment needs for the project as specified in the HASP. Its purpose is to serve as a final checklist to help ensure all of the necessary resources are available to carry out the requirements of the HASP.

13.1 DOCUMENTATION

- Incident reports (Blank)
- Site safety follow-up reports (Blank)
- H&S log book
- HASP (Signed copy)
- OSHA poster (11" x 14")
- MSDS
- Medical data sheets (Blank)
- Blank MicroTip air monitoring logs (Figure 5-1 of HASP)
- Employee training certificates (HALLIBURTON NUS personnel)
- Subcontractor training and medical surveillance documentation

13.2 H&S EQUIPMENT

- First aid kit
- Eye wash
- Viton and/or Silvershield gloves
- Inner gloves
- Nitrile gloves
- Boot covers
- Hard hats and safety glasses
- Face/splash shields
- Tyvek
- PVC and/or Saranex (with hoods)
- SCBAs
- Decontamination kit
- Fire extinguisher
- Fall protection devices (body harness and lanyard)

- Duct tape
- LEL/O_2 meters
- MicroTips (11.7 eV)
- 11.7 eV lamp cleaner (cerium oxide)

JOB SAFETY & HEALTH PROTECTION

The Occupational Safety and Health Act of 1970 provides job safety and health protection for workers by promoting safe and healthful working conditions throughout the Nation. Requirements of the Act include the following:

Employers

All employers must furnish to employees employment and a place of employment free from recognized hazards that are causing or are likely to cause death or serious harm to employees. Employers must comply with occupational safety and health standards issued under the Act.

Employees

Employees must comply with all occupational safety and health standards, rules, regulations and orders issued under the Act that apply to their own actions and conduct on the job.

The Occupational Safety and Health Administration (OSHA) of the U.S. Department of Labor has the primary responsibility for administering the Act. OSHA issues occupational safety and health standards, and its Compliance Safety and Health Officers conduct jobsite inspections to help ensure compliance with the Act.

Inspection

The Act requires that a representative of the employer and a representative authorized by the employees be given an opportunity to accompany the OSHA inspector for the purpose of aiding the inspection.

Where there is no authorized employee representative, the OSHA Compliance Officer must consult with a reasonable number of employees concerning safety and health conditions in the workplace.

Complaint

Employees or their representatives have the right to file a complaint with the nearest OSHA office requesting an inspection if they believe unsafe or unhealthful conditions exist in their workplace. OSHA will withhold, on request, names of employees complaining.

The Act provides that employees may not be discharged or discriminated against in any way for filing safety and health complaints or for otherwise exercising their rights under the Act.

Employees who believe they have been discriminated against may file a complaint with their nearest OSHA office within 30 days of the alleged discrimination.

Citation

If upon inspection OSHA believes an employer has violated the Act, a citation alleging such violations will be issued to the employer. Each citation will specify a time period within which the alleged violation must be corrected.

The OSHA citation must be prominently displayed at or near the place of alleged violation for three days, or until it is corrected, whichever is later, to warn employees of dangers that may exist there.

Proposed Penalty

The Act provides for mandatory penalties against employers of up to $1,000 for each serious violation and for optional penalties of up to $1,000 for each nonserious violation. Penalties of up to $1,000 per day may be proposed for failure to correct violations within the proposed time period. Also, any employer who willfully or repeatedly violates the Act may be assessed penalties of up to $10,000 for each such violation.

Criminal penalties are also provided for in the Act. Any willful violation resulting in death of an employee, upon conviction, is punishable by a fine of not more than $10,000, or by imprisonment for not more than six months, or by both. Conviction of an employer after a first conviction doubles these maximum penalties.

Voluntary Activity

While providing penalties for violations, the Act also encourages efforts by labor and management, before an OSHA inspection, to reduce workplace hazards voluntarily and to develop and improve safety and health programs in all workplaces and industries. OSHA's Voluntary Protection Programs recognize outstanding efforts of this nature.

Such voluntary action should initially focus on the identification and elimination of hazards that could cause death, injury, or illness to employees and supervisors. There are many public and private organizations that can provide information and assistance in this effort, if requested. Also, your local OSHA office can provide considerable help and advice on solving safety and health problems or can refer you to other sources for help such as training.

Consultation

Free consultative assistance, without citation or penalty, is available to employers, on request, through OSHA supported programs in most State departments of labor or health.

More Information

Additional information and copies of the Act, specific OSHA safety and health standards, and other applicable regulations may be obtained from your employer or from the nearest OSHA Regional Office in the following locations:

Atlanta, Georgia
Boston, Massachusetts
Chicago, Illinois
Dallas, Texas
Denver, Colorado
Kansas City, Missouri
New York, New York
Philadelphia, Pennsylvania
San Francisco, California
Seattle, Washington

Telephone numbers for these offices, and additional area office locations, are listed in the telephone directory under the United States Department of Labor in the United States Government listing.

Washington, D.C.
1988 (Revised)
OSHA 2203

Ann McLaughlin, Secretary of Labor

U.S. Department of Labor
Occupational Safety and Health Administration

Under provisions of Title 29, Code of Federal Regulations, Part 1903.2(a)(1) employers must post this notice (or a facsimile) in a conspicuous place where notices to employees are customarily posted.

GPO : 1988 O - 219-667

ATTACHMENT 1

CONFINED SPACE/LIMITED EGRESS (CS/LE) STANDARD OPERATING PROCEDURES

NUS CORPORATION

ENVIRONMENTAL MANAGEMENT GROUP

STANDARD OPERATING PROCEDURES

Number	Page
HS-03	1 of 9
Effective Date: 05/04/90	Revision: 2
Applicability: EMG	
Prepared: Health and Safety	
Subject: CONFINED SPACE/LIMITED EGRESS (CS/LE)	Approved: D. Senovich

TABLE OF CONTENTS

1.0 PURPOSE

To define action to be taken when NUS EMG personnel are required to enter confined space/limited egress (CS/LE) enclosures or spaces.

2.0 SCOPE

Applies to all NUS/EMG CS/LE activity.

3.0 GLOSSARY

CS/LE Enclosure or Space - Any space or enclosure that: has limited openings for entry and egress; may have limited ventilation; may contain or produce life-threatening atmospheres due to oxygen deficiency or the presence of toxic, flammable, and/or corrosive contaminants; and is not intended for continuous employee occupancy. Examples of CS/LE enclosures may include BUT ARE NOT LIMITED TO: storage tanks, ship compartments, process/reaction vessels, stacks, pits, basements, silos, vats, degreasers, boilers, ventilation and exhaust ducts, manholes, sewers, tunnels, underground utility vaults, pipelines, and any open-topped space four feet or more in depth that is not subject to adequate ventilation.

