SAMPLING and ANALYSIS PLAN
UNISYS CORPORATION I.D. # 130045
GREAT NECK, NEW YORK

July 1, 1993

Prepared For:

NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
State University of New York
Building 40
Stony Brook, New York

RECEIVED
JUL - 9 1993
HAZARDOUS WASTE REMEDIATION
NYSDEC REGION 1

Prepared by:

Unisys Corporation
365 Lakeville Rd.
Great Neck, NY

SAMPLING and ANALYSIS PLAN
UNISYS CORPORATION I.D. # 130045
GREAT NECK, NEW YORK

July 1, 1993

Prepared For:

NYS Department of Environmental Conservation
Division of Hazardous Waste Remediation
State University of New York
Building 40
Stony Brook, New York

Prepared by:

Unisys Corporation
365 Lakeville Rd.
Great Neck, NY

TABLE OF CONTENTS

PAGE

LIST OF FIGURES

LIST OF TABLES

TABLE

LIST OF APPENDICES

APPENDIX

1.0 PROJECT DESCRIPTION

This Sampling and Analysis Plan (SAP) sets forth procedures to assure the quality, quantity and validity of data collected during the RI/FS at the Unisys Corporation Facility at Great Neck, New York Site (the Site). This section of the SAP describes the purpose of the plan and provides background information on site conditions.

The SAP presents the organization, objectives, functional activities and specific sampling and analysis quality assurance (QA) and quality control (QC) procedures under which the Round 1 sampling of the remedial investigation at the Site will be performed. The SAP is designed to achieve all the specific technical and data quality objectives and goals needed to identify, characterize and delineate the fact, nature, extent and magnitude of contaminants related to the Site in on site and off site locations as this pertains to Round 1 sampling.

1.1 SITE BACKGROUND AND HISTORY

The purpose of providing background information is to educate RI/FS personnel about present site conditions and planned actions so that the QA/QC program outlined in this document can be understood.

1.1.1 LOCATION/DESCRIPTION

The Unisys Defense Systems, Inc. Shipboard and Ground Systems Facility is located on Long Island, New York along the western edge of Nassau County. The facility straddles the border between the Town of North Hempstead and the Incorporated Village of Lake Success. The facility is bounded on the north by Marcus Avenue, on the west by Lakeville Road, on the south by Union Turnpike, and to the east by the Triad Office Park (Figure 1). The facility can be accessed by car on either the Northern State Parkway or the Long Island Expressway by utilizing the Lakeville Road exit off of either roadway. The mailing address of the facility is 365 Lakeville Road, Great Neck, New York 11020-1696. Please note that the facility is not located in Great Neck but is serviced by the United States Postal Service Great Neck Branch Office, hence, the Great Neck mailing address.

The current Unisys property consists of a 1.5 million-square-foot (approximate) main manufacturing facility located on approximately 98 acres of relatively flat land. An additional six buildings are located immediately south of the main building, and several small buildings (i.e. pump houses and guard posts) are located on the edges of the property. Three small (2.4 acre total) drainage basins are located in the southwest corner of the property. The drainage basins collect storm runoff from the parking lot and roof drains. The majority of the remaining property is used as parking space for Unisys employees. The facility was constructed in 1941 by the Defense Plant Corporation, an instrumentality of the US. Government, and has been in continuous operation since that time.

Originally, the property included an additional 48 acres with a large manufacturing building immediately to the east of the present day plant. However, this portion of the property was sold to a developer in 1972 and was subsequently developed as a business park with office buildings, two stories above ground and three stories below ground. During construction of this business park, the property was excavated to a depth of approximately 50 feet below grade, and, apparently, no evidence of soil contamination existed.

1.1.2 HISTORY

The facility was constructed in 1941 by the Defense Plant Corporation for the purposes of manufacturing/assembling precision parts associated with the war effort. The facility was considered a Government-Owned, Contractor-Operated (GOCO) site until 1950, when it was purchased from the Government by the Sperry Gyroscope Company, a Division of the Sperry Rand Company, which was a predecessor of the Sperry Corporation.

1.1.3 OPERATIONAL HISTORY

During its period of operation, the facility has been used to manufacture a wide range of defense-related products. These products include gyroscopes, fire control systems and radar systems. Manufacturing processes utilized during plant operations included a foundry, plating, etching, machining, degreasing, painting, photo-imaging and assembly. Currently the facility is used for engineering, research and development and assembly. Degreasing, plating, etching, painting, photo-imaging and machining operations are still part of the manufacturing processes, however, these processes have been significantly reduced on size over the years.

An environmental testing center, used to simulate and expose manufactured components to various weather or other destructive conditions, is an extension/addition to the former foundry building. This operation closed in 1991. Foundry operations were discontinued in 1960.

1.1.3.1 Chemical Usage/Storage

Chemical usage at the plant during the manufacturing process includes halogenated/nonhalogenated solvents, cooling/cutting oils, paints and fuel oils.

In the past, these chemicals (solvents, cutting oils, and fuel oils) were stored in both above-ground and below-ground storage tanks. Currently, all process chemicals are stored in approved containers (e.g. 55-gallon drums) located in a secure chemical storage area in the southeast corner of the main building. Fuel oil, used by the facility's heating plant, is stored in two underground storage tanks located adjacent to the boiler room.

Solvents were previously stored in underground tanks located along the south wall near the southeast corner of the main building. These tanks were removed in the early 1980s when Sperry remodeled the area. A gasoline tank was removed from the site in 1990. This underground tank had furnished gasoline for fleet vehicles and was located along the south wall of the garage building.

An aboveground tank used for the storage of ethylene glycol was located along the east wall of the main building. This tank was removed in 1981. Three underground fuel oil tanks were located along the south wall of the former foundry building. These tanks were removed subsequent to the closure of the foundry.

A 500,000-gallon above-ground tank is located immediately south of the eight underground field oil tanks. This tank is used to store water for fire control. A similar tank was removed from the southeast corner of the east (extension) building, which was sold to developers in 1972.

Eight steel underground tanks used for the storage of #6 fuel oil were removed in May and June of 1991. The #6 fuel oil was used as a backup fuel for boiler system. The eight tanks were replaced with two new 20,000 gallon double wall fiberglass tanks.

1.1.3.2 Waste Disposal

Aerial photographs from 1950, 1976, 1980, and 1990 were evaluated to determine if any areas on-site were used for disposal of waste products. Based upon this review, no areas of waste disposal were identified on-site. However, in reviewing the manufacturing processes, it was learned that the facility had dry wells located near the southeastern portion of the main manufacturing building that were used to dispose of water tainted with solvents.

1.1.3.3 Water Usage

There are presently three industrial wells and one municipal well located on the Unisys property. The municipal well, N 1802, supplied water for the Manhasset-Lakeville water district and is screened in the Lloyd Formation. The three Unisys production wells, N-1818, N-4173 and N-1804 are screened within the Magothy Formation.

The main water use at the facility is for cooling. Generally, only the output of one well is needed to adequately cool the facility, although a second well is sometimes pumped when demand is especially high. Drinking water is obtained from the Manhasset-Lakeville water district. Little to no water is used for process purposes. Water is returned to the aquifer through the use of three diffusion wells and through infiltration from the holding ponds.

1.1.3.4 Surface Water

There are three small holding ponds (2.4 acres) located in the southwest portion of the site. The holding ponds receive runoff from the roof, parking lots and landscaped areas. The only runoff not directed to the holding ponds is a small portion of the parking lot in the northeast corner of the facility. Runoff from this area is drained by a storm sewer which connects to a line running parallel to Marcus Avenue. Water in the holding ponds can evaporate, infiltrate, or be pumped to the lawn irrigation system.

1.2 CONDITION STATEMENT

Previous studies have detected (via direct measurements and soil gas) volatile organics in on-site subsurface soils and groundwater. The volatile organic compounds detected in these media include total-1,2-dichloroethene, trichloroethene and tetrachloroethene at varying concentrations. The studies have identified possible on-site sources of the compounds. The Round 1 sampling approach has been developed, in part, to identify sources, better characterize contaminants and define the pathways of contaminant migration. A second round of groundwater collection activities will be performed to gather additional information and to eliminate data gaps that may be apparent based on an evaluation of the Round 1 data.

1.3 PROJECT OBJECTIVES

The project objectives described in this section define the purpose of the Remedial Investigation/Feasibility Study (RI/FS) being conducted. The objectives of the RI/FS are to gather data of adequate technical content, quality and quantity to:

- Determine fully the fact, nature, extent and magnitude of organic and inorganic compounds the Site;

- Fully identify and characterize migration pathways, routes of entry and receptors for the inorganic and organic compounds;

- Determine if VOCs relating to the Site in the underlying groundwater pose a threat to human health or the environment through the development of a risk assessment;

- Determine if there is a need for additional remedial actions based upon the performance of a comprehensive risk assessment; and

- If it is determined that additional remedial actions are warranted, to support the identification, development and evaluation of remedial alternatives during the FS, remedial technology screening, alternative development and screening, and detailed alternative evaluation.

The project data quality objectives for analytical laboratory data and field measurements are presented in Section 3 of this SAP.

1.4 INTENDED DATA USE

The Round 1 and 2 data collected during the investigation will be used to meet the project objectives specified in Section 1.3. Groundwater samples will be used to evaluate the potential public health risks. The data will be carefully selected and applied to assure that data used for this purpose is of suitable quality.

The Round 1 groundwater samples will be analyzed for volatile organics by NYSDEC Analytical Services Protocol (ASP) 1991 Contract Laboratory Program (CLP) procedures. Once data of demonstrated validity has been obtained, Round 2 groundwater samples will be examined for volatile organics by the low level method (ASP 12/91, 524.2) for those wells that do not reveal high enough concentrations of volatile organics which make this analysis impractical. The intent to analyze these wells in the Round 2 sampling event for volatile organics by the drinking water methods is to attempt to achieve the lowest possible detection sensitivity in consideration of health-based criteria.

In addition to the off site analyses, there will also be on-site field measurements performed utilizing a specific conductivity meter,pH meter,thermometer, turbidity, and a PID (Section 2.3). The PID will be used for screening subsurface soil samples to determine bore holes that will be converted to vapor extraction wells (viz., interim remedial measure). PID will also be used for health and safety purposes. A separate soil vapor survey will also be performed to determine the levels of volatile organic constituents present in the subsurface soil atmosphere.

The PID screening will be utilized as an aid in to determine which samples will be submitted for off site analyses. This selection process will be based upon a comparison of PID instrument responses. The pH, temperature and conductivity data will be used as a field indicator of groundwater quality and for determining the stability of groundwater with respect to a properly purged groundwater system. This determination will be based upon a comparison of readings during the purging process.

Samples collected at the Site will be analyzed to produce data of sufficient quality to evaluate the extent of contamination. For this application, NYSDEC ASP (1991) CLP procedures and have been selected. When NYSDEC ASP CLP criteria are not met due to a variety of sample matrix-related reasons, the data will be carefully evaluated to determine if certain aspects of this data can still be used to meet the project objectives.

1.5 SAMPLE NETWORK AND RATIONALE

Sample locations and analyses have been identified that will provide data necessary to meet the objectives of the investigation and to provide data of demonstrated validity for the risk assessment activities. The sample network rationale collection method and type of information needed are listed on Table 1-1.

1.6 MONITORING PARAMETERS AND FREQUENCY OF COLLECTION

The locations where investigative samples are to be collected are specified in the RI/FS Work Plan. Groundwater samples will be obtained from all existing and proposed monitoring wells and from existing off site wells. Soil samples will be collected from borings drilled in the former dry wells. Sediment and surface water samples will be collected from the drainage basins. The types, frequency of collection, and analytical parameters are provided on Table 1-2.

1.7 PROJECT ORGANIZATION AND SCHEDULE

The key individuals who are responsible for the overall coordination of efforts to be conducted, as well as the collection, validation and interpretation of data generated during the RI are identified on Figure 1-1. Resumes of key individuals are included as Appendix A.

The schedule for completing the RI/FS is provided as Figure 1-2. The fourteen (14) month schedule allows a 30 day period for the NYSDEC to review data generated during the Phase I prior to commencing Phase II activities. This schedule assumes a reasonable amount of time for obtaining access to off site sampling locations.

2.0 FIELD EXPLORATION

The procedures to be used in conducting the field explorations are described below.

2.1 SOIL BORINGS

Soil samples will be collected from borings that will be drilled in the five former dry wells and at seven (7) locations within substations SST1 and SST2. Soil samples will be analyzed for parameters as designated on Table 1-2.

During auger drilling of the former dry well borings continuous split spoons (2 foot) will be driven to a depth of twenty (20) feet; note the depth of the dry wells as discussed in the RI/FS Work Plan is fifteen (15) feet. In the event that residual contamination is evident at the 18 to 20 foot interval, the boring will be advanced and split spoon samples will be collected until no residual contamination is observed. The split spoon sample experiencing the highest headspace (Section 4.2.1) reading and the sample collected at the deepest interval will be submitted to the laboratory for analysis.

The substation borings will be advanced to a depth of eight (8) feet with the auger rig. Then a split spoon will collected from eight (8) to ten (10) feet. Each sample collected in SST1 and SST2 will be submitted to the laboratory for analysis.

A geologist will document the drilling operation and log the soil samples per the USCS classification system. In addition, the geologist will collect samples, obtain headspace readings of each sample, and supervise the decontamination of the drilling equipment as described in Sections 4.2.1 and 4.5.1.

2.2 MONITORING WELL CONSTRUCTION

Wells will be installed under continuous observation of a geologist and will be constructed to meet NYSDEC specifications. The geologist will be responsible for documenting the drilling activities, well construction, and lithology encountered during drilling. Lithologic logs will be prepared based on drill cuttings obtained at ten foot intervals from grade level to the base of the well. The geologist will log the cuttings based upon the USCS classification system.

Exact well locations will be determined in the field and may be altered, with NYSDEC input snd approval, depending on accessibility. Unisys proposes to use a combination water rotary/casing advancement drilling method. The borehole will be advanced with a rotary bit and stabilized with casing that will be driven approximately five (5) feet behind the bit. When the final depth of the well is reached the casing will be removed as the well is constructed in the borehole. Drill cuttings will be collected and staged in a defined staging area (refer to NYSDEC's TAGM # 89-4032). Grossly contaminated cuttings will be separated and placed in 55 gallon drums for disposal. To minimize the potential for cross contamination between wells, all drilling equipment will be decontaminated as described in Section 4.5.1.2.

The wells will be completed using 4-inch flush thread SCH 80 PVC riser and 4-inch flush thread stainless steel screens (316SS, #20 slot). The length and exact location of the screen zones will vary depending on the local changes in lithology, however, Unisys, proposes to install ten (10) foot screens. A gravel pack will be placed along the screened zone to a point at least two (2) feet above the screen. The gravel pack will be placed with a tremie, if at all possible. If this is not possible, the screen will be installed with the gravel pack attached. The remaining annular space will be tremied grouted with bentonite grout. The well head will be completed with a locking steel surface casing set in a 2 ft x 2 ft concrete concrete pad. Upon completion, the top of the well casing will be surveyed by a licensed NY surveyor. The vertical and horizontal control will be +/- .01 feet and +/- 3.0 respectively. Typical well construction logs are included in Appendix B.

2.3 MONITORING WELL DEVELOPMENT

All newly installed wells and existing wells with low yields will be developed to ensure that relatively sediment-free groundwater samples can be obtained. The objectives of the well development will be to remove sediments from the bottom of the well and the screened interval. The development will allow for collection of representative groundwater samples and a determination of the aquifers hydraulic parameters. The wells will be developed by high velocity jetting and over pumping. Water will be jetted into the screened zone of the well at pressures ranging from 50 to 150 psi for approximately one (1) hour. After the jetting is complete, the well will be pumped until the discharge is relatively free of sediment. The well development process and the turbidity of the discharge, as measured with a NTU meter, will be observed and documented by a geologist.

2.4 SOIL GAS SURVEY

The soil gas survey is to be performed by Tracer Research Corporation (TRC). In the event that Unisys uses a contractor other than TRC, the procedures described in this SAP will also be used. The following are standard soil gas survey operating procedures as provided by TRC:

2.4.1 METHOD

Probes (3/4" diameter) are driven into the ground by the hydraulic pusher/puller mechanism to a minimum depth of depth of 10'. Then the area around the probe will be sealed with bentonite. If there is concrete or pavement over a sample location, TRC personnel use a rotohammer to drill a 1-1/2" diameter hole through the surface material. This is useful for going through up to 2' of concrete or 10' of asphalt. After 3-5 probe volumes have been drawn through the probe using a vacuum pump, a gas sample is collected with a glass syringe that is inserted through a section of silicone tubing (leading to the vacuum pump) and into the metal tubing of the adapter. Gas samples only contact metal surfaces and are never in contact with potentially sorbing materials (I.E. Tubing, hose, pump diaphragm). A vacuum gauge monitors the negative pressure in the evacuation line to assure that there is no impedance to gas flow caused by clayey or water-saturated soils.