The configuration of the space and the proposed operation to be conducted within that space will ultimately determine if a CS/LE condition exists.

Purging - Displacing gases, vapors, or other airborne contaminants from a CS/LE Area by ventilation or inert gas.

4.0 RESPONSIBILITIES

Health and Safety Officer (HSO) - The HSO has primary responsibility to evaluate and justify the need for CS/LE entry and will issue the necessary CS/LE entry permit. CS/LE entry permits require Office Health and Safety Supervisor (OHSS) approval prior to the entry and signature on the permit.

5.0 PROCEDURES

5.1 ENTRY DECISION

Entry into a CS/LE enclosure shall only be undertaken where there is no alternative means of obtaining the necessary results or accomplishing the required operation. Thus, CS/LE entries are to be recognized as a means of last resort.

5.2 ENTRY PERMIT SYSTEM

Entry into a CS/LE enclosure shall be by permit only. The permit serves as written approval and authorization for an entry of a specific space for a specific task. The permit certifies that existing and potential hazards have been evaluated by the onsite HSO and identifies the protective measures specified to ensure worker safety. The entry permit, when completed, will serve as a final safety briefing outline before entry and will be reviewed by the HSO with the entry team and standby personnel. The entry permit will identify:

1. The location of the CS/LE Area and a description of the entry task.
2. Known and potential hazards that may be encountered in the CS/LE Area.
3. Isolation checklist:
   a. Blanking and/or disconnecting of all lines
   b. Electrical lockout and tagout (both)
   c. Mechanical isolation and tagout (both)
   d. Mechanical ventilation (volumes)
4. Safety and protective equipment required:
   a. Level of protection
   b. Type of protective equipment
   c. Safety harness and/or lifelines
   d. Extraction devices
   e. Tools and electrical equipment approvals (including lighting and communications devices)
5. Pre-entry atmospheric monitoring:
   a. Oxygen level
   b. Combustible gas/vapor level
   c. Toxic substances level
6. Provisions for continuous atmospheric monitoring:
   a. Equipment
   b. Evacuation criteria
7. Identification of entry team:
   a. Personnel to make entry
   b. Personnel on stand-by
8. Emergency procedures and first-aid equipment location:

9. Training required:

   a. CS/LE entry

   b. CS/LE rescue

   c. Respirator use

5.3 TRAINING

Personnel required to work inside, or in support of those working inside CS/LE Areas shall have site-specific training in the following areas:

1. Hazards associated with CS/LE operations
2. Emergency entry and egress procedures
3. Respiratory protection
4. First aid
5. Cardiopulmonary resuscitation
6. Safety equipment
7. Lockout and tagout procedures
8. Rescue operations
9. Permit system
10. Work practices (see Section 5.6)

5.4 TESTING AND MONITORING

Absolutely no CS/LE entry without use of appropriate supplied-air respirators and dermal protection is to be initiated until appropriate initial testing has been conducted to assure the atmosphere in the CS/LE Area is safe. Monitoring shall be conducted for oxygen content, combustible gases/vapors, toxic contaminants, and any other tests specified by the HSO. Monitoring of the CS/LE Area shall be done on a continuous basis while personnel are in the CS/LE enclosure.

Entry into the CS/LE Area shall not be permitted, or evacuation of the region undertaken, without use of appropriate supplied-air respirators and dermal protection under the following conditions:

1. Oxygen concentrations less than 19.5% (148 mm Hg*) or greater than 23.5% (178 mm Hg*).
2. Flammability measurements greater than 25% of the lower explosive limits (LEL) for Non-Hot Work Operations.

*Based on Atmospheric Pressure of 760 mm Hg (Sea Level).

3. Flammability measurements greater than 10% of the LEL for Hot Work Operations.

4. Toxicity measurements indicating that an Immediate Danger to Life and Health (IDLH) atmosphere exists in the CS/LE Area.

Whenever any of the no entry permitted/evacuation conditions occur, the volumes of mechanical ventilation supplied to the space shall be increased and maintained. Entry or re-entry will be permitted when: (1) oxygen levels are measured greater than 19.5% and less than 23.5%; (2) LEL measurements fall below 10%; and (3) an IDLH atmospheric condition no longer exists.

Initial atmospheric samples shall be drawn while outside the CS/LE, at least at the following locations:

1. Outside the entry point(s).
2. Immediately inside the entry point(s).
3. At least every 4 feet in depth of the CS/LE Area to the surface of the floor or any remaining residues.

All initial monitoring results will be recorded on the entry permit.

5.5 PROTECTIVE EQUIPMENT AND CLOTHING

The entry permit will specify the level of protection to be used for the CS/LE entry. When the nature of the air contamination present is unknown, supplied-air respirator protection will be required.

Additional safety equipment in the form of safety belts, body harness, or wrist type harnesses with life lines shall be provided and used for all CS/LE entries. Lifelines shall be attached to extraction devices outside the CS/LE Area, so that nonentry rescues may be accomplished.

Standby personnel shall be equipped with at least the same level of protection as the entry team, as well as be supplied with respirators suitable for IDLH atmospheres.

Other safety equipment that may be utilized (where appropriate) include safety nets, life jackets, electrical insulations, and barriers, as the particular CS/LE Area warrants.

5.6 WORK PRACTICES

As part of the pre-entry procedure, the HSO shall review the entry permit with all members of the entry team and standby team personnel (as indicated in Section 5.2) and shall be present during the operation. He will maintain communications and have ready access to emergency and support services and facilities.

5.6.1 Purging and Ventilation

All CS/LE enclosures shall be subject to purging and continuous ventilation after initial atmospheric testing, but prior to any actual entry. The only exception to this requirement is where entry is made solely to obtain samples of materials remaining in the CS/LE Area AND initial atmospheric testing indicates:

1. No oxygen deficiency or enrichment.

2. LEL measurements are less than 10%.

3. Toxicity measurement is less than 10% of the established IDLH of the airborne contaminant present.

4. Organic vapor measurements coincide with the ap oriate level of personal protective equipment employed for confined spaces.

5. Special conditions exist, such that the above criteria do not apply and specific authorization is obtained from the OHSS.