Ten (10) ml glass syringe air samples are collected from each sampling probe after 1 to 4 minutes of pumping . These 10 ml samples are subsampled according to analytical requirements and replicates are injected into the gas chromatograph for documentation of reproducibility. More than two injections may be necessary where there are multiple contaminants that require different sample sizes for chromatographic analysis. A modified EPA 601/602 method adapted to soil gas will be used to analyze the soil gas samples. The analysis will be performed with HP 5890 dual column FID/ECD detector.

TRC has determined that reproducibility of soil gas samples from the same probe is typically within 20% and always within a factor of two. This sampling error is well within the limits required to accurately map concentration contours in the vadose zone where concentrations normally range from 3 to 6 orders of magnitude over a subsurface plume. Correlation coefficients between contaminant concentrations in soil gas and in groundwater are determined by sampling probes near existing monitor wells and are interpreted on an order-of-magnitude basis.

Once sampling has been completed, the probe is withdrawn and backfilled with native soil or granulated bentonite. Asphalt or concrete patch is used to cap holes that have been created through paved or concrete areas. Total data acquisition time including : sampling, analysis and data calculation, is approximately 20 minutes per sampling location.

2.4.2 CHECKS FOR CONTAMINANTS

Prior to sampling each day, system blanks are run to check the sampling apparatus (probe, adapter, 10cc syringe) for contamination by drawing ambient air from above ground through the system and comparing the analysis to concurrently sampled air analysis.

2.4.3 SAMPLING EQUIPMENT DECONTAMINATION

- Steel probes are used only once during the day and then washed with high pressure soap and hot water spray or steam-cleaned to eliminate the possibility of cross -contamination.

- probes are carried on each van to avoid the need the reuse any during the day.

- Probe adapters (TRC's special design) are used to connect the sample probe to the vacuum pump. The adapter is designed to eliminate the possibility of exposing the sample stream to any part of the adapter. Associated tubing connecting the adapter to the vacuum pump is replaced periodically as needed during the job to insure cleanliness and good fit. At the end of each day the adapter is cleaned with soap and water and subsequently baked in the GC oven.

- Silicone tubing (connecting the adapter to the vacuum pump) is replaced as needed to insure proper sealing around the syringe needle. This tubing does not directly contact soil gas samples.

2.4.5 ANALYTICAL CHEMISTRY PROCEDURES

2.4.5.1. Method

Halocarbon and hydrocarbon compounds detected in soil gas are identified by chromatographic retention time using a modified EPA 601/602 method adapted to soil gas. Verification of compound identity is obtained by chromatographic analysis with columns of differing polarity and selectivity.

Quantification of compounds is achieved by comparison of the detector response of the sample with the response measured for calibration standards (external standardization). Instrument calibration checks are run throughout the day as are system blanks are run at the beginning of each day to check for background levels in the atmosphere.

Proprietary modifications to the gas chromatograph allow direct aqueous injections of water for analysis. Results of soil gas injection analysis are available to the site engineer within 20 minutes of sample collection.

2.4.5.2 Check for Contamination

- 10cc subsampling syringes are checked for contamination prior to sampling each day by injecting nitrogen carrier gas into the gas chromograph.
- Microliter size subsampling syringes are reused only after a nitrogen carrier gas blank is run to insure it is not contaminated by the previous sample.

2.4.5.3 Analytical Equipment Decontamination

At the beginning of each day, standards are analyzed to calibrate the analytical equipment and determine daily response factors. Chemical standards are prepared in water from commercially available pure standards stored in methanol. Prior to running standards, water for standards is analyzed for purity. At least three standard injections are analyzed until resultant responses fall within 25% of each standard responses. Standards are repeated after every 5 samples to verify response.

2.4.5.4 Analytical Procedures

Soil gas samples are collected in 10mL glass syringes and subsampled for analysis in volumes ranging from 1 uL to 1 mL. Soil gas samples are analyzed by headspace techniques using a HP 5890 dual column FID and ECD detector. Injection volume is varied to insure that resultant masses of analyte fall within the linear response range of daily standards. All subsampling syringes and needles are used only once before decontamination.

2.4.5.5 Detection Limits

Detection limits are a function of the injection volume as well as the detector sensitivity for individual compounds. Thus, the detection limit varies with the sample size.

Generally, the larger the injection size the greater the sensitivity. However, peaks for compounds of interest must be kept within linear range of the detector. If any compound has a high concentration, it is necessary to use small injections, and in some cases to dilute the sample to keep it within linear range. This may cause decreased detection limits for other compounds in the analyses. The detection limits range down to 0.02 ug/L in soil gas for compounds such as carbon tetrachloride depending on the conditions of the measurement, in particular, the sample size. If any component being analyzed is not detected, the detection limit for that compound in that analysis is given as a "less than" value (e.g. <0.02 ug/L). This number is calculated from the current response factor, the sample size, and the estimated minimum peak size (area) that would have been visible under the conditions of the measurements.

The list on the following page includes typical detection limits for the volatile organic compounds of concern in soil gas using direct injection techniques.

Compound	**Detection Limit (ug/L)**
benzene	0.02
ethylbenzene	0.02
toluene	0.02
m- & p-xylene	0.02
o-xylene	0.02
carbon tetrachloride	0.00005
chloroform	0.005

1,1-dichloroethane	0.01
1,2-dichloroethane	0.01
1,1-dichloroethylene	0.01
cis-1,2-dichloroethylene	0.01
trans-1,2-dichloroethylene	0.01
tetrachloroethylene	0.0001
1,1,1-trichloroethane	0.0001
trichloroethylene	0.0001
trichlorofluoromethane	0.00005
vinyl chloride	0.1

The stated detection limits for water samples can be lowered by a factor of 10 to 100 by using headspace analysis techniques. The exact amount the detection limit can be lowered is dependent on the individual compounds partition coefficient.

2.4.5.6 Analytical Equipment Decontamination

- All sampling and 2cc subsampling syringes are decontaminated each day and no such equipment is reused before being decontaminated.
- Glass syringes are used for only one sample per day and are washed and baked out at night.
- Injection port septa through which soil gas samples are injected into the chromatograph are replaced on a daily basis to prevent possible gas leaks from the chromatographic column.

2.4.6 DOCUMENTATION

A numbering system for samples is established prior to sampling and remains consistent throughout each phase of an investigation. Because chemical analyses are performed on site, conventional chain of custody protocols are unnecessary. There are no samples to lose or preserve. Water and soil samples are immediately labeled with the date, time, depth, and location number of each probe. The probe location number is entered on each chromatogram and verified by TRC's field personnel. The GC operator is responsible for checking and interpreting each day's chromatograms. The field assistant is responsible for plotting probe locations on the map and entering the date, time, and location number of sampling locations into the log book. Calculations of contaminant concentrations for each probe location are compiled on TRC data sheets by the GC operator and checked. The standards and response factors used for calculations will be present on the same sheet with the sample data calculated from them. Each time during the investigation that the instrument is recalibrated, a new data sheet will be started. Thus, it will always be clear as to which standards are used for each calculation.

The data sheets were designed to contain all the information needed to access the original chromatograms and to check every aspect of the calculations. The documentation as wells as other QA procedures have been developed to satisfy the needs of EPA Superfund and other investigations where it is anticipated that the data may be exposed to legal scrutiny.

The GC operator will document each set of chromatograms with the following information:

- Gas flows for H_2, N_2, and air
- Tank pressures for H_2, N_2, and air
- Temperatures of the injectors, column & detectors
- Injector parameters (injector, peak markers & baseline offset)
- Column type, length and diameter, packing material, and column temperature
- Operator
- Date

If any system parameters change, the GC operator will document on the chromatograms that the changes occurred, and will list the actual changes on the chromatograms.

The field operator assistant will maintain a daily log book as well as individual field logs for each sample location recording the following information for each sample location:

- Time (military notation)
- Weather conditions
- Sample number
- Location (keyed to mapped location supplied by client and an appropriate description, including street name)
- Sampling depth

- Evacuation time between samples

- Probe and adapter numbers and volume of the probe

- Number of sampling points used

- Observation (including, but not limited to: ground conditions, concrete, asphalt, soil appearance, surface water, odors and vegetation)

- Backfill procedure & materials

- Actual sample location marked on the site map (1 inch = 200 feet) provided by client

- Relative degree of condensation in duplicate sample container

Daily reporting is completed by the GC operator. By the end of each day's work, the GC operator supplies the on site client representative with a condensed copy of the day's analyses plus condensed data for the previous day's work. This data, in addition to a map of the sample locations, will constitute TRC's daily report to the client. The report will be signed and dated by the field GC operator and submitted to the Field Operations Manager. This daily report will include:

- Preliminary assessment of findings regarding character and extent of contamination, if present;

- Map of site sketching; and

- Notation of any QA problems & affected data

The final report TRC will prepare to summarize the results and conclusions of the soil gas survey. The final report will include:

- Maps showing locations of soil gas sampling location, control points and other pertinent features at a scale of one inch to 200 feet;

- Analytical results for each target compound reported in micrograms per liter (ug/L) in tabular form;

- Description of field procedures including sampling, analytical and QA/QC procedures; and

- Results of the survey discussing estimated limits of soil and/or groundwater contamination by VOCs as well as iso-concentration contour for each mappable contaminant.

2.4.7 QUALITY ASSURANCE/QUALITY CONTROL PROCEDURES

Tracer Research Corporation has a complete Quality Assurance/Quality Control (QA/QC) Program for its soil gas contaminant investigation services. Included as part of this is a full Field Operation Manual with very detailed QA/QC procedures. The steps outlined below summarize TRC's overall QA/QC program and if needed a client can be provided with documentation detailing the entire program.

- Steel probes are used only once during the day and then washed with high pressure soap and hot water spray or steam-cleaned to eliminate the possibility of cross-contamination. Enough probes are carried on each van to avoid the need to reuse any during the day.

- Probe adapters (TRC's patented design) are used to connect the sample probe to the vacuum pump. The adapter is designed to eliminate the possibility of exposing the sample stream to any part of the adapter. Associated tubing connecting the adapter to the vacuum pump is replaced periodically as needed during the job to insure cleanliness and good fit. At the end of each day the adapter is cleaned with soap and water and subsequently baked in the GC oven.

- Silicone tubing (which acts as a septum for the syringe needle) is replaced as needed to insure proper sealing around the syringe needle. This tubing does not directly contact soil gas samples.

- Glass syringes are usually used for only one sample per day and are washed and baked at night. If they must be used twice in the same day, they are purged with carrier gas (nitrogen) and baked out between probe samplings.

- Injector port septa through which soil gas samples are injected into the chromatograph are replaced on a daily basis to prevent possible gas leaks from the chromatographic column.

- Analytical instruments are calibrated each day by analytical standards from Chem Service, Inc. Calibration checks are also run after approximately every five soil gas sampling locations.

- 2cc subsampling each day by injecting nitrogen carrier gas into the gas chromatograph.

- Prior to sampling each day, system blanks are run to check the sampling apparatus (probe, adapter, 10cc syringe) for contamination by drawing ambient air from above ground through the system and comparing the analysis to a concurrently sampled ambient air analysis.

- All sampling and 2cc subsampling syringes are decontaminated each day and no such equipment is reused before being decontaminated. Microliter size subsampling syringes are reused only after a nitrogen carrier gas blank is run to insure it is not contaminated by the previous sample.

- Soil gas pumping is monitored by a vacuum gauge to insure that an adequate gas flow from the vadose zone is maintained. A reliable gas sample can be obtained if the negative pressure reading on the vacuum gauge is at least 2 inches of Hg less than the maximum pressure of the pump.

3.0 QA OBJECTIVES FOR MEASUREMENT DATA

The primary objective of the Quality Assurance (QA) program is to provide data of sufficient quality and quantity to assure that project objectives as stated in Section 1.3 are achieved. Data quality and quantity are measured through comparison of resulting data with established acceptable limits for data precision, sensitivity, accuracy, representativeness, comparability and completeness (PSARCC) as described in USEPA/540/G-87/003, titled "Data Quality Objectives for Remedial Response Activities. "Data that have certain aspects that may be outside PSARCC QA objectives will be evaluated, according to section 3.2.3 of the DQO document, to determine what, if any, aspects of the data can be defensibly used to meet the RI/FS objectives. Objectives for the PSARCC parameters for this RI/FS are described in this section.

3.1 PSARCC OBJECTIVES

PSARCC parameter objectives for the Round 1 sampling have been developed for two (2) sample categories based on sample objectives, analytical methods, historical data (examined in a qualitative sense) and published guidelines for the NYSDEC 1991 ASP Contract Laboratory Program (CLP). The PSARCC parameters for the Round 2 sampling will be evaluated and formulated (if different from Round 1) depending on the results obtained from the Round 1 sampling.

The three (3) PSARCC categories that have been developed are:

1. Samples scheduled for routine NYSDEC ASP CLP TCL organic and inorganic analyses with quantitation limits/detection limits achievable by routine protocols.

2. Samples scheduled for routine TCL organic and inorganic analyses where matrix interferences due to expected high concentrations of constituents may prevent the achievement of low-level quantitation limits/detection limits for other applicable constituents.
3. Samples Scheduled for TCL organic analysiswith low level quantitation limits by alternate NYSDEC ASP CLP procedures.

Data quality objectives for Round 1 sampling are summarized on Table 3-1. Tables 3-2 and 3-3 contain separate PSARCC objectives for investigative samples. The parameters for routine TCL/TAL analyses and low level TCL analyses are based on NYSDEC 1991 ASP guidance documents. PSARCC parameter objectives should be achieved through the use of standardized sample collection and analysis procedures.

Technically, obtaining low-level (routine) quantitation limits may not be feasible for samples with high matrix interferences caused by high concentration analytes. For example, if a sufficiently high concentration of one compound is present in a sample, attempts to analyze the sample without a dilution may "shut down" an instrument. Samples in which this may occur include potentially one or more of the monitoring well samples. All attempts will be made to analyze samples directly or with the absolute minimum dilution. However, the primary consideration for these high-level samples is the accurate identification and quantification of analytes, since these high-level analytes will essentially drive the cleanup process. In addition, it should be noted that low-level detection limits can be obtained on these samples to determine if other contaminants are present after some remedial action has effectively removed or reduced the high-level components. Accordingly, project objectives could be achieved even if quantitation limits may not be met for high concentration samples.

PSARCC parameter objectives are presented on Tables 3-2 and 3-3 and are described in more detail below.

3.1.1 PRECISION

Precision measures the reproducibility of data or measurements under specific conditions. Precision is a quantitative measure of the variability of a group of data compared to their average value. Precision is stated in terms of relative percent difference (RPD) or relative standard deviation (RSD). Measurement of precision is dependent upon sampling technique and analytical method. Both sampling and analysis will be as consistent as possible.

To ensure that precision is achieved, QC samples, including field and laboratory duplicate samples, and matrix spike and matrix spike duplicate recoveries will be analyzed and used to measure precision. An additional measure of precision is the comparison of surrogate recoveries between the unspiked, matrix spike and matrix spike duplicate sample aliquots. A one-in-twenty frequency per matrix will receive a laboratory duplicate analysis (inorganics) and matrix spike/matrix spike duplicate (organics analysis).

Field duplicates/replicates will be collected once for every 20 samples per matrix. Field duplicate/replicate results will be evaluated during data validation with respect to the stated DQO's.

3.1.2 SENSITIVITY

Quantitation limits for analysis scheduled to be completed for the Round 1 sampling are specified by the analytical method. Quantitation limits may be affected by matrix interferences, such as those caused by highly contaminated samples. In a case in which routine detection limits are not possible, sample/extract cleanups will be performed, if possible. If the quantitation limits are still not achievable, the applicability of the data, with respect to meeting the project objectives, will be evaluated. It should be noted that if high levels of compounds are found in groundwater samples, these results will be used to develop a risk assessment, and to drive the cleanup process in order to satisfy the project objectives.