5.6.2 Isolation/Lockout and Tagging

Except for such CS/LE Areas as manholes, sewers, and tunnels, where complete isolation is not physically possible, all CS/LE Areas shall be completely isolated from all other systems by means such as double block and bleed, blanking, or physical disconnection of all lines into the Areas. All lines that have been subject to the isolation actions shall be tagged to identify the reason for blocking, blanking, and/or disconnection. The Tag shall contain the following statement:

THIS EQUIPMENT
REMOVED FROM SERVICE DUE
TO CONFINED SPACE WORK
AT _____

DO NOT OPERATE

The CS/LE Area shall be electrically isolated to prevent accidental activation of moving parts or other electrical equipment serving the Work Area. Electrical isolation shall be accomplished by lockout of circuit breakers and/or power disconnects in the open (OFF) position by key-type padlock. Each person entering the CS/LE Area shall have placed a lock on the circuit breaker/disconnect and shall maintain possession of the only key to the lock. Any circuit breaker/disconnect that is locked out, shall also be tagged to identify the reason for the lockout.

Mechanical isolation of moving parts shall be achieved by disconnecting linkages, or removing chain or belt drives. Other moving mechanical parts shall be blocked in such a way to preclude accidental rotation. Any mechanical isolation shall be tagged to identify the reason for the isolation.

5.6.3 Cleaning

Initial cleaning of any CS/LE Area shall be done from the outside, if at all feasible. If initial atmospheric testing shows a flammable atmosphere approaching the lower explosive limit (LEL) in the enclosure, it shall be inert gas-purged prior to starting ventilation.

The cleaning process itself may create an additional potential for hazard in the CS/LE. Examples of such conditions include:

1. Excessive heat stress in the enclosed space, if it is steamed, cleaned, and not allowed to cool down.

2. Build-up of toxic materials, if a chemical neutralization is used and ventilation is not maintained or adequate.

3. Potential for fire and explosion in the Area where the autoignition temperature of the stored product in the enclosed space is 120% or less of the steam pressure and/or the steam hose nozzle is not bonded to the CS/LE Area during steam cleaning operations.

5.6.4 Equipment, Instruments, and Tools

All tools and other equipment, including monitoring instruments, for use in CS/LE Areas shall be inspected for compliance with the following requirements:

1. Tools and equipment will be kept clean and in a good state of repair.

2. All electrical equipment such as portable tools, lighting, and power cords shall meet approvals in accordance with OSHA regulations found in 29 CFR 1910 Subpart S, including provisions for ground fault interruption protection and visual inspection of equipment for defects or damage.

3. Lighting used in CS/LE Areas shall be of explosion-proof design, equipped with necessary guards, and bear Underwriters Laboratories (UL) or other appropriate approval listings.

4. Air-activated tools shall be used, where flammable liquids are present, and shall be bonded to the CS/LE Area.

5. Compressed gas cylinders, except those that are part of a SCBA or resuscitation equipment, shall never be permitted inside a CS/LE Area. Cylinders used to supply compressed gases to CS shall be turned off at the cylinder valve when not in actual use and the supply lines shall be removed from the Area.

6. Ladders, scaffolding, and staging shall be adequately designed, secured, and be in conformance with OSHA regulations found in 29 CFR 1910 Subpart D.

7. Any equipment or instrumentation subject to use in the CS/LE Area, where flammable atmospheres may occur, shall be listed as explosion-proof or intrinsically safe by a recognized testing laboratory.

5.6.5 Record Keeping

Copies of the entry permit will be maintained in an employee exposure record, as required under 29 CFR 1910.20.

6.0 REFERENCES

Criteria for a Recommended Standard. Working in Confined Spaces, DHEW (NIOSH) Publication Number 80-106. Cincinnati, U.S. Department of Health Education and Welfare, Public Health Service, National Institute for Occupational Safety and Health. 1979.

Limited Egress/Confined Spaces, Los Alamos, New Mexico, Los Alamos Scientific Laboratory. 1980.

Proposed Michigan State Confined Space Entry Standard, Part 90 Rule 408. Ann Arbor, Michigan, Michigan Occupational Safety and Health Administration. 1984.

Standard Practice for Confined Area Entry, ASTM D4276-84, Philadelphia, Pennsylvania, American Society for Testing and Materials. 1984.

AA Primer on Confined Area Entry, Malvern, Pennsylvania, Bio Marine Industries, Inc., 17 pp.

7.0 ATTACHMENTS

Attachment A - Work Permit for CS/LE Operations

ATTACHMENT A

WORK PERMIT FOR CS/LE OPERATIONS

EXPIRATION DATE: _____

Location of CS/LE: _____

Description of task: _____

Identified Hazards (see checklist): _____

Personnel Assigned

Name: _____ Duties: _____
Name: _____ Duties: _____
Name: _____ Duties: _____
Name: _____ Duties: _____
Name: _____ Duties: _____

Special Equipment Required _____

Special Safety Requirements/Procedures _____

Initial Atmospheric Tests:

	AT ENTRY INSIDE	DEPTHS 4'	8'	12'	16'	20'
oxygen levels						
combustible gas						
toxics						

Level of Protection		Ventilation Functions	
Adequate PPE Supply		Tools & Equipment Approved	
Isolation Complete		Lighting & Elec. Approved	
Rescue Equipment		Communications	

Permit Prepared by: _____ _____
Health and Safety Officer Date

Permit Approved by: _____ _____
Office Health and Safety Officer Date

APPENDIX A

FORMS

APPENDIX A
TABLE OF CONTENTS

SAMPLE LABEL

NUS CORPORATION

LABORATORY SERVICES GROUP
5350 CAMPBELLS RUN ROAD
PITTSBURGH, PA. 15205

NUS SAMPLE #

Client Name _____

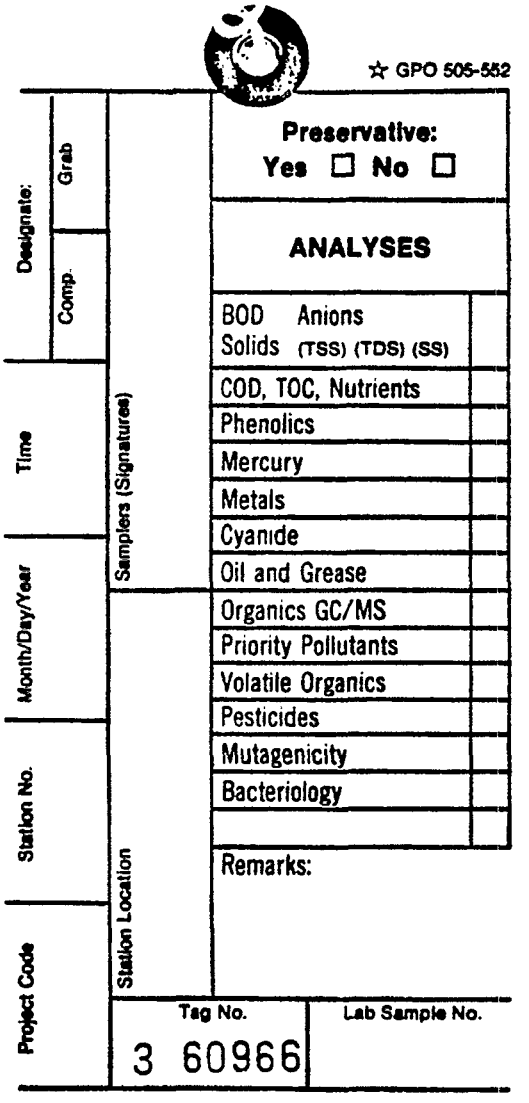
Date Sampled _____ Time _____

Client Sample # _____

Sample Source _____

_____

SAMPLE IDENTIFICATION TAG



☆ GPO 505-552

Designate: Grab / Comp.	**Preservative:** Yes ☐ No ☐
Time	**ANALYSES**
Month/Day/Year	BOD Anions Solids (TSS) (TDS) (SS)
Station No.	COD, TOC, Nutrients
Project Code	Phenolics
Samplers (Signatures)	Mercury
Station Location	Metals
	Cyanide
	Oil and Grease
	Organics GC/MS
	Priority Pollutants
	Volatile Organics
	Pesticides
	Mutagenicity
	Bacteriology
	Remarks:
Tag No. 3 60966	Lab Sample No.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

EPA

AR300315

R-33-5-91-13

ENVIRONMENTAL PROTECTION AGENCY
Office of Enforcement

CHAIN OF CUSTODY RECORD

REGION 3
Curtis Bldg., 6th & Walnut Sts.
Philadelphia, Pennsylvania 19106

PROJ. NO.	PROJECT NAME					NO. OF CON-TAINERS							REMARKS
SAMPLERS: *(Signature)*													
STA. NO.	DATE	TIME	COMP.	GRAB	STATION LOCATION								

Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*	Relinquished by: *(Signature)*	Date / Time	Received by: *(Signature)*
Relinquished by: *(Signature)*	Date / Time	Received for Laboratory by: *(Signature)*	Date / Time	Remarks	

Distribution: Original Accompanies Shipment; Copy to Coordinator Field Files

3-15966

CHAIN-OF-CUSTODY RECORD FORM FOR USE IN REGION III
(Original is 8-1/2 x 11-3/4")

A-3

AR300316

CHAIN-OF-CUSTODY SEAL

AR300317

NUS CORPORATION
A Halliburton Company

SAMPLE LOG SHEET

Page _____ of _____

☐ Monitoring Well Data
☐ Domestic Well Data
☐ Other _____

Case # _____

By _____

Project Site Name _____ Project Site Number _____

NUS Source No. _____ Source Location _____

Total Well Depth:	Purge Data				
Well Casing Size & Depth:	Volume	pH	S.C.	Temp. (°C)	Color & Turbidity
Static Water Level:					
One Casing Volume:					
Start Purge (hrs.):					
End Purge (hrs.):					
Total Purge Time (min.):					
Total Amount Purged (gal.):					
Monitor Reading:					
Purge Method:					
Sample Method:					
Depth Sampled:					

Sample Date & Time:	Sample Data			
	pH	S.C.	Temp. (°C)	Color & Turbidity
Sampled By:				

Signature(s):

Observations / Notes:

Type of Sample
- ☐ Low Concentration
- ☐ High Concentration
- ☐ Grab
- ☐ Composite
- ☐ Grab - Composite

Analysis:	Preservative		Organic	Inorganic
		Traffic Report #		
		Tag #		
		AB #		
		Date Shipped		
		Time Shipped		
		Lab		
		Volume		

NUS CORPORATION
A Halliburton Company

SAMPLE LOG SHEET

- ☐ Surface Soil
- ☐ Subsurface Soil
- ☐ Sediment
- ☐ Lagoon / Pond
- ☐ Other _____

Page _____ of _____

Case # _____

By _____

Project Site Name _____ Project Site Number _____

NUS Source No. _____ Source Location _____

Sample Method:	Composite Sample Data		
	Sample	Time	Color / Description
Depth Sampled:			
Sample Date & Time:			
Sampled By:			
Signature(s):			
Type of Sample ☐ Low Concentration ☐ High Concentration ☐ Grab ☐ Composite ☐ Grab - Composite			
	Sample Data		
	Color	Description: (Sand, Clay, Dry, Moist, Wet, etc.)	

Analysis:	Observations / Notes

	Organic	Inorganic
Traffic Report #		
Tag #		
AB #		
Date Shipped		
Time Shipped		
Lab		
Volume		

NUS CORPORATION
A Halliburton Company

SAMPLE LOG SHEET

☐ Spring
☐ Lake
☐ Stream
☐ Other _____

Page _____ of _____

Case # _____

By _____

Project Site Name _____ Project Site Number _____

NUS Source No. _____ Source Location _____

Sample Method:	Sample Data			
	pH	S.C.	Temp. (°C)	Color & Turbidity
Depth Sampled:				
Sample Date & Time:				
Sampled By:				
Signatures:				

Type of Sample
- ☐ Low Concentration
- ☐ High Concentration
- ☐ Grab
- ☐ Composite
- ☐ Grab - Composite

Analysis:	Preservative

	Organic	Inorganic
Traffic Report #		
Tag #		
AB #		
Date Shipped		
Time Shipped		
Lab		
Volume		

USEPA CONTRACT LABORATORY PROGRAM
SAMPLE MANAGEMENT OFFICE
P.O. BOX 818 ALEXANDRIA, VA 22313
703/557-2490 FTS-557-2490

CASE NO: | SAS NO: (IF APPLICABLE)

ORGANIC TRAFFIC REPORT
(FOR CLP USE ONLY)

TYPE OF ACTIVITY (CIRCLE ONE) ①
SUPERFUND—PA SI ESI RIFS RD RA ER NPLD O&M OTHER _____
NON-SUPERFUND—_____PROGRAM

SITE NAME:

CITY, STATE: SITE SPILL ID:

REGION NO: SAMPLING COMPANY ②

SAMPLER: (NAME)

SHIP TO: ③

ATTN: _____

SAMPLING DATE: ④

BEGIN: _____ END: _____

DATE SHIPPED: _____ CARRIER: _____ ⑤

AIRBILL NO: _____

SAMPLE DESCRIPTION ⑥
(ENTER IN BOX A)
1. SURFACE WATER
2. GROUND WATER
3. LEACHATE
4. SOIL
5. SEDIMENT
6. OIL (SAS)
7. WASTE (SAS)