3.1.3 ACCURACY

Accuracy measures the bias in a measurement system which may result from sampling or analytical error. Sources of error that may contribute to poor accuracy are: laboratory error, sampling inconsistency, field and/or laboratory contamination, handling, matrix interference and poor preservation. Field and trip blanks, surrogate spikes, performance evaluation (PE) samples, as well as matrix spike QC samples will be used to measure accuracy for project samples. Field blanks will be collected at a frequency of one per 20 groundwater samples and one per 20 soil samples. If the bailers are well dedicated, then the number of field blanks taken will be reduced to one per lot of bailers.

3.1.4 REPRESENTATIVENESS

Representativeness expresses the degree to which sample data represents the characteristics of the media or matrix from which it is collected. Samples that are considered representative are ones that are properly collected to accurately characterize the nature and extent of contamination at a general sample location. Therefore, an adequate number of sampling locations have been chosen and the sampling methods will be consistent. Representativeness will be measured by using the methods (e.g., sampling, handling and preserving) specified in the Work Plan for sampling of various media. Representativeness will also be measured by the collection of field replicates (VOAs). Comparison of the analytical results from field replicates will provide a direct measure of individual sample representativeness. Field replicates for volatile organics will be collected once for every 20 samples for the subsurface soil borings. Duplicates will be collected for the balance of analytical parameters at the same frequency as above.

3.1.5 COMPARABILITY

Comparability is a qualitative parameter expressing the confidence with which data sets can be compared. Comparability relies upon precision and accuracy to be within appropriate QC limits before the data can be used for comparison of data sets. This will be accomplished through the consistent use of the analytical and sampling methods described in this document.

3.1.6 COMPLETENESS

Completeness is defined as the percentage of data that is judged to be valid to achieve the objectives of the RI compared to the total amount of data. Deficiencies in the data may be due to sampling techniques, poor accuracy or precision, or laboratory error. While these deficiencies may affect certain aspects of the data, usable data may still be extracted from applicable samples.

3.2 QA OBJECTIVES FOR GROUNDWATER

Due to the fact that the aquifer beneath the site is used for potable purposes at off site locations, it will be necessary to examine groundwater samples for volatile organics and pesticides/PCBs utilizing analytical methods that will result in sensitivities that can be compared against relevant health-based criteria. However, due to the fact that the validity of historical data has not been demonstrated, groundwater samples will be examined for volatile organics utilizing routine NYSDEC 1991 ASP CLP methods. Once the levels of volatile organics in the monitoring wells have been confidently determined, wells with sufficiently low levels will be examined by the applicable methods (e.g., ASP Method 542.2) during Round 2 groundwater sampling activities.

3.3 PROCEDURES FOR MONITORING PSARCC PARAMETERS

PSARCC parameters will be monitored through the use of procedures which have been referred to in Section 3.1. These procedures will include the use of appropriate field blanks, trip blanks, laboratory method blanks, field and laboratory duplicates or replicates, matrix spikes, duplicate matrix spike duplicates, surrogate spikes, performance evaluations and laboratory control samples and a careful examination of all calibration and check standards. Laboratory control samples (LCSs) and performance evaluation (PE) samples are samples containing a known or true value which the laboratory prepares and analyzes concurrently with project samples. LCSs and PE samples are of most use in judging analytical accuracy.

3.4 FIELD MEASUREMENTS

Measurement data will be generated in many field activities that are incidental to collecting samples for off site analytical testing or in activities unrelated to sampling. These activities include, but are not limited to, the following:

- Documenting time and weather conditions
- Locating and determining the elevation of sampling stations

- Determining pH, specific conductance, turbidity, and temperature of groundwater samples
- Qualitative and semi-quantitative organic vapor analysis of soil gas and subsurface soils samples
- Determining depths in a borehole or well
- Standard penetration testing
- Calculating pump rates
- Verifying well development and pre-sampling purge volumes

The general QA objective for field measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the intended use of the data through the documented use of standardized procedures. The procedures for performing these activities and the standardized formats for documenting them are presented in the Work Plan. Accuracy and precision field data quality assurance objectives are presented on Table 3-4. A summary of the overall project Data Quality Objectives (DQOs) and the levels of DQOs are presented as Table 3-5 and Table 3-6, respectively.

4.0 SAMPLING PROCEDURES

4.1 SAMPLING RATIONALE

Sample locations and analyses have been specifically selected to provide data necessary to meet the objectives of the investigation. Sampling locations and analytical parameters were selected in order to determine the characteristics, extent and magnitude of contamination; to sample the applicable media to determine pathways of contaminant migration from the site; to determine the contaminant flux at the site boundaries; and to ultimately establish with a high degree of confidence the boundaries where contamination is attributable to this site. Sample type, general collection method, holding times, and container types are listed on Table 4-1.

4.2 SAMPLING PROTOCOL SUMMARY

The Work Plan contains detailed descriptions of the objectives and rationale of the sampling program and the sampling procedures that will be followed during Round 1 sampling activities. These items presented in this section are summaries of sampling procedures.

4.2.1 SUBSURFACE SOIL SAMPLING

Subsurface soil samples will be collected from soil borings. Soil borings will be completed using a hollow-stem auger. Soil samples will be collected with a two-foot long, 2-inch diameter split-spoon sampler. A portion of all subsurface soil samples collected from the split-spoon samples will be screened for the presence of volatile organics using a PID by the following procedure.

1. Transfer a representative portion of the sample into the clear sample jar and fill it approximately halfway.

2. Seal the jar with a piece of aluminum foil and secure it with a lid.

3. Store the sample for at least one quarter hour in a warm area.

4. The HNU should be calibrated as described in the HNU Standard Operating Procedure (Appendix C).

5. In order to take a measurement, push the intake probe of the instrument through the foil, taking care not to allow soil or water to enter the intake.

6. Record the highest reading, which usually occurs within five seconds of puncturing the seal. Record measurement on log. Allow meter to return to background before next measurement.

A seperate portion (grab sample) from the split-spoon samples from each boring will be placed into a clean laboratory supplied bottle utilizing a clean stainless steel spatula. This grab sample bottle will be immediately labeled, sealed in a plastic bag and placed in an iced cooler for analysis as designated on Table 1-2.

4.2.2 GROUNDWATER SAMPLING

Groundwater samples will be collected from on site as well as off site monitoring wells and analyzed for parameters as designated on Table 1-2. [redacted]

Prior to purging and sampling, the well protective casing, lock and apron will be inspected for damage or signs of tampering. Static water depth and total depth will be measured using a decontaminated probe with permanent depth markings. The static and total depth will be used to calculate the volume of standing water.

Where possible, the standing water in the well and at least four (4) well volumes will be removed prior to sampling. Less than this amount will be purged only if all standing water is removed before four (4) volumes are purged. The standing water in the well is calculated from (3.14) (d^2)(h), where d = the diamater of the casing and h = the height of the water column. During the purging the turbidity of the discharge will be measured periodically. If the turbidity is greater the 50 NTU's, the well will not be sampled and further purging or development will be performed; this is for high yielding wells only. In addition, the pH and temperature will be measured during purging to verify stability.

Clean submersible pumps will be used during purging to ensure that all standing water is removed. The pump used for purging the monitoring wells will be leakproof and free of oils or other adultrating components. During purging the pump will be moved up and down the well and the pumping rate will be kept low. Periodically, the flow will be measured using a graduated bucket. If the water level drops in the well, the pump will be lowered. Hoses for the submersible pump will be capped with a "foot valve" to prevent purged water from flowing back into the well as the hose is removed. Purge water will be collected in a storage tank and then transferred and injected into the IRM groundwater treatment system. Sampling will take place within 3 hours after purging procedures are completed.

Samples will be collected from the monitoring wells using dedicated Teflon bailers or disposable bailers. The first water withdrawn from the well will be checked for temperature, pH and conductivity. Subsequent volumes collected from within the screened interval will be used to directly fill sample bottles once the series of temperature, pH and conductivity readings indicate stable groundwater conditions. Bottles intended for volatile organic compound analysis will be filled first, bottles for the extractable organic analysis will be filled next and bottles for the inorganic analysis will be filled last. The sample bottles designated for total metals and cyanide will be preserved utilizing nitric acid and sodium hydroxide (respectively). After preservation, the pH will be checked and recorded using narrow range pH paper (using disposable capillary tubes). If the pH is not within the acceptable range (<2 for metals and >12 for cyanide), additional preservative will be added. Round 1 samples will be analyzed for total metals. If levels of concern are obtained for Round 1, Round 2 sampling will include the collection of groundwater for total and dissolved metals.

Groundwater samples will be immediately labeled and bottles will be individually sealed in plastic bags and placed in iced coolers.

4.2.3 DRAINAGE BASIN SEDIMENT SAMPLING

The objectives of this task are to determine if the sediments of the drainage basins have been impacted or are being impacted by industrial activities of the facility and vehicular use in the vicinity of the site. A total of six (6) sediment samples will be collected and analyzed for parameters as designated in Table 1-2. The sediment sample collection procedures are as described below:

- The samplers will travel to the sampling location in a small row boat guided by a NY licensed surveyor who will be located on land.
- When the boat is in position anchors will be cast of the bow and stern and the surveyor will check the location several times to verify that the boat has not drifted. Unisys anticipates that the sample location will be accurate to within ten (10) feet.
- A sediment sample will be obtained with a ponar grab. A ponar grab is a clamshell type scoop activated by a counter lever type system. The shell is opened and latched in place and slowly lowered to the bottom. When the ponar grab reaches the bottom a latch releases and newly applied tension will close the clamshell.
- Equipment decontamination procedures are contained in Section 4.5.1 of this SAP.
- Sediment samples will be immediately labeled and bottles will be individually sealed in plastic bags and placed in iced coolers.

4.2.3 DRAINAGE BASIN SURFACE WATER SAMPLING

One (1) surface water sample will be collected from each of the three (3) drainage basins and analyzed for parameters as designated on Table 1-2. Samples will be obtained as described in NYSDEC TAGM 4008. Samples will be collected in a dedicated wide mouth container and transferred to the bottles provided by the laboratory. The sampler will ensure that his/her gloved hand remains on the outside of the sampling container. Sample containers will be dedicated to each sampling location.

4.2.4 GROUNDWATER SAMPLING DURING DRILLING

Groundwater samples will be collected during the drilling of the deep wells and analyzed for parameters as designated on Table 1-2. The samples will be collected at fifty (50) foot intervals from the top of the water table to the bottom of the boring. The sample collection procedures are as described below:

- A 2-inch diamater by five (5) foot long galvanized well point will be driven ten (10) feet below the bottom of the boring.

- The well point will be purged of all standing water and 4 to 10 well volumes with a 1 1/2" stainless steel pump; see Section 4.2.2 for the method of calculating the volume to be purged. Less than this amount will be purged only if all standing water is removed before four (4) volumes are purged.

- During purging the turbidity, pH, temperature , and conductivity of the discharge will be measured periodically.

- Groundwater samples will be immediately labeled and bottles will be individually sealed in plastic bags and placed in iced coolers.

4.2.5 PACKER TEST SAMPLING

The packer test will be performed by packing-off a ten foot interval (minimum) and pumping the section for at least 1/2 hour or a reasonable amount of time to determine if inflow is occurring. If inflow is occurring, a minimum of two samples will be collected and analyzed as designated on Table 1-2. If the surveys do not identify areas of the casing that are damaged then the packer will be placed just above the well screen and the section of the casing above the packer will be pumped to determine if inflow is occurring. In the event that inflow is occurring, an attempt to determine the location of inflow by re-evaluating the TV survey, the cement bond logs, and by performing additional packer tests.

In an effort to determine the quality of water in the Lloyd Formation, a packer test of the screened zone will also be completed as follows:

1. A packer, with a submersible pump extending below, will be inflated directly above the well screen.

2. The well will be pumped at a rate of at least 100 gpm or greater. Samples will be collected after 10 well volumes have been removed and after 50 well volumes have been removed. A well volume will be defined as the volume of water below the packer.

3. Groundwater samples will be immediately labeled and bottles will be individually sealed in plastic bags and placed in iced coolers. Samples will be analyzed for parameters as designated on Table 1-2.

4. One (1) field blank will be collected from the pumping equipment prior to its initial use. A trip blank will accompany each shipment to and from the laboratory.

5. During a packer testing a transducer will be placed above, between, and below the packer to determine if the packer seal is leaking.

4.3 SAMPLE PACKING, HANDLING AND SHIPMENT

After a given sample has been collected, a self-adhesive label will be prepared with indelible ink and affixed to each container. At a minimum, the sample label will contain:

- The Investigation Name (Unisys-Great Neck).
- Field Sample Number
- Sample Description
- Date and Time Collected
- Sampler's Initials
- Testing Required
- Preservatives Added

Immediately after sample collection, each labeled sample container will be sealed in an individual plastic bag. Samples will then be placed immediately into insulated, iced coolers.

At the end of each sampling day, samples will be repacked in dry coolers. Chain-of-custody aspects of sample handling are discussed in detail in Section 5.0. These records are to be sealed in Ziplock bags to protect them against moisture and then taped to the underside door of the appropriate sample coolers. Each cooler will contain sufficient "blue ice" packs to insure that proper temperature ($4^{o}C \pm 2^{o}C$) is maintained and will be packed in an appropriate packing material (e.g., foam inserta) to prevent damage to sample containers at the end of each day of sampling.

The sample coolers will be shipped either by a direct courier or by an overnight courier according to current U.S. DOT regulations. All samples will be delivered to the laboratory within 24 to 48 hours from the time of collection.

4.4 SAMPLE CONTAINERS, PRESERVATIVES AND HOLDING TIMES

The specific containers, preservatives and holding times that will be utilized for this investigation are presented on Table 4-1. IEA will provide "virgin" bottleware such as I-Chem Series 200 or equivalent and all bottles will contain appropriate preservatives (reagent grade or better).

4.5 PREPARATION OF SAMPLING EQUIPMENT AND CONTAINERS

4.5.1 DECONTAMINATION OF SAMPLING EQUIPMENT

This section describes procedures for decontaminating drilling and sampling equipment. Detailed personnel decontamination procedures are discussed in the Health and Safety Plan. Decontamination protocols will be strictly adhered to in order to minimize the potential for cross-contamination between sampling locations and contamination of off site areas.

4.5.1.1 General Considerations

The following general procedures will be adhered to during decontamination:

1. All decontamination and subsequent use of decontaminated equipment will be documented in a field book.

2. If visual signs such as discoloration indicate that decontamination was insufficient, the equipment will again be decontaminated. If the situation persists, the equipment will be taken out of service until the situation can be corrected.

3. Verification of the non-dedicated sampling equipment cleaning procedures will be documented by the collection of field blanks and trip blanks.

4. All properly decontaminated equipment will be stored in aluminum foil and plastic bags when not in use.

4.5.1.2 Drilling Equipment

Drilling equipment (i.e., rods, auger flights, bits, casings) will be cleaned between each boring location and sample. Decontamination procedures will be as follows:

1. Brush off excess soil.

2. Steam clean the equipment.

3. Air dry.

All cleaned equipment will be transported and stored in plastic sheets.

4.5.1.3 Sampling Equipment

Non-dedicated sampling equipment used to collect environmental samples will be cleaned prior to its initial use and between each sample location and after the final use. All equipment will be transported and stored in aluminum foil and plastic sheets.

4.5.1.3.1 Subsurface Sampling

Soil sampling equipment will be decontaminated at the sample locations. Equipment that will be cleaned will include: split spoons, stainless steel spatulas, ponar grab, and stainless steel compositing containers. Specific procedures are as follows:

1. Brush off excess soil.
2. Wash and scrub with Alconox detergent.
3. Thoroughly rinse with distilled water.
4. Air dry.

4.5.1.3.2 Temperature, Conductivity, pH and Depth to Water Probes

These probes used during groundwater sampling will be decontaminated via the procedures specified below:

1. Wash with Alconox detergent.
2. Rinse with potable water.
3. Rinse with deionized water.
4. Air dry.

All equipment will be transported and stored in plastic sheeting.

4.5.1.4 Electronic Equipment

Electronic equipment such as PID's, pH meters, turbidity meters, and conductivity meters will be decontaminated prior to their initial use and at the end of each day. The procedure for decontaminating this equipment is as follows:

1. Remove particulate contamination.

2. Wipe down with clean damp cloth (deionized water).

3. Air dry.

Equipment will be wrapped in plastic and stored when not in use.