TRIPLE VOLUME REQUIRED FOR MATRIX SPIKE/DUPLICATE AQUEOUS SAMPLE

SHIP MEDIUM AND HIGH CONCENTRATION SAMPLES IN PAINT CANS

SEE REVERSE FOR ADDITIONAL INSTRUCTIONS

CLP SAMPLE NUMBER (FROM LABELS)	Ⓐ SAMPLE DESCRIPTION (FROM BOX 1) 1 2 3 4 5 6 7	Ⓑ CONCENTRATION L = LOW/MED H = HIGH (SAS)	Ⓒ RAS ANALYSIS: VOLATILE	BASE/NEUT /ACID	PESTICIDE /PCB's		Ⓓ SPECIAL HANDLING	Ⓔ STATION LOCATION

EPA Form 2075-7 (8-87)

WHITE — SMO COPY PINK — CLIENT COPY WHITE — LAB COPY FOR RETURN TO SMO YELLOW — LAB COPY

USEPA CONTRACT LABORATORY PROGRAM
SAMPLE MANAGEMENT OFFICE
P.O. BOX 818 ALEXANDRIA, VA 22313
703/557-2490 FTS-557-2490

CASE NO: | SAS NO: (IF APPLICABLE)

INORGANIC TRAFFIC REPORT

(FOR CLP USE ONLY)

TYPE OF ACTIVITY (CIRCLE ONE) ①
SUPERFUND—PA SI ESI RIFS RD RA ER NPLD O&M OTHER _____
NON-SUPERFUND—_____PROGRAM

SITE NAME:

CITY, STATE: SITE SPILL ID:

REGION NO: SAMPLING COMPANY ②

SAMPLER: (NAME)

SHIP TO: ③

ATTN:

SAMPLING DATE: ④

BEGIN: _____ END: _____

DATE SHIPPED:_____ CARRIER: ⑤

AIRBILL NO:

SAMPLE DESCRIPTION ⑥
(ENTER IN BOX A)
1. SURFACE WATER
2. GROUND WATER
3. LEACHATE
4. SOIL
5. SEDIMENT
6. OIL (SAS)
7. WASTE (SAS)

DOUBLE VOLUME REQUIRED FOR MATRIX *SPIKE/DUPLICATE AQUEOUS SAMPLE*

SHIP MEDIUM AND HIGH CONCENTRATION SAMPLES IN PAINT CANS

SEE REVERSE FOR ADDITIONAL INSTRUCTIONS

CLP SAMPLE NUMBER (FROM LABELS)	Ⓐ SAMPLE DESCRIPTION (FROM BOX 1) 1 2 3 4 5 6 7	Ⓑ CONCENTRATION L = LOW M = MED H = HIGH (SAS)	Ⓒ RAS ANALYSIS: TOTAL METALS	CYANIDE	DISSOLVED METALS	HIGH ONLY (SAS): SULFIDE	pH	CONDUCTIVITY	OXIDANTS	Ⓓ SPECIAL HANDLING	Ⓔ STATION LOCATION

EPA Form 2075-6 (8-87)

WHITE — SMO COPY PINK — CLIENT COPY WHITE — LAB COPY FOR RETURN TO SMO YELLOW — LAB COPY

AR300322

TRAFFIC REPORT LABELS

MAB 342

: 6003

AC 865 · Soil/Sediment (VOA)

U.S. ENVIRONMENTAL PROTECTION AGENCY
CLP Sample Management Office
P.O. Box 818 - Alexandria, Virginia 22313
Phone: 703/557-2490 - FTS/557-2490

SAS Number

SPECIAL ANALYTICAL SERVICE
PACKING LIST

Sampling Office:	Sampling Date(s):	Ship To:	For Lab Use Only
Sampling Contact:	Date Shipped:		Date Samples Rec'd:
(name)	Site Name/Code:		Received By:
(phone)		Attn:	

	Sample Numbers	Sample Description i.e., Analysis, Matrix, Concentration	Sample Condition on Receipt at Lab
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

For Lab Use Only

White - SMO Copy, Yellow - Region Copy, Pink - Lab Copy for return to SMO, Gold - Lab Copy

page___ of ___ EPA SAMPLE SHIPPING LOG FOR ALL SAMPLES SENT THROUGH THE CONTRACT LAB PROGRAM (12/85 version)

CASE#_____ SAS#_____ SITE NAME:_____

Site Leader:_____ EPA Project Officer:_____

Phone:

QC SAMPLE INFO AND/OR COMMENTS	CONC. (low/ med/ high)	SAMPLE PHASE (aq/ sol)	TYPE OF REQUEST org,dio inor, SAS	SAMPLE TRAFFIC REPORT NUMBER	ORGANICS OR INORGANICS								SAS REQUEST: (details required)			
					LAB NAME	DATE SHIPPED	DATA RECEIVED XX out items not requested VOA	BNA	PEST	TCDD	METALS	CN	LAB NAME	SAS REQUEST (itemize)	DATE SHIPPED	DATA REC'D

PUMPING TEST DATA SHEET

PUMPING TEST DATA SHEET — *NUS CORPORATION*

PROJECT NAME: _____ MEASURED WELL: _____
PROJECT NO.: _____ DATE: _____ PUMPING WELL: _____
GEOLOGIST: _____ CHECKED: _____ TEST NO.: _____
DISTANCE FROM PUMPING WELL(ft.)(r): _____ PUMP SETTING, FEET BELOW MONITORING POINT: _____
STATIC H_2O LEVEL (ft.)(s_o): _____ MONITORING POINT: _____
TIME PURGE START OR STOP (t_o): _____ ELEVATION OF MONITORING POINT (ft. above MSL): _____

TIME	(t) MIN. SINCE PUMP START OR STOP	WATER LEVEL MEASUREMENTS (ft.)			(s) DD Or RECOVERY (ft.)	PUMPING RATE (Q) GPM	REMARKS
		READING	CORRECTION	DTW			

HYDRAULIC CONDUCTIVITY TESTING DATA SHEET — *NUS CORPORATION*

PROJECT NAME: ..... WELL/BORING NO.: .....
PROJECT NO.: ..... GEOLOGIST: .....
WELL DIAMETER: ..... SCREEN LENGTH/DEPTH: ..... TEST NO.: .....
STATIC WATER LEVEL (Depth/Elevation): ..... / ..... DATE: .....
TEST TYPE (Rising/Falling/Constant Head): ..... CHECKED: .....
METHOD OF INDUCING WATER LEVEL CHANGE: ..... PAGE ___ OF ___

TIME	ELAPSED TIME (min. or sec.)	MEASURED DEPTH TO WATER (ft.)	CORRECTION	DEPTH TO WATER (ft.)	DRAWDOWN OR HEAD (ft.)	REMARKS

kac 3/88

GROUNDWATER LEVEL MEASUREMENT SHEET — NUS CORPORATION

Project Name: _____ Location: _____
Project No.: _____ Weather Conditions: _____
Personnel: _____ Measuring Device: _____
Date: _____ Remarks: _____
Tidally Influenced: Yes _____ No _____

Well or Piezometer Number	Date/Time	Elevation of Reference Point (Feet)*	Water Level Indicator Reading (Feet)*	Correction Factor	Adjusted Depth (Feet)*	Groundwater Elevation (Feet)*

* ALL MEASUREMENTS TO NEAREST 0.01 FOOT

BORING LOG **NUS CORPORATION**

PROJECT: ..... BORING NO.: .....
PROJECT NO.: ..... DATE: ..... DRILLER: .....
ELEVATION: ..... FIELD GEOLOGIST: .....
WATER LEVEL DATA : .....
(Date, Time & Conditions) .....