4.5.1.5 Well Construction Materials

Well construction materials (i.e., screen, casing, caps) will be cleaned prior to insertion into the boring. Decontamination procedures will be as follows:

1. The materials will be elevated on horses above the ground surface.

2. Steam clean the materials.

3. Air dry.

4.5.2 PREPARATION OF SAMPLE CONTAINERS

The selected laboratory will provide sample containers (with added preservatives), trip blanks, ultra pure water to prepare field blanks, designated temperature bottles, and coolers for this project. All containers for volatile organics, extractable organics and inorganics will be required to be "virgin" bottleware (I-Chem Series 200 or equivalent).

4.6 DOCUMENTATION OF SAMPLING ACTIVITIES

In order to ensure that all pertinent information and data collected during the RI/FS is documented completely and correctly, the procedures and protocols described in the following sections will be implemented.

4.6.1 FIELD NOTEBOOKS

All information pertinent to the field investigation will be recorded in bound and numbered field notebooks. Each team member will be assigned an individual notebook. Field records should, at a minimum, contain the following information:

1. Date

2. Time of each data entry

3. Description of work being performed that day

4. Names and affiliations of all personnel at location

5. Weather conditions on site

6. Location and type of activity (monitoring well, surface water sample, etc.)

7. Sample or boring methods in use

8. Visual observations

9. Pertinent field data (pH, specific conductance, turbidity, temperature, and any other field measurements, such as from the PID)

10. Calibration information relative to the pH, conductivity meters and PID

11. Each page will be numbered and initialed.

4.6.2 PHOTO DOCUMENTATION

All photographers will record time, date, site location, general direction faced, sequential number of photograph and roll number, and brief description of the subject in a field notebook. Please note that due to security restrictions, no photography is allowed within the site security fence. Prior to any other photography the project coordinator should be notified.

4.6.3 CORRESPONDENCE/COMMUNICATIONS

All documents including field notes will be copied, checked for completeness, and filed. All correspondence received or sent during the investigation will be dated and labeled with a project filing identification control number. All telephone conversations will be documented and filed at the Unisys Paoli, PA office.

4.7 QUALITY CONTROL SAMPLES

Duplicate or replicate samples, as well as field (prepared in the field) and trip (prepared in the laboratory) blanks will be collected and submitted to the analytical laboratories to provide an assessment of the quality of sampling activities and results. Field duplicate samples are samples that have been homogenized and divided into two or more portions at some step in the measurement process and submitted to the laboratory as unique independent samples. These samples will be analyzed to monitor analytical precision. Since homogenization will not yield acceptable data for volatile organics, duplicates will not be performed for volatile organics. Instead, replicates will be collected for this fraction. Field replicates are separate grab samples collected from one sample location. Replicates are not homogenized. These samples will be analyzed to monitor sample representativeness.

Performance Evaluation (PE) samples will be prepared by an independent laboratory for the analyses of volatile organics and metals. Two double-blind PE samples will be submitted with the groundwater samples collected during Round 1 sampling activities. PE samples provide an excellent indication of analytical accuracy.

Field blank samples will be collected when non-dedicated sampling equipment is used and will be analyzed to check for procedural contamination. Field blank sampling involves the use of deionized, laboratory-supplied water, which is either poured over or passed through sampling devices.

To confirm the level of cleanliness of the bottles, laboratory personnel will prepare the appropriate trip blanks by filling two VOA sample bottles per shipment with organic free water. Frequencies for collecting field QA samples and the required types and numbers of laboratory QC samples are presented on Table 4-2.

5.0 SAMPLE CUSTODY

5.1 FIELD ACTIVITIES SAMPLE CUSTODY

The primary objective of sample custody procedures is to create accurate written records which can be used to trace the possession and handling of all samples from the moment of their collection, to shipment, through analysis, until their final disposition. Sample custody for samples collected during this investigation will be maintained by the Site Manager (SM). The FM or field personnel are responsible for documenting each sample transfer and maintaining custody of all samples until they are shipped to the laboratory.

All necessary sample bottles (I-Chem series 200 or equivalent) will be shipped directly to the Unisys Facility by IEA and received by the SM or field personnel. All necessary chemical preservatives (reagent grade or better) will be added to the bottles by the laboratory. IEA will also be required to prepare trip blanks and to provide an ample supply of ultra-pure water (ASTM Type II or better) for use during the preparation of field blanks. Sample bottles needed for a specific sampling task will be relinquished by the SM to the sampling team after the SM has verified the integrity of the bottles and assured that the proper bottles have been assigned for the task to be conducted.

Immediately after sample collection and bottle labeling, each sample container will be sealed in an individual plastic bag and stored in an iced cooler at $4^{O}C \pm 2^{O}C$. At the end of each sampling day, samples will be removed from the iced cooler and will then be repacked immediately into a second dry insulated cooler with "Blue Ice" and packing materials (e.g., foam inserts) for shipment to the laboratory. Field Chain-of-Custody records completed at the time of sample collection, will accompany the samples inside the cooler for shipment to the laboratory. The samples will be properly relinquished on the field Chain-of-Custody record by the sampling team. These record forms will be sealed in a Ziplock plastic bag to protect them against moisture. All sample coolers will be delivered to the analytical laboratory by either direct courier or 24-hour delivery courier (i.e., Federal Express) at the end of each sampling day.

All sample coolers will have a evidence tape that will be affixed and signed across the lid of the cooler. When samples are shipped, the evidence tape will be placed on each shipping container in a manner that would indicate if the container was opened in transit. A copy of the Chain of Custody form to be used is presented in Appendix B.

5.2 LABORATORY SAMPLE CUSTODY

Laboratory sample custody begins when the sample arrives at the laboratory. Details regarding laboratory sample custody will be included in IEA's SAP (Appendix E). At a minimum, the Laboratory Sample Custodian will be required to note any damaged sample containers or discrepancies between the sample label and information on the field Chain-of-Custody record when logging the sample. The laboratory will also be required to check and record the pH for the aqueous samples designated for metals and cyanide analyses. In addition, the temperature of a designated bottle of ultra-pure water (clearly labeled "For Temperature") will be obtained and recorded to verify (by analogy) that project samples are received. The Laboratory Sample Custodian must indicate on each field Chain of Custody the time the cooler was opened, the time the temperature was taken, the time the samples were placed in cold storage, and the temperature and correction factor based upon the annual NIST thermometer calibration. This information will be communicated to the SM within 3 hours of laboratory sample log-in so proper corrective action can be taken if there are any problems. The Chain-of-Custody form will be signed by both the relinquishing and receiving parties each time the sample changes hands, with the reason for transfer indicated.

An internal Chain-of-Custody form will be required to be used by the selected laboratory to document sample possession from the Laboratory Sample Custodian to the Analyst and to the final disposition. All Chain-of-Custody information will be required to be supplied with the data packages for inclusion in the document control file.

5.3 FINAL EVIDENCE FILES

5.3.1 Unisys's FINAL EVIDENCE FILE

Unisys will maintain all original documentation, including but not limited to: field Chain-of-Custody forms, laboratory analytical reports, field notes, sample logs, telecons, photographs, memoranda, logbooks and letters in a designated secure, limited-access area at the Unisys office in Paoli, PA. All items being placed into this file will be assigned a document control identification number and a document description. All items will then be logged onto the file "Table of Contents". All items added or removed from the file will be signed and dated by the person making the entry. All records will be maintained in this fashion for a period of 6 years.

5.3.2 IEA's FINAL EVIDENCE FILE

The final project report, which includes the raw data, is retained in the laboratory's archives. These will be required to be permanent, locked archives which will not be purged. All associated original laboratory logbooks will also be required to be retained in these archives.

6.0 CALIBRATION PROCEDURES AND FREQUENCY

6.1 FIELD INSTRUMENTS

To ensure that measurements during the investigation have been collected with properly calibrated instruments, field personnel will follow the procedures described in the Equipment Owner's Manual. All field equipment will be calibrated, at a minimum, daily prior to use and repaired in accordance with manufacturer's specifications. In addition, prior to use, each major piece of equipment will be cleaned, decontaminated, checked for damages, and repaired as needed. These activities will be noted in a field log notebook.

Despite even the most rigorous maintenance program, equipment failures do occur. When equipment cannot be repaired, it will be returned to the manufacturer for repairs and noted in the field log book.

Quality control efforts, accuracy and precision objectives for field measurement equipment are summarized below. Calibration procedures and frequency for all field instruments are summarized in Table 6-1. Specific detailed methods of calibration for the following instruments are presented in Appendix C.

6.2 LABORATORY CALIBRATIONS

The analytical methods selected for use in this investigation specify the types and frequency of calibrations. Nonetheless, IEA has provided this information in their SAP which is presented in Appendix E.

7.0 ANALYTICAL PROCEDURES

In order to accomplish the objectives of the RI/FS, analyses will be performed for TCL volatile organics, TCL semi-volatile organics, TCL pesticides/PCBs and TAL inorganics in accordance with the New York State Department of Environmental Conservative (NYSDEC) Analytical Services Protocol (ASP) Contract Laboratory Program (CLP) protocols (1991). Table 7-1 specifies the approved methods that will be utilized for the Round 1 samples. Tables 7-2, 7-3 7-4 and 7-5 list the target parameters and quantification limits.

8.0 DATA REDUCTION, VALIDATION AND REPORTING

8.1 DATA REDUCTION

It is anticipated that data reduction for this investigation will consist of summarizing laboratory analytical results onto tables through the use of a computerized database management system. All reduced data will be assigned document control identification numbers and placed in the central file maintained by the Project Manager.

All TCL VOA, TCL BNA, TCL pesticide/PCBs and TAL Inorganics data obtained for groundwater samples will be reported in ug/L. All TCL VOA, TCL BNA and TCL pesticide/PCBs soil boring samples and sediment will be reported in ug/Kg on a dry-weight basis. All TAL inorganics data obtained for soil boring and sediment samples will be reported as mg/Kg on a dry-weight basis. All laboratory analytical data will be summarized and tabulated in an Excel format (prearranged with the data validator) by IEA with hardcopy and disk and deliverable before final data submittal to the project team for use in the investigation reports. The results of the data reduction will be included in the project files.

8.2 DATA VALIDATION

8.2.1 FIELD DATA

Quality assurance for field data is accomplished through the use of approved field protocols. To ensure that the correct protocols are used, all field team members, prior to beginning site work, will be briefed by the SM on their familiarity with the site-specific Field Sampling Plan.

Data review will occur to ensure that raw data are not altered and that an audit trail is developed for those data which require reduction. All field data, such as those generated during field measurements, observations and field instrument calibrations, will be entered in pen directly into a bound field notebook. Each project team member will be responsible for proofing all data transfers made, and the SM will proof at least ten percent of all data transfers. Any corrections or alterations of information in the field notebooks will be accompanied by the initials of the person making the changes and the date of the change.

Following each task, the data collected will be evaluated for completeness and comparability. If either parameter does not meet the objective for field data, an explanation or qualifier will be added to the data. Finally, the evaluation (data review) of trip and field blanks and other field QC samples will provide definitive indications of the data quality. If a problem arises and can be isolated, corrective actions can be instituted for the Round 2 sampling event.

8.2.2 LABORATORY DATA

Validation of laboratory data is the process of reviewing data and accepting or rejecting it on the basis of sound criteria. The data generated will receive both technical and editorial review. Technical review concerns itself with the analytical techniques and their effect on data validity. Editorial review ensures that the text is concise and lucid and that it contains no transpositional errors. Prior to submission to Unisys, IEA will be required to use appropriate validation methods and criteria to validate data. The criteria used in evaluating data include:

- Accuracy requirements
- Precision requirements
- Detection/Quantitation Limit requirements
- Completeness
- Representativeness

Upon receipt of the data packages, all laboratory data will be quantitatively and qualitatively validated by Environmental Standards, Inc. in strict accordance with the "National Functional Guidelines For Organic Data Review - Draft" (U.S. EPA, 1990) and the "Functional Guidelines For Evaluating Inorganics Analyses" (U.S. EPA, 1988). The data will subsequently be submitted to Unisys. Data validation is discussed in detail in Section 12.

8.2.3 DATA REPORTING

Complete data packages, inclusive of all raw data, will be submitted for each of the analyses. The data packages for the analyses for TCL VOAs, TCL BNAs, TCL pesticides/PCBs and TAL inorganics will be provided by IEA utilizing full NYSDEC 1991 ASP Superfund Category deliverables. The data packages will be provided in sample delivery groups of between 15 and 20 investigative samples. One bound data package and one unbound data package will be delivered to Unisys. A hardcopy of the Excel data tables and the disk deliverable will be delivered to Environmental Standards for data validation.

Qualifiers used by IEA when reporting data will be in accordance with the aforementioned NYSDEC deliverable requirements. Sample results will not be blank-corrected. Case narratives will be provided which document any nonstandard occurrences within the case. Any and all problems that may be apparent with the analyses will be relayed to the SM and the Project Quality Assurance Manager. They will then be responsible for notifying the appropriate personnel and implementing project level corrective action, such as resampling.

9.0 INTERNAL QUALITY CONTROL

9.1 FIELD QUALITY CONTROL CHECKS

Field Quality Control Checks will be utilized during this investigation through the use of the following:

- Potable Water Blank - A single source of water will be collected at the beginning of the RI to be used for decontamination purposes, drilling water, and for mixing of well construction materials. This source will be sampled on one occasion and the sample will be submitted to the laboratory to be analyzed for all parameters examined in the associated project samples.

- Trip Blank - One Trip Blank will be submitted for each day of sampling or one for every 20 samples (whichever is more frequent) submitted for the analysis of volatile organics. Trip Blanks will be prepared by the laboratory with deionized water, transported to the Site, handled like a sample and returned to the laboratory for analysis.

- Field Blanks - Field Blanks are prepared in the field to ensure that a nondedicated sampling device has been effectively cleaned. Deionized water either fills or is pumped through the device, transferred to the appropriate sample bottles, preserved and returned to the laboratory for analysis. Aqueous field blanks will be submitted one for every 20 samples or for each day of sampling (whichever is more frequent) for all parameters examined in the associated project samples.

- Field Duplicates or Replicates - Two sets of samples from a single sample location are obtained (replicates) or prepared (duplicates), labeled with unique sample numbers and submitted to the laboratory to determine analytical precision and sample representativeness. Field duplicates or replicates will be collected at a frequency of 1 per 20 samples per matrix.

- Performance Evaluation (PE) - Groundwater samples submitted for volatiles and metals analysis will be accompanied by a known concentration PE sample. Two PE samples will be supplied by an independent laboratory who will certify "true" sample values and prepare the PE samples in the same bottleware that is used for project samples. It is anticipated that the volatile PEs will be prepared with 2-3 volatile organics with concentration ranges of 20-40 ug/L. The inorganic (metals) PE will be prepared with 5-6 metals with concentration ranges of 30-50 ug/L. The PE samples will be submitted to the select laboratory with a fictitious identification (double blind).

- Matrix Spike/Matrix Spike Duplicate Samples - Matrix Spike (MS) and Matrix Spike Duplicate (MSD) samples will be submitted as further QC checks. One MS and MSD in every twenty (20) groundwater and subsurface soil samples will be collected and submitted for organic analysis. These will allow accuracy to be determined by the recovery rates of compounds (the matrix spike and/or surrogate spike compounds defined in the analytical methods). The purpose of these laboratory spikes is to monitor any possible matrix effects specific to samples collected from the Site. The addition of known concentrations of compounds/constituents into the sample also monitors extraction/digestion efficiency.

- The analysis of MS/MSD samples checks precision by comparison with the respective spiked recoveries. In addition, any non-spiked analytes present in an unspiked sample will be compared with the results of the non-spiked compounds in the MS/MSD. Therefore, data will be assessed for precision for this triplicate analysis. The analysis of laboratory duplicates (inorganic analyses) is an excellent assessment of analytical precision.

Duplicate/replicate and matrix spike sample aliquots will be acquired for groundwater by collecting sequential grab samples after the collection of the initial sample aliquot. Therefore, the specific sample location which will be used for matrix spikes and duplicates/replicates will be chosen by the SM.

Soil duplicate or replicate and matrix spike samples will be collected by splitting the sample between the sample container, duplicate container and matrix spike container. Homogenizing <u>will not</u> be performed for the aliquots designated for volatile organic compounds; therefore, these aliquots are designated as sample replicates. If insufficient soil sample is present at a particular location to collect the three sample volumes, a single sample bottle will be split at the laboratory for MS/MSD analysis.