SAMPLE NO. & TYPE OR RQD	DEPTH (ft.) OR RUN NO.	BLOWS/ 6" OR RQD (%)	SAMPLE RECOVERY /SAMPLE LENGTH	LITHOLOGY CHANGE (Depth,ft.) OR SCREENED INTERVAL	MATERIAL DESCRIPTION			BORE HOLE CONSTRUCTION	REMARKS
					SOIL DENSITY/ CONSISTENCY OR ROCK HARDNESS	COLOR	MATERIAL CLASSIFICATION		

REMARKS _____

BORING _____

PAGE ____ OF ____

SOIL TERMS

UNIFIED SOIL CLASSIFICATION (USCS)

COARSE GRAINED SOILS
More than half of material is LARGER than No. 200 sieve size

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3" & basing fractions on estimated weights)			GROUP SYMBOL	TYPICAL NAMES
GRAVELS 50%(+) > #4 Ø	CLEAN GRAVELS Low % fines	Wide range in grain size and substantial amounts of all intermediate particle sizes	GW	Well graded gravels, gravel-sand mixtures, little or no fines
		Predominantly one size or a range of sizes with some intermediate sizes missing.	GP	Poorly graded gravels, gravel-sand mixtures, little or no fines.
	GRAVELS w/FINES High % fines	Non plastic fines (for identification procedures see ML)	GM	Silty gravels, poorly graded gravel sand-silt mixtures.
		Plastic fines (for identification procedures see CL)	GC	Clayey gravels, poorly graded gravel-sand-clay mixtures.
SANDS 50%(+) < #4 Ø	CLEAN SANDS Low % fines	Wide range in grain size and substantial amounts of all intermediate particle sizes.	SW	Well graded sand, gravelly sands, little or no fines.
		Predominantly one size or a range of sizes with some intermediate sizes missing.	SP	Poorly graded sands, gravelly sands, little or no fines.
	SANDS w/FINES High % fines	Non plastic fines (for identification procedures see ML)	SM	Silty sands, poorly graded sand-silt mixtures.
		Plastic fines (for identification procedures see CL)	SC	Clayey sands, poorly graded sand-clay mixtures.

FINE GRAINED SOILS
More than half of material is SMALLER than No. 200 sieve size

FIELD IDENTIFICATION PROCEDURES (Excluding particles larger than 3" & basing fractions on estimated weights)				GROUP SYMBOL	TYPICAL NAMES
Identification procedures on fraction smaller than No. 40 sieve size					
	DRY STRENGTH (Crushing Characteristics)	DILATANCY (Reaction to Shaking)	TOUGHNESS (Consistency Near Plastic Limit)		
SILTS & CLAYS Liquid limit < 50	None to slight	Quick to slow	None	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity
	Medium to high	None to very slow	Medium	CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
	Slight to medium	Slow	Slight	OL	Organic silts and organic silt-clays of low plasticity
SILTS & CLAYS Liquid limit > 50	Slight to medium	Slow to none	Slight to medium	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
	High to very high	None	High	CH	Inorganic clays of high plasticity, fat clays
	Medium to high	None to very slow	Slight to medium	OH	Organic clays of medium to high plasticity
HIGHLY ORGANIC SOILS	Readily identified by color, odor, spongy feel and frequently by fibrous texture.			Pt	Peat and other organic soils

Boundary classifications: Soils possessing characteristics of two groups are designated by combining group symbols. For example GW-GC, well graded gravel-sand mixture with clay binder.
All sieve sizes on this chart are U.S. standard.

DENSITY OF GRANULAR SOILS

DESIGNATION	STANDARD PENETRATION RESISTANCE - BLOWS/FOOT
Very loose	0-4
Loose	5-10
Medium dense	11-30
Dense	31-50
Very dense	Over 50

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNC. COMPRESSIVE STR. TONS/SQ. FT.	STANDARD PENETRATION RESISTANCE - BLOWS/FOOT	FIELD IDENTIFICATION METHODS
Very soft	Less than 0.25	0 to 2	Easily penetrated several inches by fist
Soft	0.25 to 0.50	2 to 4	Easily penetrated several inches by thumb
Medium stiff	0.50 to 1.0	4 to 8	Can be penetrated several inches by thumb
Stiff	1.0 to 2.0	8 to 15	Readily indented by thumb
Very stiff	2.0 to 4.0	15 to 30	Readily indented by thumbnail
Hard	More than 4.0	Over 30	Indented with difficulty by thumbnail

ROCK TERMS

ROCK HARDNESS (FROM CORE SAMPLES)

DESCRIPTIVE TERMS	SCREWDRIVER OR KNIFE EFFECTS	HAMMER EFFECTS
Soft	Easily gouged	Crushes when pressed with hammer
Medium soft	Can be gouged	Breaks (one blow) Crumbly edges
Medium hard	Can be scratched	Breaks (one blow) Sharp edges
Hard	Cannot be scratched	Breaks conchoidally (several blows) Sharp edges

ROCK BROKENNESS

DESCRIPTIVE TERMS	ABBREVIATION	SPACING
Very broken	(V. Br.)	0 - 2"
Broken	(Br.)	2" - 1'
Blocky	(Bl.)	1' - 3'
Massive	(M.)	3' - 10'

LEGEND

SOIL SAMPLES - TYPES

S - 2" O.D. Split Barrel Sample
ST - 3" O.D. Undisturbed Sample
O - Other Samples, Specify in Remarks

ROCK SAMPLES - TYPES

X - NX (Conventional) Core (~2-1/8" O.D.
Q - NQ (Wireline) Core (~1-7/8" O.D.)
Z - Other Core Sizes, Specify in Remarks