9.2 LABORATORY QUALITY CONTROL CHECKS

All QC procedures employed by IEA will be in full accordance with those described in the NYSDEC 1991 ASP CLP Superfund Category. General QC protocols for analyses will be required as follows:

9.2.1 ORGANIC ANALYSES

- A minimum of one procedural blank (method blank) in every 20 samples analyzed to detect contamination during analysis. (Every 12-hour shift for VOAs.)

- One matrix spike, one matrix spike duplicate (organics), laboratory duplicate (inorganics) per every 20 samples, per level, or per SDG, whichever is more frequent; to determine recovery, precision and the presence of matrix effect.

- Surrogate spikes and internal standards to quantitate results, determine recoveries and to account for sample-to-sample variation.

- Multilevel initial calibrations of instruments to establish calibration curves.

- Continuing calibration standards at least once every 12 hours of instrumental analysis for accurate quantitation, and recalibration if these do not meet NYSDEC ASP 12/91 CLP criteria.

- Calibration of GCs and GC/MSs, according to the appropriate NYSDEC ASP 12/91 CLP methods.

- Tuning of GC/MS systems every 12 hours to meet NYSDEC criteria using BFB (bromofluorobenzene) for volatile organics analysis, and DFTPP (decafluorotriphenylphosphine) for semi-volatile organics analysis.

9.2.2 INORGANIC ANALYSES

- Analysis of moderate-to-high concentration levels by ICP (inductively coupled plasma spectroscopy).

- Analysis of low-level metal concentrations by graphite furnace atomic absorption spectroscopy.

- Calibration blanks and method blanks prior to and between the analysis of samples.

- Multilevel calibration curves generated by analyses of individual standards (AA) or mixed standards (ICP).

- Initial Calibration Verification (ICV) and Continuing Calibration Verification (CCV) at a minimum of one in every ten samples to verify instrument calibration.

- ICP Interference Check Standards after initial calibration and after samples are analyzed (within 8-hour period).

- Recalibration and reanalysis of applicable samples if check standard response deviates from the NYSDEC ASP 12/91 CLP criteria from the initial calibration.

- A minimum of one matrix spike in every 20 samples or one for each sample matrix type.

- A minimum of one laboratory duplicate in every 20 samples analyzed.

- A minimum of one Laboratory Control Sample (LCS) for every 20 samples digested together.

- A minimum of one method blank for every 20 samples digested together.

- Digestion of aqueous, solid or waste samples according to the specified NYSDEC ASP 12/91 CLP procedures.

10.0 PERFORMANCE AND SYSTEM AUDITS

10.1 LABORATORY AUDIT BY ESI

For this project, IEA will be required to undergo an on site audit prior to initiating analysis. This on site audit will be conducted by Environmental Standards, Inc. The NYSDEC on site audit checklist is provided as Appendix D of this SAP. NYSDEC will be provided a copy of the audit report and completed checklist. The laboratory will be required to correct any deficiencies identified during the audit prior to project initiation.

10.2 INTERNAL LABORATORY AUDIT

IEA will be required to describe its internal audit procedures with respect to the level of effort and the frequency by which these audits take place. IEA internal audit procedures is presented in its SAP presented in Appendix E.

11.0 PREVENTATIVE MAINTENANCE

11.1 FIELD EQUIPMENT MAINTENANCE

The field equipment is maintained through an on-staff equipment supervisor responsible for routine maintenance. When damaged or equipment in need of repair is returned to the office, it is appropriately flagged for the required maintenance to be performed. This process assures that only operable and maintained equipment enters the field. In the event of equipment failure in the field, a replacement will be made available within 24 hours. Routine daily maintenance procedures conducted in the field to help prevent failure will include:

- Removal of surface dirt and debris from exposed surfaces of the sampling equipment and measurement systems.
- Cleansing of filters in the organic vapor analyzer.
- Storage of equipment away from the elements.
- Daily inspections of sampling equipment and measurement systems for possible problems (e.g., cracked or clogged lines or tubing or weak batteries).
- Checking instrument calibrations as described in Appendix C.
- Charging any battery packs for equipment when not in use.

Spare and replacement parts stored in the field to minimize downtime include, but are not limited to the following:

- Appropriately sized batteries.
- Locks.
- Extra sample containers and preservatives.
- Calibration gases, battery charger and support equipment.
- Spare filters for filtration apparatus.
- Extra pH probes, conductivity probes, sample coolers, packing material and sample location stakes.
- Additional supply of health and safety equipment (i.e., respirator cartridges, boots, gloves, tyvek, etc.).
- Additional equipment as necessary for the field tasks.

11.2 LABORATORY PREVENTATIVE MAINTENANCE

IEA will be required to maintain a complete inventory of replacement parts needed for preventative maintenance and spare parts that routinely need replacement (e.g., gauges, detectors, etc.).

12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS PRECISION, ACCURACY AND COMPLETENESS

12.1 OVERALL PROJECT ASSESSMENT

Overall, data quality will be assessed by a thorough understanding of the project objectives and data quality objectives which are stated during the design phase of the investigation. By maintaining thorough documentation of all decisions made during each phase of sampling, performing field and laboratory audits, thoroughly reviewing (validating) the analytical data as it is generated by the laboratory and providing appropriate feedback as problems arise in the field or at the laboratory, Unisys will closely monitor data accuracy, precision and completeness.

12.2 FIELD DATA QUALITY ASSESSMENT

To assure that all field data are collected accurately and correctly, all personnel involved in the field data acquisition will be required to read and understand the Work Plan and this SAP. Copies of these documents will be on site at all times for reference.

The evaluation (data review) of field QC samples will provide definitive indications of the data quality. If a problem arises and can be isolated, corrective actions will be instituted for future field efforts.

12.3 EQUATIONS FOR ASSESSING PRECISION, ACCURACY AND COMPLETENESS

12.3.1 PRECISION

Precision is frequently determined by the comparison of duplicates, where duplicates result from an original sample that has been split for identical analyses. Standard deviation(s) of a sample is commonly used in estimating precision.

$$\text{Sample standard deveation(s)} = \sqrt{\frac{1}{n-1} \sum_{i=1}^{n} (X_i - X)^2}$$

where a quantity x (e.g., a concentration) is measured n times with a mean x.

The Relative Standard Deviation (RSD) or sample coefficient of variation (CV), which expresses standard deviation as a percentage of the mean, is generally useful in the comparison of three or more measurements.

$$RSD = 100\,(s/x)$$

or

$$CV = 100\,(s/x)$$

where RSD = relative standard deviation, or
CV = coefficient of variation
s = standard deviation
x = mean

In the case of duplicates/replicates - samples that result when an original sample has been split into two parts for identical analyses - the Relative Percent Difference (RPD) between the two samples may be used to estimate precision.

$$RPD = \frac{D_1 - D_2}{(D_1 + D_2)/2} \times 100$$

where: RPD = relative percent difference
D_1 = first sample value
D_2 = second sample value (duplicate)

12.3.2 ACCURACY

The determination of accuracy of a measurement requires a knowledge of the true or accepted value for the analyte being measured. Accuracy may be calculated in terms of bias as follows:

$$\text{Bias} = X - T$$

$$\%\ \text{Bias} = \frac{(X-T)}{T} \times 100$$

where: X = average observed value of measurement

T = "true" value

Accuracy may also be calculated in terms of the recovery of spiked samples:

$$\%\ \text{Recovery} = \frac{X}{T} \times 100$$

12.3.3 COMPLETENESS

Determining whether a database is complete or incomplete may be quite difficult. To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. Less obvious is whether the data are sufficient to achieve the goals of the project. All data are reviewed in terms of goals in order to determine if the database is sufficient.

Where possible, the percent completeness for each set of samples is calculated as follows:

$$\% \text{ completeness} = \frac{\text{valid data obtained}}{\text{total data needed}} \times 100$$

12.3.4 OBJECTIVES

Objectives in terms of completeness, precision and accuracy are presented in Section 4.

12.3.5 REPORTING

Precision and accuracy data will be calculated at the time of the analysis from IEA's perspective. If the method control limits have been exceeded, the sample will be reanalyzed (if applicable) according to NYSDEC ASP 12/91 CLP protocols. All laboratory precision and accuracy results (standards: %RSD, %D; samples: surrogate recoveries, matrix spike recoveries, RPD's on duplicates) will be presented in the laboratory-issued data packages.

12.4 LABORATORY DATA ASSESSMENT

12.4.1 ESI's DATA VALIDATION

Analytical data generated during this investigation will undergo a rigorous ESI data validation. This validation will be performed in accordance with the "National Functional Guidelines For Organic Data Review - Draft" (U.S. EPA, 1990) and the "Functional Guidelines for Evaluating Inorganics Analyses" (U.S. EPA, 1988).

ESI's data validation will include a preliminary review to verify that all necessary paperwork (Chain-of-Custodies, analytical reports and laboratory personnel signatures) and deliverables as stated in the NYSDEC ASP Superfund Category are present.

A detailed quality assurance review will be performed by ESI to verify the qualitative and quantitative reliability of the data as it is presented. This review will include a detailed review and interpretation of all data generated by IEA. The primary tools which will be used by ESI's quality assurance staff will be the aforementioned NYSDEC guidance document "General Instructions for Compilation of the Data Validation Report" and EPA guidance documents, established analytical method criteria and professional judgment.

Based upon a review of the analytical data, quality assurance reports which will state in a technical yet "user-friendly" fashion the qualitative and quantitative reliability of the analytical data will be prepared. The report will consist of a general introduction section, followed by qualifying statements that should be taken into consideration such that the analytical results can be best utilized. Based upon the quality assurance review, qualifier codes will be placed next to specific sample results on the sample data tables. These defined qualifier codes will serve as an indication of the qualitative and quantitative reliability.

During the course of the data review, support documentation packages will be prepared. These will provide backup information that will be used to support the qualifications of data made in the quality assurance review. Upon completion of the review, the Quality Assurance Manager will submit these data to the Unisys Project Manager.

12.5 MANAGEMENT DATA QUALITY ASSESSMENT

The field and laboratory data generated from this investigation will be assessed from an overall management perspective, with respect to the project and data quality objectives. Information that can be obtained includes determination of the adequacy of current data points and the potential identification of missing data points. By examination of the collective data at the "back-end" of the process, data quality will be assessed with respect to all of the PSARCC objectives.

13.0 CORRECTIVE ACTION

13.1 UNISYS CORRECTIVE ACTION

One of the critical roles in a successful QA program is the implementation of corrective actions in the event that problems arise. The Project Manager is ultimately responsible for taking appropriate corrective action if a problem is discovered. The NYSDEC Project Manager will be informed of problems and the proposed course of action to be taken.

To assess the quality of the samples collected in the field and to determine if there is a need for corrective action, field procedures will be evaluated through various audits. Some of the areas examined in the audit processes are summarized below.

- Sampling procedures are in accordance with the Work Plan and SAP.
- Indications of faulty sampling equipment or inappropriate bottleware and preservatives.
- Fully completed field data sheets for all activities.
- Strict Chain-of-Custody on all samples collected.

Any problems with the above identified during the investigation will be reported on a Corrective Action Form, as presented in Appendix B. The aforementioned examples are tests for soundness that will be checked during data evaluation and interpretation. Any errors or problems will be corrected by an appropriate action which may include:

- Replacing or repairing a faulty measurement system
- Discarding erroneous data
- Collecting new data
- Accepting the data and acknowledging a level of uncertainty

13.2 LABORATORY CORRECTIVE ACTION

IEA has described their corrective action program in their SAP presented in Appendix E.

Tables

TABLE 1-1
SAMPLING RATIONALE

1. Characteristics of subsurface soils.

   Rationale:
   1. Soil constituent distribution horizontal and vertical.
   2. Determine constituent concentrations, migration pathways and routes of entry.

   Data Gathering Methods:
   Soil borings, sampling and analysis of split spoon samples.

2. Characteristics of on and off site groundwater.

   Rationale:
   1. Constituent distribution in the aquifer horizontal and vertical.
   2. Determine constituent concentrations, migration pathways and routes of entry.
   3. Provide data of known quality for the development of a comprehensive risk assessment.
   4. Support the identification, development, and evaluation of remedial alternatives/technology screening and detailed alternative evaluation completed during the Feasibility Study.

   Data Gathering Methods:
   Sampling and analysis of monitor wells.

3. Drainage basin sediment and surface water samples.

   Rationale:
   1. Constituent distribution in the drainage basin.
   2. Determine constituent concentrations, migration pathways and routes of entry.
   3. Provide data of known quality for the development of a comprehensive risk assessment.

   Data Gathering Methods:
   Sampling and analysis of drainage basin sediment and surface water samples.

TABLE 1-2
ESTIMATED ROUND 1 SAMPLING SUMMARY

		Chemical Analyses(1)					Number of Field QC Samples				
Matrix	Number of Investigative Samples	A	B	C	D	E	Field Dup	Field Blank(2)	Trip(2) Blank	PE(3)	Matrix Total (4)
Soil - Soil borings	12	12	12	12	12	12	1	1	1	0	15
Soil - Substation samples	7	7	7	2	0	0	1	1	1	0	10
Soil - Well Borings	19	19	0	0	0	0	1	1	1	0	22
Water - Existing Off Site Wells	15	15	0	0	0	0	1	1	1	0	18
Water-Monitoring Wells	48	48	48	48	48	48	2	2	2	2	56
Water-Lloyd Well	6	6	6	6	6	6	1	1	1	0	9
Water-During Drilling	60	60	0	0	0	0	0	2	12	0	74
Water-Drainage Basin	3	3	3	3	3	3	1	0	1	0	5
Water-Potable Water	1	1	1	1	1	1	0	0	0	0	1
Sediment -Drainage Basin	10	10	10	10	10	10	1	1	1	0	13

---

1 A TCL volatile organics (plus 10 TICs)
B TCL semivolatile organics (plus 20 TICs)
C TCL pesticides/PCBs
D TAL Metals
E Cyanide

2 The number of blanks may vary depending on the number of samples collected on any given day of sample collection activities.

3 Performance evaluation samples will be prepared for VOAs and TAL metals by an independent laboratory.

4 Matrix total does not include laboratory QC samples (e.g., MS/MSD).

TABLE 3 – 1 DATA QUALITY OBJECTIVES

DQO Parameter	Routine Analyses[1]
Precision	Tables 3-2 and 3-3
Accuracy	Tables 3-2 and 3-3
Sensitivity	Section 7 of the QAPP
Representativeness	Inorganic-Aq <20% RPD @ >RDL Inorganic-Sol <35% RPD @ >RDL Organic-VOA <15% RPD (Aq), <25% RPD (Sol) Organic-BN <25% RPD (Aq), <32% RPD (Sol) Organic-Acids <45% RPD (Aq), <43% RPD (Sol) Organic-Pest/PCBs <25% RPD (Aq), <45% RPD (Sol)
Completeness	90%
Comparability	Based on Precision and Accuracy and Media Comparison

NOTES:

1 Routine Analyses Include TCL VOA's, TCL BNA's, TCL Pesticides/PCBs and TAL Inorganics.
RDL Required Detection Limit.
RQL Required Quantitation Limit.