WATER LEVELS

12/18
▼ 12.6' Initial Level ▼/Date & Depth

12/18
▼ 12.6' Stabilized Level ▼/Date & Dept

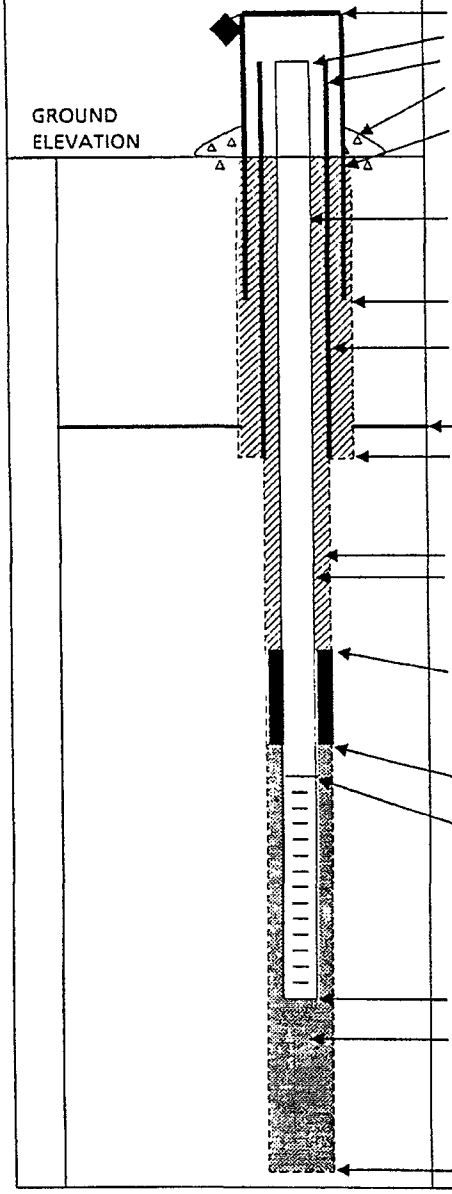
(CONTINUED)

BORING NO.: _____

BEDROCK
MONITORING WELL SHEET
WELL INSTALLED IN BEDROCK

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF SURFACE CASING : _____
ELEVATION OF TOP OF RISER PIPE: _____
ELEVATION TOP OF PERM. CASING: _____
TYPE OF SURFACE SEAL: _____
I.D. OF SURFACE CASING: _____
TYPE OF SURFACE CASING: _____
RISER PIPE I.D. _____
TYPE OF RISER PIPE: _____
BOREHOLE DIAMETER: _____
PERM. CASING I.D. _____
TYPE OF CASING & BACKFILL: _____
ELEVATION / DEPTH TO BEDROCK: _____
ELEVATION/DEPTH BOTTOM OF CASING: _____
BOREHOLE DIA. BELOW CASING: _____
TYPE OF BACKFILL: _____
ELEVATION / DEPTH TOP OF SEAL: _____
TYPE OF SEAL: _____
ELEVATION / DEPTH TOP OF SAND PACK: _____
ELEVATION/DEPTH TOP OF SCREEN: _____
TYPE OF SCREEN: _____
TYPE OF SAND PACK: _____
ELEVATION / DEPTH BOTTOM OF SCREEN: _____
ELEVATION / DEPTH BOTTOM OF SAND PACK: _____
TYPE OF BACKFILL BELOW OBSERVATION WELL: _____
ELEVATION / DEPTH OF HOLE: _____

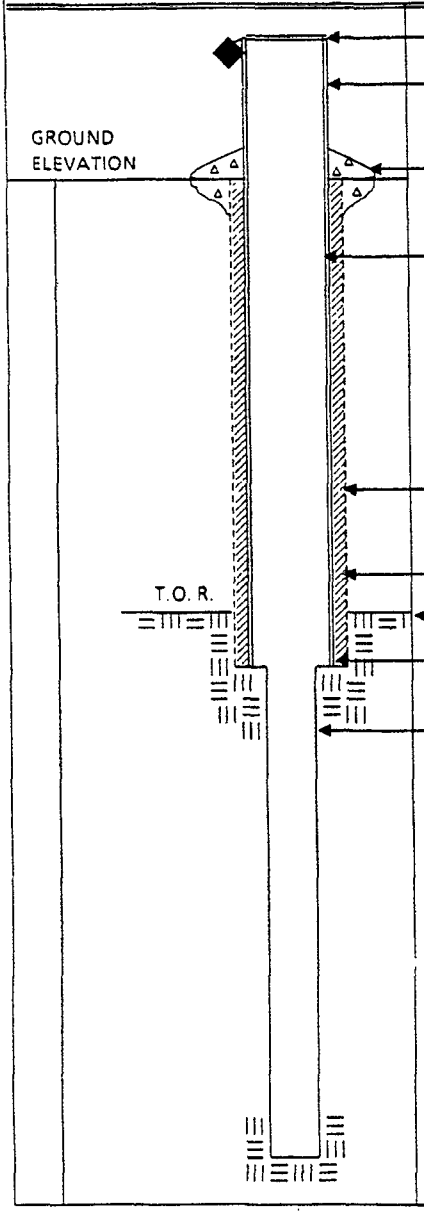
NUS CORPORATION
A Halliburton Company

BORING NO.: _____

BEDROCK
MONITORING WELL SHEET
OPEN HOLE WELL

PROJECT _____ LOCATION _____
PROJECT NO. _____ BORING _____
ELEVATION _____ DATE _____
FIELD GEOLOGIST _____

DRILLER _____
DRILLING METHOD _____
DEVELOPMENT METHOD _____



ELEVATION OF TOP OF CASING: _____

STICK UP OF CASING ABOVE GROUND SURFACE: _____

TYPE OF SURFACE SEAL: _____

I.D. OF CASING: _____

TYPE OF CASING: _____

TEMP. / PERM.: _____

DIAMETER OF HOLE: _____

TYPE OF CASING SEAL: _____

DEPTH TO TOP OF ROCK: _____

DEPTH TO BOTTOM CASING: _____

DIAMETER OF HOLE IN BEDROCK: _____

DESCRIBE IF CORE / REAMED WITH BIT:

_____

_____

_____

DESCRIBE JOINTS IN BEDROCK AND DEPTH:

_____

_____

_____

ELEVATION / DEPTH OF HOLE: _____

EQUIPMENT CALIBRATION LOG

Instrument (Name/Model No./Serial No.): _____

Manufacturer _____ Date Purchased _____

Calibration Date	Initial Settings	Standard/Gas Used	Procedure	Adjustments Made	Final Settings	Signature	Comments