TA[illegible] 3-2

ACCURACY AND PRECISION DATA QUALITY OBJECTIVES FOR ORGANICS

Parameter	Audit	Compounds	Aqueous Control Limits	Solid Control Limits
VOA Components	Lab Blank, Field Blank, Trip Blank	All TCL Compounds	<5 X < RQL Methylene Chloride, Acetone and 2-Butanone < RDL All Other Compounds	<5 X < RQL Methylene Chloride, Acetone and 2-Butanone < RDL All Other Compounds
	Matrix Spike Duplicate Precision	See Matrix Spikes	<14% RPD (95% CI)	<24% RPD (95% CI)
	Surrogate Spike Recovery	D4-1,2-dichloroethane	(76-114%)	(70-120%)
		D8-toluene	(88-110%)	(84-138%)
		Bromofluorobenzene	(86-115%)	(59-113%)
	Matrix Spike Recovery	1,1-dichloroethene	(61-145%)(14% RPD)	(59-172%)(22% RPD)
		trichloroethene	(71-120%)(14% RPD)	(62-137%)(24% RPD)
		benzene	(76-127%)(11% RPD)	(66-142%)(21% RPD)
		toluene	(76-125%(13% RPD)	(59-139%)(21% RPD)
		chlorobenzene	(75-130%)(13% RPD)	(60-133%)(21% RPD)
	Double-Blind Performance Evaluation	TBA	(80-120%)	NA
BNA Components	Lab Blank, Field Blank	All Parameters	<5 C RQL Phthalate Esters <RDL All Other Compounds	<5 X RQL Phthalate Esters < RDL All Other Compounds
	Matrix Spike Recovery and Matrix Spike Duplicate Precision	phenol	(12-112%)(42% RPD)	(26-90%)(35% RPD)
		2-chlorphenol	(27-123%)(40% RPD)	(25-102%)(50% RPD)
		1,4-dichlorobenzene	(36-97%)(28% RPD)	(28-104%)(27% RPD)
		N-nitroso-di-n-propylamine	(41-116%)(38% RPD)	(41-126%)(38% RPD)
		1,24-trichlorobenzene	(39-98%)(28% RPD)	(38-107%)(23% RPD)
		p-chloro-m-cresol	(23-97%)(42% RPD)	(26-103%)(33% RPD)
		acenaphthene	(46-118%)(31% RPD)	(31-137%)(19% RPD)
		4-nitrophenol	(10-80%)(50% RPD)	(11-114%)(50% RPD)
		2,4-dinitrotoluene	(24-96%)(38% RPD)	(28-89%)(47% RPD)
		pentachlorophenol	(9-103%)(50% RPD)	(17-109%)(47% RPD)
		pyrene	(26-127%)(31% RPD)	(35-142%)(36% RPD)
	Surrogate Spike Recovery	d5-nitrobenzene	(35-114%)	(23-120%)
		2-fluorobiphenyl	(43-116%)	(30-115%)
		d14-terphenyl	(33-141%)	(18-137%)
		d6-phenol	(10-110%)	(24-113%)
		2-fluorophenol	(21-110%)	(25-121%)
		2,4,6-tribromophenol	(10-123%)	(19-122%)
		2-chlorophenol-d4	(33-110%)(advisory)	(20-130%)(advisory)
		1,2-dichlorobenzene-d4	(116-110%)(advisory)	(20-130%)(advisory)
Pesticides/PCBs	Lab Blank, Field Blank	All TCL Pesticides/PCBs	<RQL for All Compounds	<RQL for All Compounds
	Matrix Spike Recovery and Matrix Spike Duplicate Precision	lindane	(56-123%)(15% RPD)	(46-127%)(50% RPD)
		heptachlor	(40-131%)(20% RPD)	(35-130%)(31% RPD)
		aldrin	(40-120%)(22% RPD)	(34-132%)(43% RPD)
		dieldrin	(52-126%)(18% RPD)	(31-134%)(38% RPD)
		endrin	(56-121%)(21% RPD)	(42-139%)(45% RPD)
		4,4'-DDT	(38-127%)(27% RPD)	(23-134%)(50% RPD)
	Surrogate Spike Recovery	decachlorobiphenyl	(60-150%) (advisory)	(60-150%) (advisory)
		tetrachlorometaxylene	(60-150%) (advisory)	(60-150%) (advisory)

TBA - To Be Announced. RQL - Required Quantitation Limit. NA - Not Applicable. MDL - Method Detection Limit. CI - Confidence Interval.

TABLE 3-3

ACCURACY AND PRECISION DATA QUALITY OBJECTIVES FOR INORGANICS

PARAMETER	AUDIT	CONSTITUENT	AQUEOUS CONTROL LIMITS	SOIL CONTROL LIMITS
Metals and Cyanide	Lab Blank, Field Blank	All TAL Constituents	< ± RDL	< ± RDL
	Laboratory Duplicates	All TAL Constituents	<20% RPD for results >5 × RDL <± RDL results <5 × RDL	<20% RPD for results >5 × RDL <± RDL results <5 × RDL
	Matrix Spike Recovery	All TAL Constituents	75-125% unless the sample concentration exceeds the spike added concentration by a factor of 4 or more	75-125% unless the sample concentration exceeds the spike added concentration by a factor of 4 or more
	Double-Blind Performance Evaluation	TBA	75-125%	NA

TBA	-	To Be Announced.
RDL	-	Required Detection Limit.
NA	-	Not Applicable.

TABLE 3-4
ACCURACY AND PRECISION QUALITY OBJECTIVES FOR FIELD DATA

Measurement	Instrument	Precision	Accuracy
PID	HNU HW-101	+/- 0.2 ppm	+/- 0.5% for pure Benzene
pH	Presto-Tek SDPH-3	+/- 0.03 pH units	+/- 0.01 or +/- 0.05% (whichever is greater)
Conductivity	YSI Model 33	+/- 10/25/250 uhmo/cm (3)	+/- 5/25/250 uhmo/cm (depending on scale)
Temperature	YSI Model 33	+/- .1 degrees C	+/- 0.1 degrees C or 1% (whichever is greater)
Turbidity	Lamotte model 2008	+/- 0.05 NTU	+/- 2% or 0.05 NTU (whichever is greater)

TABLE 3-5 DQO SUMMARY FORM

1. Site

Name Unisys - Shipboard
Location Great Neck, NY
EPA Region NYSDEC
Phase Round 1

2. Media (Circle One)	Soil	[✓ Ground Water]	Surface Water	Sediment	Air	Biota	Other
3. Use (Circle all that apply)	[✓ Site Characteristics (H&S)]	[✓ Risk Assessment]	[✓ Evaluate Alternatives]	[✓ Engineer Design]	PRP Determ.	Monitor Remedial Action	Other

4. Objective

Determine transport mechanisms for site characterization and assessment of risk to human health and environmental receptors.

5. Site Information

Area	1 million square feet	Sensitivity Receptors	Offsite ground water users
Ground Water Use	Onsite & Offsite potable wells within aquifer - also non-potable uses	Depth to Ground Water	80-100 ft.
Soil Types	Sandy		

6. Data Types

A. Analytical Data

[✓ pH]	[✓ Pesticides]			
[✓ Conductivity]	[✓ PCBs]			
[✓ VOA]	[✓ Metals]			
[✓ ABN]	[✓ Cyanide]			
TCLP				

B. Physical Data

Permeability	Moisture
Porosity	Soil Classification
Grain Size	Specific Gravity
Atterburg Limits	

7. Sample Method

(Circle methods to be used)

[✓ Environmental]	Biased	Grab	Non-intrusive	Phased
Source	Grid	Composite	Intrusive	

8. Analytical Levels

(Indicate Level(s) and Equipment & Methods)

Level 1	Field Screening	- Equipment	pH, Cond., PID, Temp.
Level 2	Field Analysis	- Equipment	
		- Laboratory	
Level 3	Non-CLP	Methods	VOA, ABN, Pesticides/PCBs, Metals, CN
Level 4	CLP/RAS	- Methods	
Level 5	Non-Standard	- Methods	(91-4 and 91-6)

9. Sampling Procedures

Background	Upgradient
Critical (List)	All
Procedures	Purge wells with submersible pumps, collect samples with dedicated bailers

10. Quality Control Samples

(Confirm or Set Standard)

A. Field

Collocated - 5% or	none
[illegible]ate - 5% or	1
[illegible]lank - 5% or	
Trip Blank - 1 per day or	
Performance Evaluation - 5% for VOAs and metals	

B. Laboratory

Reagent Blank - 1 per analytical batch or	
Replicate - 1 per analytical batch or	
Matrix Spike - 1 per analytical batch or	
Other	

TABLE 3-5 DQO SUMMARY FORM

1. Site

Name Unisys - Shipboard
Location Great Neck, NY
EPA Region NYSDEC
Phase Round 1

2. Media (Circle One)

[✓ Soil] Ground Water Surface Water Sediment Air Biota Other

3. Use (Circle all that apply)

[✓ Site Characteristics (H&S)] [✓ Risk Assessment] [✓ Evaluate Alternatives] [✓ Engineer Design] PRP Determ. Monitor Remedial Action Other

4. Objective

Determine the placement of vapor extraction wells as an interim remedial measure. Establish baseline concentrations.

Monitor vapor extraction concentrations

5. Site Information

Area 1 million square feet
Sensitivity Receptors Offsite ground water uses
Ground Water Use Onsite & Offsite potable wells within aquifer - also non-potable uses
Depth to Ground Water 80-100 ft.
Soil Types Sandy

6. Data Types

A. Analytical Data

pH
Conductivity
[✓ VOA]
[✓ ABN]
TCLP
[✓ Pesticides]
[✓ PCBs]
[✓ Metals]
[✓ Cyanide]

B. Physical Data

Permeability
Porosity
Grain Size
Atterburg Limits
Moisture
Soil Classification
Specific Gravity

7. Sample Method (Circle methods to be used)

[✓ Environmental] Source
Biased Grid
Grab Composite
Non-Intrusive Intrusive
Phased

8. Analytical Levels (Indicate Level(s) and Equipment & Methods)

Level 1 Field Screening - Equipment PID (Soil Boring Screening and H & S)
Level 2 Field Analysis - Equipment Soil Gas Survey - VOCs
- Laboratory
Level 3 Non-CLP Methods
Level 4 CLP/RAS - Methods VOA, ABN, Pesticides/PCBs, Metals, CN
Level 5 Non-Standard

9. Sampling Procedures

Background None
Critical (List) All
Procedures Composite intervals for non-volatiles & inorganics grab highest PID interval for VOA

10. Quality Control Samples (Confirm or Set Standard)

A. Field

Collocated - 5% or none
ate - 5% or 1
Field Blank - 5% or
Trip Blank - 1 per day or

B. Laboratory

Reagent Blank - 1 per analytical batch or
Replicate - 1 per analytical batch or
Matrix Spike - 1 per analytical batch or
Other

TABLE 3-5 DQO SUMMARY FORM

Section 5
Revision No. 0
Date: May 15, 1991
Page 12 of 14

1. Site

Name Unisys - Shipboard
EPA Region NYSDEC
Location Great Neck, NY
Phase Round 1

2. Media (Circle One)	Soil	Ground Water	[✓ Surface Water]	Sediment	Air	Biota	Other
3. Use (Circle all that apply)	[✓ Site Characteristics (H&S)]	[✓ Risk Assessment]	[✓ Evaluate Alternatives]	[✓ Engineer Design]	PRP Determ.	Action	Other

4. Objective

Determine transport mechanisms for site characterization and assessment of risk to human health and environmental receptors.

5. Site Information

Area	1 million square feet	Sensitivity Receptors	Unknown
Ground Water Use	potable uses	Depth to Ground Water	80-100 ft.
Soil Types	Sandy		

6. Data Types

A. Analytical Data

[✓ pH]
Conductivity
[✓ VOA]
[✓ ABN]
TCLP
[✓ Pesticides]
[✓ PCBs]
[✓ Metals]
[✓ Cyanide]

B. Physical Data

Permeability
Porosity
Grain Size
Atterburg Limits
Moisture
Soil Classification
Specific Gravity

7. Sample Method (Circle methods to be used)

[✓ Environmental]
Source
Biased
Grid
Grab
Composite
Non-intrusive
Intrusive
Phased

8. Analytical Levels (Indicate Level(s) and Equipment & Methods)

Level 1	Field Screening	- Equipment	PID
Level 2	Field Analysis	- Equipment	
		- Laboratory	
Level 3	Non-CLP	Methods	
Level 4	CLP/RAS	- Methods	VOA, ABN, Pesticides/PCBs, Metals, CN
Level 5	Non-Standard	- Methods	

9. Sampling Procedures

Background: None
Critical (List): All
Procedures: Collect using dedicated bottles

10. Quality Control Samples (Confirm or Set Standard)

A. Field

Collocated - 5% or	none
Replicate - 5% or	1
Field Blank - 5% or	
Trip Blank - 1 per day or	

B. Laboratory

Reagent Blank - 1 per analytical batch or	
Replicate - 1 per analytical batch or	
Matrix Spike - 1 per analytical batch or	
Other	

TABLE 3-5 DQO SUMMARY FORM

1. Site			Section 5 Revision No. 0 Date: May 15, 1991 Page 13 of 14
	Name Unisys - Shipboard Location Great Neck, NY	EPA Region NYSDEC Phase Round 1	

2. Media (Circle One)	Soil	Ground Water	Surface Water	[✓ Sediment]	Air	Biota	Other
3. Use (Circle all that apply)	[✓ Site Characteristics (H&S)]	[✓ Risk Assessment]	[✓ Evaluate Alternatives]	[✓ Engineer Design]	PRP Determ.	Action	Other

4. Objective

Determine the placement of vapor extraction wells as an interim remedial measure. Establish baseline concentrations. Monitor vapor extraction concentrations

5. Site Information

Area	1 million square feet	Sensitivity Receptors	Unknown
Ground Water Use	potable uses	Depth to Ground Water	80-100 ft.
Soil Types	Sandy		

6. Data Types

A. Analytical Data			B. Physical Data	
pH	[✓ Pesticides]		Permeability	Moisture
Conductivity	[✓ PCBs]		Porosity	Soil Classification
[✓ VOA]	[✓ Metals]		Grain Size	Specific Gravity
[✓ ABN]	[✓ Cyanide]		Atterburg Limits	
TCLP				

7. Sample Method (Circle methods to be used)

[✓ Environmental]	Biased	Grab	Non-Intrusive	Phased
Source	Grid	Composite	Intrusive	

8. Analytical Levels (Indicate Level(s) and Equipment & Methods)

Level 1	Field Screening	- Equipment	PID
Level 2	Field Analysis	- Equipment	
		- Laboratory	
Level 3	Non-CLP	Methods	
Level 4	CLP/RAS	- Methods	VOA, ABN, Pesticides/PCBs, Metals, CN
Level 5	Non-Standard		

9. Sampling Procedures

Background	None
Critical (List)	All
Procedures	Collect using dedicated bottles

10. Quality Control Samples (Confirm or Set Standard)

A. Field		B. Laboratory	
Collocated - 5% or	none	Reagent Blank - 1 per analytical batch or	
Replicate - 5% or	1	Replicate - 1 per analytical batch or	
Field Blank - 5% or	5%	Matrix Spike - 1 per analytical batch or	
Trip Blank - 1 per day or	5% for VOA	Other	

TABLE 3-6
LEVELS OF DATA QUALITY OBJECTIVES FOR ROUND 1

Sample Matrix	Field Parameters	Laboratory Parameters	Level of DQO's
Soil Borings	PID		I
	Soil Gas Survey		II
		TCL VOC, TCL BNA, TCL Pest./PCBs, TAL metals	IV
Groundwater	PID		I
	pH, conductivity, temperature, and turbidity		II
		TCL VOC, TCL BNA, TCL Pest./PCBs, TAL metals	IV
Surface Water	PID		I
	pH, conductivity, Temperature, and turbidity		II
		TCL VOC, TCL BNA, TCL Pest./PCBs, TAL metals	IV
Sediment	PID		I
		TCL VOC, TCL BNA, TCL Pest./PCBs, TAL metals	IV

TABLE 4-1

SAMPLE CONTAINERS, PRESERVATIVES AND HOLDING TIMES (1)

Analysis	Matrix	Container and Volume(2)	Preservative	Maximum Holding Time (6)
Semivolatiles	Aqueous	(2) Glass, amber 1/2 gal. with Teflon-lined caps (filled to shoulder)	None, cool, 4 degrees C	5 days extn./40 days anal. (4)(5)
	Solid	(1)Glass, amber 8 oz. jar with Teflon-lined caps	None, cool, 4 degrees C	5 days extn./40 days anal.(3)(4)
Volatiles	Aqueous	(3) 40 ml. VOA vials with Teflon-lined caps (no headspace)	None, cool, 4 degrees C	7 days anal.
	Solid	(1) 120ml. glass vials with Teflon-lined caps (filled to shoulder)	None, cool, 4 degrees C	7 days anal.
Pesticides/PCBs	Aqueous	(2) Glass, amber 1/2 gal. with Teflon-lined caps	None, cool, 4 degrees C	5 days extn./40 days anal. (4)(5)
	Solid	(1)Glass, 8 oz. jar with Teflon-lined caps	None, cool, 4 degrees C	5 days extn./40 days anal. (3)(4)
Metals, except Mercury	Aqueous	(1) Polyetthelene, 1 liter with Teflon-lined caps	HNO3 pH<2, cool, 4 degrees C	6 mos. anal.
	Solid	(1)Glass, 8 oz. jar with Teflon-lined caps	None, cool, 4 degrees C	6 mos. anal.
Cyanide	Aqueous	(1) Polyetthelene, 1 liter with Teflon-lined caps	NaOH to pH >12	14 days anal.
	Solid	(1)Glass, 8 oz. jar with Teflon-lined caps	None, cool, 4 degrees C	14 days anal.
Mercury	Aqueous	(1) Polyetthelene, 1 liter with Teflon-lined caps	HNO3 pH<2, cool, 4 degrees C	28 days anal.
	Solid	(1)Glass, 8 oz. jar with Teflon-lined caps	None, cool, 4 degrees C	28 days anal.