DAILY ACTIVITIES RECORD - FIELD INVESTIGATION **NUS CORPORATION**

PROJECT NAME:_____ PROJECT NO.:_____
CLIENT:_____ LOCATION:_____
DATE:_____ ARRIVAL TIME:_____ DEPARTURE TIME:_____
CONTRACTOR:_____ DRILLER:_____
BORING NO.:_____ NUS REPRESENTATIVE:_____

ITEM (1)	ORIGINAL QUANTITY (2) ESTIMATE	QUANTITY (2) TODAY	PREVIOUS TOTAL (2) QUANTITY	CUMULATIVE QUANTITY (2) TO DATE
1. Mobilization/Demobilization	Job			
2. Overburden Drilling/Sampling, minimum 6-inch	100 ft.			
3. Overburden Drilling, 10-inch	250 ft.			
4. Overburden Drilling 14-inch	450 ft.			
5. Bedrock Drilling 6-inch	530 ft.			
6. Bedrock Drilling 10-inch	650 ft.			
7. Bedrock Drilling 14-inch	150 ft.			
8. Temporary 6-inch Steel Casing	250 ft.			
9. Temporary 10-inch Steel Casing	200 ft.			
10. Temporary 14-inch Steel Casing	250 ft.			
11. Permanent 6-inch Steel Casing	1,250 ft.			
12. Permanent 10-inch Steel Casing	400 ft.			
13. PVC Well Construction/Installation	1,120 ft.			
14. Mine Void Sealing	8			
15. Boring Backfilling	NA			
16. Well Development	24 hrs.			
17. Test Borings	200 ft.			
18. Test Pit Excavation	50 hrs.			
19. Standby	20 hrs.			

COMMENTS:_____

(1) AS LISTED IN SPECS
(2) INCLUDE QUANTITY AND UNITS
(Ex. 20 ft., 6 hrs.)

APPROVED BY:

_____
NUS FIELD REPRESENTATIVE

_____
DRILLER OR REPRESENTATIVE

WEEKLY FIELD SUMMARY REPORT

PROJECT SITE NAME: _____

EPA WORK ASSIGNMENT NO.: _____

PROJECT NO.: _____

DATE(S): _____

SUNDAY

Date :_____ **Personnel**_____ _____

Weather:_____ **Onsite** _____ _____

_____ _____

Site Activities:_____

_____

_____

_____

MONDAY

Date :_____ **Personnel**_____ _____

Weather:_____ **Onsite** _____ _____

_____ _____

Site Activities:_____

_____

_____

_____

TUESDAY

Date :_____ **Personnel**_____ _____

Weather:_____ **Onsite** _____ _____

_____ _____

Site Activities:_____

_____

_____

_____

WEDNESDAY

Date :_____ Personnel_____ _____

Weather:_____ Onsite _____ _____

_____ _____

Site Activities:_____

_____

_____

_____

THURSDAY

Date :_____ Personnel_____ _____

Weather:_____ Onsite _____ _____

_____ _____

Site Activities:_____

_____

_____

_____

FRIDAY

Date :_____ Personnel_____ _____

Weather:_____ Onsite _____ _____

_____ _____

Site Activities:_____

_____

_____

_____

SATURDAY

Date :_____ Personnel_____ _____

Weather:_____ Onsite _____ _____

_____ _____

Site Activities:_____

_____

_____

NUS CORPORATION
ARCS III PROGRAM
TASK MODIFICATION REQUEST

EPA Work Assignment Number _____ Project Number _____ TMR Number _____

To _____ Location _____ Date _____

Description:

Reason for Change:

Recommended Disposition:

Field Operations Leader (Signature) _____ Date _____

Disposition:

Project Manager _____ Date _____

Distribution: Program Manager
Quality Assurance Officer
Project Manager
Field Operations Leader

Others as required _____

WATER SUPPLY HOME WELL SURVEY

General Information (please print all information; use other side or additional paper if additional space is needed):

Respondents Name: _____
Home Owners/Business Name: _____
Address of Residence/Business: _____
Telephone: _____

What source(s) of water do you use/have?

_____ Well
_____ Spring
_____ City Water (name of supplier _____)
_____ Bottled Water

Well (or spring) water is used for the following:

_____ Drinking Water
_____ Washing, General Household Needs
_____ Agriculture (livestock, irrigation)
_____ Well is not in use
_____ Other (specify): _____

If you use well (or spring), are any filters or other water treatment used?

_____ UV Light
_____ Carbon Filter
_____ Water Softener
_____ Acid Neutralization
_____ Other (specify): _____

What type of wastewater treatment do you use?

_____ Sewer
_____ Septic Tank, Cesspool and/or Drainfield
_____ Other (specify): _____

If a business, what former onsite disposal/wastewater facilities existed (provide details): _____
_____

Have you used a septic tank, cesspool, or drainfield in the past year?

_____ Yes
_____ No

If yes, was the system removed? (provide details): _____
_____

Please list exact or approximate well installation data, as known:

Installation Method: _____ Drilled
_____ Dug

Name/Address of Drilling: _____

_____

_____ Date Installed
_____ Casing Diameter/Hole Diameter
_____ Well Depth (ft)
_____ Well Casing Material Type
_____ Well Screen Material Type
_____ Plumbing Material Type
_____ Pump Depth (ft)
_____ Pump Size
_____ Casing Length (ft)
_____ Well Capacity (gpm)
_____ Hours pumped per day (average)
_____ Depth to Water (ft)

Depth of screened or open interval _____ feet to _____ feet.

Soil/rock type in screen or open interval:

Soil: _____
Weathered Bedrock: _____
Bedrock: _____

Please sketch on back the well location in relationship to house (also show present or past septic system, if applicable).

Have you ever experienced problems with low water yield or pressure?

_____ Yes
_____ No

If yes, please indicate when.

Have you ever experienced water quality problems (odor, color, taste, hardness, other)?

_____ Yes
_____ No

If yes, please indicate type and when.

Is your well easily accessible?

_____ Yes
_____ No

If yes, please indicate where.

Do any other nearby residences/businesses use your well as a water supply source?

_____ Yes
_____ No

If yes, please indicate who: _____

Have you ever observed any dumping of liquids in the area that could possibly pollute the subsurface?

_____ Yes
_____ No

If yes, by whom, when, and where?

Would you be agreeable to allowing us to collect a water sample and/or measure your water level?

_____ Yes
_____ No

Please list any additional comments in the space below (i.e., problems with well or water quality, existence of unused wells, etc.):

Should you have any questions regarding this questionnaire, please contact Lisa Nichols at 215-597-3216.

_____ _____
Signature Date