NOTES:

1 From date of sample collection
2 Triplicate the sample volume must be submitted to the laboratory for samples designated as matrix samples/matrix sample duplicates.
3 This is a project requirement - not an error.
4 If reextraction is required, it must be within 10 days of VTSR
5 Liquid-liquid extraction must be completed within 7 days of collection
6 If the NYSDEC VTSR hold time is shorter then the hold time from collection, then former will prevail
extn: extraction
anal.: analysis
VTSR: verified time of sample receipt

TABLE 4-2
SAMPLING PLAN

								Field QA Samples												Lab QA Samples			
			Chemical Analysis					Duplicate/Replicate			Trip Blanks(1)			Field Blanks(1)			Performance Evaluations(2)			Matrix Spike/Matrix Spike Duplicate(3)			Total Matrix
Matrix	Field Parameters	Number of Samples	A	B	C	D	E	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Soil (SB)	PID Screenings	12	12	12	12	12	12	1	1	1	1	1	1	1	1	1	0	0	0	2	1	2	17
Soil (SST)	PID Screenings	9	9	9	9	0	0	1	1	1	1	1	1	1	1	1	0	0	0	2	1	2	14
Soil (MW)	PID Screenings	19	19	19	19	19	19	1	1	1	1	1	1	1	1	1	0	0	0	2	1	2	24
Water (OSW)	Cond., Turb., pH, & Temp.	15	15	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	2	1	2	20
Water (MW)	Cond., Turb., pH, & Temp.	48	48	48	48	48	48	1	2	2	1	2	2	1	2	2	1	2	2	2	3	6	62
Water (DB)	Cond., Turb., pH, & Temp.	3	3	3	3	3	3	1	1	1	1	1	1	0	0	0	0	0	0	2	1	2	7
Water (LI)	Cond., Turb., pH, & Temp.	6	6	6	6	6	6	1	1	1	1	1	1	1	1	1	0	0	0	2	1	2	11
Water (DD)	Cond., Turb., pH, & Temp.	60	60	0	0	0	0	0	0	0	1	12	12	1	2	2	0	0	0	2	2	4	78
Water (PW)	Cond., Turb., pH, & Temp.	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Sediment (DB)	PID Screenings	10	10	10	10	10	10	1	1	1	1	1	1	1	1	1	0	0	0	2	1	2	15

NOTES:

A	TCL volatile organics (plus 10 TICs)
B	TCL semivolatile organics (plus 20 TICs)
C	TCL pesticides/PCBs
D	TAL Metals (Total)
E	Cyanide
OSW	Existing Off Site Well
MW	Monitor Well
LI	Lloyd Well
SST	Sub Station Sample
SB	Soil Borings
PW	Potable Water Sample
DD	During Drilling; samples collected at 50' foot intervals during drilling of ML wells.
DB	Drainage Basin
1	Additional blanks may be collected depending on the number of samples collected on any one day.
2	PE to be prepared and certified by an independent laboratory for volatile organics and metals.
3	Additional MS/MSDs may be performed if medium-level samples are encountered.

TABLE 6-1
EQUIPMENT MAINTENANCE AND CALIBRATION PROTOCOLS

Equipment	**Maintenance/Calibration**	**Frequency**
PID	isobutylene gas	before use and after 20 samples
pH Meter	pH buffer solution	every 10 sample locations
Temperature	check with NIST thermometer	before each daily use
Conductivity	calibration solution	start and end of each day
Rechargable equipment	charge	after use as required
Sampling accessories	periodic maintenance	as required
Turbidity	5 and .5 NTU solution	before each daily use

TABLE 7
SAMPLING PLAN
UNISYS CORPORATION
GREAT NECK, NY FACILITY

Matrix	Field Parameters	Number of Samples	Chemical Analysis					Field QA Samples												Lab QA Samples			Total Matrix
								Duplicate/Replicate			Trip Blanks(1)			Field Blanks(1)			Performance Evaluations(2)			Matrix Spike/Matrix Spike Duplicate(3)			
			A	B	C	D	E	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	No.	Freq.	Total	
Soil (SB)	PID Screenings	12	12	12	12	12	12	1	1	1	1	1	1	1	1	1	0	0	0	2	1	2	17
Soil (SST)	PID Screenings	7	7	7	2	0	0	1	1	1	1	1	1	1	1	1	0	0	0	2	1	2	12
Soil	PID Screenings	12	12	12	12	12	12	1	1	1	1	1	1	1	1	1	0	0	0	2	1	2	17
Water (OSW)	Cond., Turb., pH, & Temp.	15	15	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	0	2	1	2	20
Water (MW)	Cond., Turb., pH, & Temp.	48	48	48	48	48	48	1	2	2	1	2	2	1	2	2	1	2	2	2	3	6	62
Water (DB)	Cond., Turb., pH, & Temp.	3	3	3	3	3	3	1	1	1	1	1	1	0	0	0	0	0	0	2	1	2	7
Water (LI)	Cond., Turb., pH, & Temp.	6	6	6	6	6	6	1	1	1	1	1	1	1	1	1	0	0	0	2	1	2	11
Water (DD)	Cond., Turb., pH, & Temp.	60	60	0	0	0	0	0	0	0	1	12	12	1	2	2	0	0	0	2	2	4	78
Water (PW)	Cond., Turb., pH, & Temp.	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Sediment (DB)	PID Screenings	6	6	6	6	6	6	1	1	1	1	1	1	1	1	1	0	0	0	2	1	2	11

NOTES:

A TCL volatile organics (plus 10 TICs)
B TCL semivolatile organics (plus 20 TICs)
C TCL pesticides/PCBs
D TAL Metals (Total)
E Cyanide
OSW Existing Off Site Well
MW Monitor Well
LI Lloyd Well
SST Sub Station Sample
SB Soil Borings
PW Potable Water Sample
DD During Drilling; samples collected at 50' foot intervals during drilling of ML wells.
DB Drainage Well
1 Additional blanks may be collected depending on the number of samples collected on any one day.
2 PE to be prepared and certified by an independent laboratory for volatile organics and metals.
3 Additional MS/MSDs may be performed if medium-level samples are encountered.

TABLE 7-1
ANALYTICAL PROCEDURES

Fraction/Parameter	Method
TCL Volatile Organics (plus 10 TICs)	ASP Method 91-1
TCL Semi-volatile Organics (plus 20 TICs)	ASP Method 91-2
TCL Pesticides/PCB's - Soils	ASP Method 91-3
TCL Pesticides/PCB's - Water	EPA Method 608
TAL Inorganics (Metals as Total - Round 1)	ASP 1991 - Superfund CLP Inorganics
TCL Low Level Volatile Organics (plus 10 TICs)	ASP Method 524.2

note:
- All deliverables will be Superfund Category.
- For non CLP Methods reporting and deliverables will conform to category B NYSDEC ASP 12/91.
- The laboratory should achieve a detection limit of 0.1 ppb for PCB's.

TABLE 7-2

TARGET COMPOUND LIST AND QUANTITATION LIMITS FOR VOLATILE ORGANICS

		Quantitation Limits[1] [4]			
Volatiles[4]	CAS Number	Routine Water ug/L	Low Water ug/L	Routine Soil ug/Kg	Medium Soil ug/Kg
Chloromethane	74-87-3	10	1	10	1200
Bromomethane	74-83-9	10	1	10	1200
Vinyl Chloride	75-01-4	10	1	10	1200
Chloroethane	75-00-3	10	1	10	1200
Methylene Chloride	75-09-2	10	2	10	1200
Acetone	67-64-1	10	5	10	1200
Carbon Disulfide	75-15-0	10	1	10	1200
1,1-Dichloroethylene	75-35-4	10	1	10	1200
1,1-Dichloroethane	75-35-3	10	1	10	1200
1,2-Dichloroethylene (total)[2]	540-59-0	10	1	10	1200
Chloroform	67-66-3	10	1	10	1200
1,2-Dichloroethane	107-06-2	10	1	10	1200
2-Butanone	78-93-3	10	5	10	1200
1,1,1-Trichloroethane	71-55-6	10	1	10	1200
Carbon Tetrachloride	56-23-5	10	1	10	1200
Bromodichloromethane	75-27-4	10	1	10	1200
1,2-Dichloropropane	78-87-5	10	1	10	1200
cis-1,3-Dichloropropene	10061-01-5	10	1	10	1200
Trichloroethene	79-01-6	10	1	10	1200
Dibromochloromethane	124-48-1	10	1	10	1200
1,1,2-Trichloroethane	79-00-5	10	1	10	1200
Benzene	71-43-2	10	1	10	1200
trans-1,3-Dichloropropene	10061-02-6	10	1	10	1200
Bromoform	75-25-2	10	1	10	1200
4-Methyl-2-pentanone	108-10-1	10	5	10	1200
2-Hexanone	591-78-6	10	5	10	1200
Tetrachloroethene	127-18-4	10	1	10	1200
Toluene	108-88-3	10	1	10	1200
1,1,2,2-Tetrachloroethane	79-3?-5	10	1	10	1200
Chlorobenzene	108-90-7	10	1	10	1200
Ethyl Benzene	100-41-4	10	1	10	1200
Styrene	100-42-5	10	1	10	1200
Total Xylenes[3]	1330-20-7	10	1	10	1200

TABLE 7-2

TARGET COMPOUND LIST AND QUANTITATION LIMITS FOR VOLATILE ORGANICS

		Quantitation Limits[1] [4]			
Volatiles[4]	CAS Number	Routine Water ug/L	Low Water ug/L	Routine Soil ug/Kg	Medium Soil ug/Kg
1,2-Dibromoethane	106-93-4	NA	1	NA	NA
1,3-Dichlorobenzene	541-73-1	NA	1	NA	NA
1,4-Dichlorobenzene	106-46-7	NA	1	NA	NA
1,2-Dichlorobenzene	95-50-1	NA	1	NA	NA
1,2-Dibromo-3-chloropropane	96-12-8	NA	1	NA	NA
Vinyl Acetate	108-05-4	NA	1	NA	NA

[1] Quantitation limits listed for soil/sediment are based on weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the protocol, will be higher.

[2] For low waters, the laboratory will report the cis and trans isomers separately.

[3] For low waters, the laboratory will report the ortho/para and meta isomers separately.

[4] 1,1,2-Trichlorotrifluoroethane and methyl tert-butyl ether will be quantitatively analyzed during the TCL analysis.

NA Not applicable.

TABLE 7-3

TARGET COMPOUND LIST AND QUANTITATION LIMITS FOR SEMIVOLATILE ORGANICS

Semivolatiles	CAS Number	Quantitation Limits [1] Routine Water ug/L	Routine Soil ug/Kg	Medium Soil ug/Kg
Phenol	108-95-2	10	330	10,000
bis(2-Chloroethyl)ether	111-44-4	10	330	10,000
2-Chlorophenol	95-57-8	10	330	10,000
1,3-Dichlorobenzene	541-73-1	10	330	10,000
1,4-Dichlorobenzene	106-46-7	10	330	10,000
1,2-Dichlorobenzene	95-50-1	10	330	10,000
2-Methylphenol	95-48-7	10	330	10,000
2,2'-oxybis(1-Chloropropane)	108-60-1	10	330	10,000
4-Methylphenol	106-44-5	10	330	10,000
N-Nitroso-di-n-Propylamine	621-64-7	10	330	10,000
Hexachloroethane	67-72-1	10	330	10,000
Nitrobenzene	98-95-3	10	330	10,000
Isophorone	78-59-1	10	330	10,000
2-Nitrophenol	88-75-5	10	330	10,000
2,4-Dimethylphenol	105-67-9	10	330	10,000
bis(2-Chloroethoxy)methane	111-91-1	10	330	10,000
2,4-Dichlorophenol	120-83-2	10	330	10,000
1,2,4-Trichlorobenzene	120-82-1	10	330	10,000
Naphthalene	91-20-3	10	330	10,000
4-Chloroaniline	106-47-8	10	330	10,000
Hexachlorobutadiene	87-68-3	10	330	10,000
4-Chloro-3-Methylphenol	59-50-7	10	330	10,000
2-Methylnaphthalene	91-57-6	10	330	10,000
Hexachlorocyclopentadiene	77-47-4	10	330	10,000
2,4,6-Trichlorophenol	88-06-2	10	330	10,000
2,4,5-Trichlorophenol	95-98-4	25	800	25,000
2-Chloronaphthalene	91-58-7	10	330	10,000
2-Nitroaniline	88-74-4	25	800	25,000
Dimethylphthalate	131-11-3	10	330	10,000
Acenaphthylene	208-96-8	10	330	10,000
2,6-Dinitrotoluene	606-20-2	10	330	10,000
3-Nitroaniline	99-09-2	25	800	25,000
Acenaphthene	83-32-9	10	330	10,000
2,4-Dinitrophenol	51-28-5	25	800	25,000
4-Nitrophenol	100-02-7	25	800	25,000

TABLE 7-3

TARGET COMPOUND LIST AND QUANTITATION LIMITS FOR SEMIVOLATILE ORGANICS

		Quantitation Limits [1]		
Semivolatiles	CAS Number	Routine Water ug/L	Routine Soil ug/Kg	Medium Soil ug/Kg
Dibenzofuran	132-64-9	10	330	10,000
2,4-Dinitrotoluene	121-14-2	10	330	10,000
Diethylphthalate	84-66-2	10	330	10,000
4-Chlorophenyl-phenylether	7005-72-3	10	330	10,000
Fluorene	86-73-7	10	330	10,000
4-Nitroaniline	100-01-6	25	800	25,000
4,6-Dinitro-2-methylphenol	534-52-1	25	800	25,000
N-Nitrosodiphenylamine[2]	86-30-6	10	330	10,000
4-Bromophenyl-phenylether	101-55-3	10	330	10,000
Hexachlorobenzene	118-74-1	10	330	10,000
Pentachlorophenol	87-86-5	25	800	25,000
Phenanthrene	85-01-8	10	330	10,000
Anthracene	120-12-7	10	330	10,000
Carbazole	86-74-8	10	330	10,000
Di-n-Butylphthalate	84-74-2	10	330	10,000
Fluoranthene	206-44-0	10	330	10,000
Pyrene	129-00-0	10	330	10,000
Butylbenzylphthalate	85-68-7	10	330	10,000
3,3'-Dichlorobenzidine	91-94-1	10	330	10,000
Benzo(a)anthracene	56-55-3	10	330	10,000
Chrysene	218-01-9	10	330	10,000
bis(2-Ethylhexyl)phthalate	117-81-7	10	330	10,000
Di-n-octylphthalate	117-84-0	10	330	10,000
Benzo(b)fluoranthene	205-99-2	10	330	10,000
Benzo(k)fluoranthene	207-08-9	10	330	10,000
Benzo(a)pyrene	50-32-8	10	330	10,000
Indeno(1,2,3-cd)pyrene	193-39-5	10	330	10,000
Dibenz(a,h)anthracene	53-70-3	10	330	10,000
Benzo(g,h,i)perylene	191-24-2	10	330	10,000

[1] Quantitation limits listed for soil/sediment are based on weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the protocol, will be higher.

[2] Not distinguishable from diphenylamine.

TABLE 7-4

TARGET COMPOUND LIST AND QUANTITATION LIMITS FOR PESTICIDES/AROCLORS

Pesticides/Aroclors	CAS Number	Quantitation Limits [1] Routine Water ug/L	Low Water ug/L	Soil ug/Kg
alpha-BHC	319-84-6	0.05	0.01	1.7
beta-BHC	319-85-7	0.05	0.01	1.7
delta-BHC	319-86-8	0.05	0.01	1.7
gamma-BHC (Lindane)	58-89-9	0.05	0.01	1.7
Heptachlor	76-44-8	0.05	0.01	1.7
Aldrin	309-00-2	0.05	0.01	1.7
Heptachlor Epoxide	1024-57-3	0.05	0.01	1.7
Endosulfan I	959-98-8	0.05	0.01	1.7
Dieldrin	60-57-1	0.10	0.02	3.3
4,4'-DDE	72-55-9	0.10	0.02	3.3
Endrin	72-20-8	0.10	0.02	3.3
Endosulfan II	33213-65-9	0.10	0.02	3.3
4,4'-DDD	72-54-8	0.10	0.02	3.3
Endosulfan Sulfate	1031-07-8	0.10	0.02	3.3
4,4'-DDT	50-29-3	0.10	0.02	3.3
Methoxychlor	72-43-5	0.50	0.10	17.0
Endrin Ketone	53494-70-5	0.10	0.02	3.3
Endrin Aldehyde	7421-36-3	0.10	0.02	3.3
alpha-Chlordane	5103-71-9	0.05	0.01	1.7
gamma-Chlordane	5103-74-2	0.05	0.01	1.7
Toxaphene	8001-35-2	5.0	1.0	170.0
Aroclor-1016	12674-11-2	1.0	0.20	33.0
Aroclor-1221	11104-28-2	1.0	0.20	67.0
Aroclor-1232	11141-16-5	1.0	0.40	33.0
Aroclor-1242	53469-21-9	1.0	0.20	33.0
Aroclor-1248	12672-29-6	1.0	0.20	33.0
Aroclor-1254	11097-69-1	1.0	0.20	33.0
Aroclor-1260	11096-82-5	1.0	0.20	33.0

[1] Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis, as required by the protocol, will be higher.

Figures

Figure 1-1
Project Organization

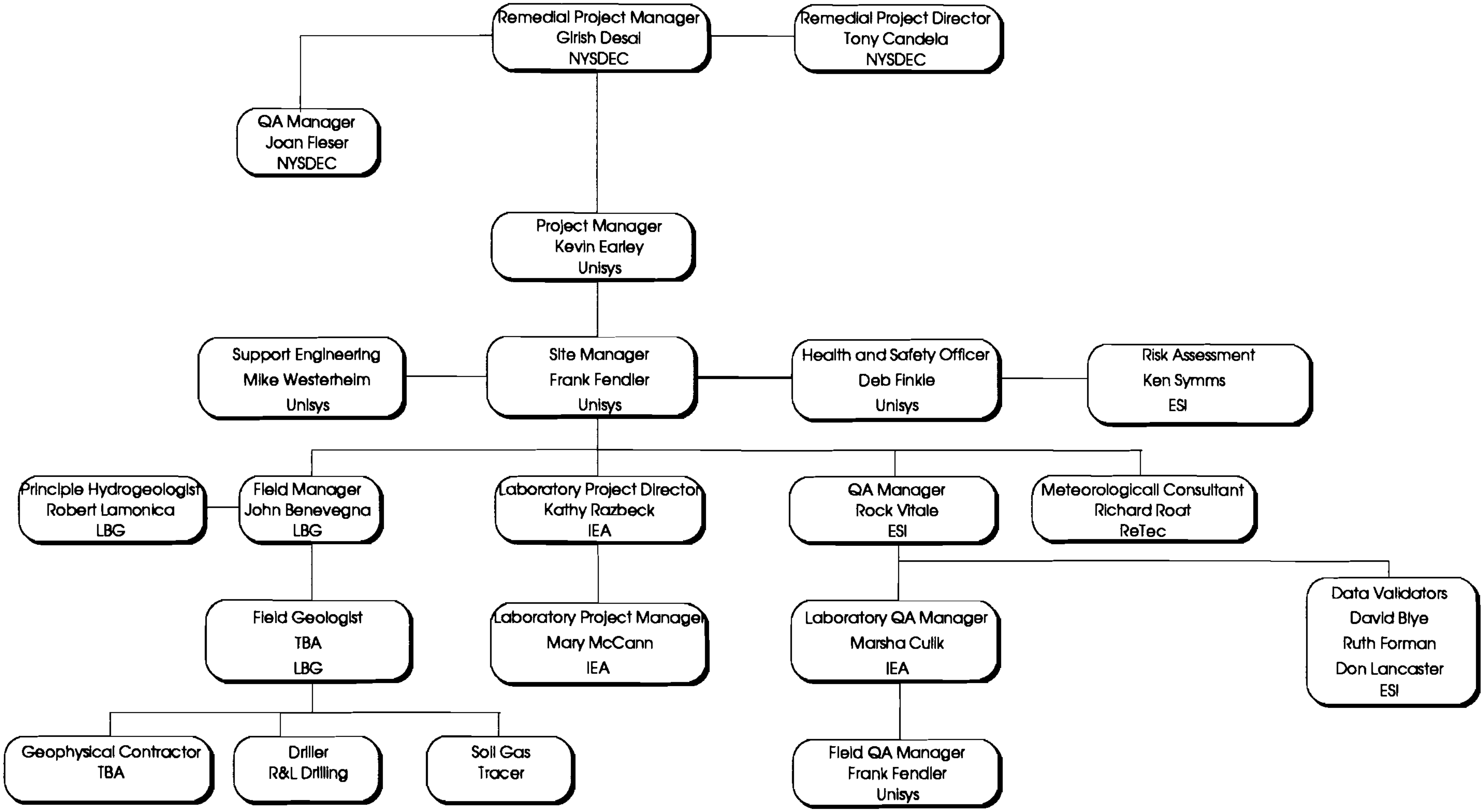


FIGURE 1-2
PROJECT SCHEDULE

TASK	WEEK FROM NYSDEC WORK PLAN APPROVAL																																		
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70
Phase I																																			
Background review	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■																				
Soil gas survey						■	■																												
Soil borings			■	■																															
Offsite well sampling		■	■																																
Monitor well drilling			■	■	■	■	■	■	■	■	■	■	■	■	■																				
Round I well sampling																	■																		
Round II well sampling																					■														
Geophysical survey																		■																	
Lloyd well investigation	■	■	■																																
Drainage basin samples													■	■																					
Domestic well survey				■	■																														
Groundwater model																											■	■	■	■	■				
Review Ph. I with DEC																				■	■														
Phase II																						■	■	■	■	■									
Data validation																		■	■									■	■						
Risk assessment																														■	■				
RI report prep																														■	■	■	■		
FS report prep																																■	■	■	■

APPENDIX A

RESUMES OF KEY INDIVIDUALS

FRANK J FENDLER III

EDUCATION

BS, Geology, 1985, **Bloomsburg University**, Bloomsburg, PA

Currently matriculated, MS, Engineering Geology/Hydrogeology Program, Drexel University, Phila., PA. Degree anticipated 1993; 36 of 48 required credits earned.

EXPERIENCE

1990 to present, Senior Hydrogeologist/Project Manager, HANDEX, Inc.
Oaks, PA

- Senior technical officer for branch office; responsible for all technical and financial aspects of managing approximately 2.5 million per year in environmental consulting and contracting services spread over 150 - 200 contracts. Report to Site Manager & corporate.
- Management and training of a group consisting of 5 geologists, 2 field technicians, 1 engineer, 1 permit admin., 1 drafter, and 1 admin. asisstant.
- Report review and prep., conceptual system design and implementation.
- Client contact, sales, marketing, and proposal preperation.
- Handex is a full service environmental consulting and recovery company that specializes in the recovery of hydrocarbon contaminated groundwater and soil for the major oil companies.

1987 to 1990, Project Geologist, R.F. WESTON, Inc.
Westchester, PA, 1989 to 1990

Managed projects and tasks of projects ranging from 5K to 100K; sampling and monitoring programs to remedial design, includes budget and technical control, client and regulatory contact; industrial and municipal clients.

Edison, NJ, 1987 to 1989

REAC contract, Environmental Response Team (ERT), US EPA, performed soil gas surveys, geophysical surveys, hydrogeological investigations at RCRA facilities and NPL sites located throughout the continental United States. Responsibilities included field work, data reduction, budget management, report preperation, and client contact.

1985 to 1987, Staff Geologist, R.E. WRIGHT Associates
Middletown, PA.

Responsibilities consisted of data collection and reduction related hydrogeological investigations, groundwater treatment system design, and water supply studies for industrial and municipal clients. Reported to a PM.

ADDITIONAL EDUCATION and EXPERIENCE

- 1984 Summer intern with the PA Geological Survey; assisted staff with collecting field data, compiling records, and preparing maps of coal beds within PA.
- 1985 Summer Intern, Geotechnical Inspector, Geotech Inc., Maple Shade, NJ.
- 40 hrs. OSHA training, Phoenix Associates, 1986
- 40 hrs. OSHA training, Hazardous Materials Incident Response Operations, US EPA, 1987
- Short course, Containment and Control Techniques for Contaminated Ground Water, 1988
- Short course, Treatment Technology for Contaminated Ground Water, 1988

INTERESTS: Outdoor activities including skiing, backpacking, deep sea fishing, backpacking, and traveling.

DEBRA J. FINKEL
ENVIRONMENTAL ENGINEER

PROFESSIONAL HISTORY

Remediation Technologies, Inc., 1990 to present
Raytheon Company 1987-1990

EDUCATION

M.S. (Environmental Engineering) University of Lowell
B.S. (Mechanical Engineering) University of New Hampshire

TECHNICAL SPECIALTIES

Engineering design of remediation systems; evaluating performance of soil venting systems; site exploration and characterization; excavation, treatment, and construction management.

REPRESENTATIVE PROJECT EXPERIENCE

Petroleum Products Terminal, Southern New England: Provided engineering support for the installation, operation and monitoring of an in situ bioremediation pilot study. Operation included scheduling and overseeing nutrient and oxygen addition to a pilot system for biological treatment of petroleum contaminated soils in the vadose zone. System monitoring included collection of pressure and soil gas data from injection trenches and soil gas monitoring probes.

Ink Blending Facility, KY: Evaluated ongoing activities of a vapor extraction system involving soils contaminated with volatile organic components of ink. Assisted in the development of a monitoring program to document venting well area of influence and recovery.

Marketing Terminal, Idaho: Evaluated removal efficiency, mass removal, and system radius of influence for a vacuum extraction system utilizing thermal oxidation as vapor-phase treatment. Compared various techniques for determining recovery rates of the gasoline hydrocarbons floating on the water in subsurface soils.

Petroleum Products Terminal, Southern New England: Supervised site operations during bioremediation of a former petroleum products terminal containing 100,000 cubic yards of contaminated soils. Performed site investigation and contaminant characterization including soil and groundwater sampling. Prepared sampling and process monitoring plans. To date 70,000 cubic yards have been bioremediated.

Superfund Site, New York: Assisted in advising client on developing remedial alternatives, negotiating cleanup levels, estimating volumes of contaminated materials, and evaluating risks associated with PCB contaminants. Reviewed and commented on EPA's Proposed Plan and Record of Decision.

Petroleum Products Terminal, New Jersey: Involved in design of an irrigation system for remediation of a former petroleum products terminal. Provided engineering support for the biological treatment of 10,000 cubic yards of petroleum contaminated soil. Summarized and evaluated analytical data to monitor efficiency of biological treatment.

Former Manufactured Gas Plant, New England: Project engineer for the remediation of soil contamination at a former manufactured gas plant (MGP) site. Project involved feasibility, treatability, and design of a remedy for coal tar contaminated soils deposited in a flood plain adjacent to an MGP site.

Superfund Site, New England: Involved in the RD/RA phase of work at a multidimensional Superfund site. The site is located in a floodplain and contains numerous organic and chlorinated organics in soil, sludge, and groundwater. Required remedial actions include off-site incineration, off-site treatment and disposal, on-site treatment, and in situ remediation.

RICHARD T. ROAT

SENIOR STAFF SCIENTIST

PROFESSIONAL HISTORY

Remediation Technologies, Inc., 1988 to present
Alliance Technologies, Inc., 1984 to 1988
U.S. Army Research and Development Laboratory, 1982 to 1983
U.S. Environmental Protection Agency, Region 1, 1980 to 1981

EDUCATION

B.S. Biology Northeastern University

TECHNICAL SPECIALTIES

Designing ambient air monitoring programs to characterize organic and inorganic constituents
Operation of emission and atmospheric dispersion models
Performance of CERCLA Remedial Investigation/Feasibility Studies
Knowledge of thermal desorption technology
Knowledge of Clean Air Act Title III Regulations

REPRESENTATIVE PROJECT EXPERIENCE

U.S. EPA and Great Lakes National Program Office: Task Manager for a pilot-scale test to evaluate the effectiveness of thermal desorption in processing PCB-contaminated sediments from the Ashtabula River. Responsible for field quality assurance and continuous emission monitoring of the off-gas.

Former MGP Sites: Task manager for the design of an ambient air monitoring network to detect concentrations of PAHs, cyanides, VOCs, and particulate matter from the remediation of former MGP sites.

QA/QC Task Manager: Data validation of a Remedial Investigation and Feasibility Study of a Superfund site consisting of waste oil recycling, drum refurbishing, and automobile salvage facilities. Contaminated media include soils and groundwater. Contaminants of concern include volatiles, semi-volatiles, halogenated organics, and metals.

Project Manager: For programs that quantify ambient levels of hazardous constituents (volatile organics, semi-volatile organic, and metals) from the biological treatment of soils and sludges contaminated with petroleum waste products.

Confidential Client: Technical oversight for RI/FS at a major Superfund site in Massena, New York. Remedial elements include on-site disposal, biological treatment, incineration along with groundwater remediation. Contaminants of concern included volatile organics, heavy metals, and PCBs.

New England Utility: Detailed air emissions from the biological treatment of contaminated soils at a former manufactured gas plant (MGP) site using land treatment and liquid/slurry reactors. Results were used for a permit application of a full-scale treatment unit.

Railroad Company: Task manager for the design and implementation of an ambient air monitoring system to characterize airborne particulate matter from the land treatment of creosote contaminated soil at a former tie treatment plant.

Petroleum Product Terminal: Participated in the permit application and installation of a soil venting system to remediate soil contamination by gasoline. The venting system was equipped with a thermal oxidizer incinerator for VOC control.

East Coast Refinery: Participated in the field demonstration of RETEC's thermal desorption technology. Responsibilities included continuous emissions monitoring of the system off-gas, preparation of quality assurance plans and process data recording.

U.S. Department of the Treasury: Project Manager for the preparation and execution of a wastewater discharge plan and trial burn permit for the Bureau of Engraving and Printing to comply with U.S. EPA Region III, and the District of Columbia permit requirements.

U.S. Army Toxic and Hazardous Materials Agency: Project Manager for the preparation and completion of a Remedial Field Investigation Study to characterize possible contaminants at the Watertown, Massachusetts Arsenal for the U.S. Army.

U.S. EPA Office of Air Quality Planning and Standards: Field management of several on-site air monitoring programs at RCRA treatment, storage and disposal facilities (TSDF) to characterize air emission rates, and to evaluate predictive emission models.

U.S. EPA Office of Toxic Substances: Field management of nationwide airborne asbestos sampling study in public buildings. Results were used in a U.S. EPA Guidance Document concerning uncontrolled ambient airborne asbestos.

U.S. EPA Hazardous Waste Groundwater Task Force: Field management of an intensive groundwater sampling and analytical program involving compliance inspections of RCRA treatment, storage and disposal facilities and CERCLA hazardous wastes disposal sites nationwide.

Massachusetts Water Resources Authority: Project management of an emission monitoring program for the development and field operation to measure volatile and total non-methane organics at designated sites within the Boston wastewater sewer system.

Curriculum Vitae

MICHAEL M. WESTERHEIM

TITLE: PROJECT ENGINEER

EXPERTISE: Soil and Groundwater Remediation

EXPERIENCE: Onsight management of RCRA and CERCLA soil and groundwater remediation projects. Joined Unisys in 1990.

- On-site manager for implementation of Interim Remedial Measures and continuing hydrogeologic assessment at an inactive hazardous waste site in Bristol, TN.
- Project Engineer for pilot testing and development of Interim Remedial Measures at an active manufacturing facility in Great Neck, NY.

PAST EXPERIENCE Seven years experience in the environmental engineering field, specifically relating to RCRA and CERCLA soil and groundwater investigation and remediation projects.

- Designed and supervised construction of at least 30 soil and groundwater remediation systems in eight different states.
- Scoped and implemented over 50 hydrogeologic assessments in 10 different states.
- Experienced with site assessment techniques, including soil borings, monitoring well installation, soil and groundwater sampling, soil vapor surveys and geophysical surveys.
- Extensive experience in implementing state of the art insitu extraction and treatment technologies for remediation of soil and groundwater.

ACADEMIC BACKGROUND Bachelor of Civil Engineering, Environmental Option.
University of Minnesota, Institute of Technology, 1984

PROFESSIONAL REGISTRATIONS Registered Professional Engineer
California, Washington, Tennessee and New York.

PROFESSIONAL AFFILIATIONS

- American Society of Civil Engineers
- American Water Works Association
- Association of Groundwater Scientists and Engineers

CONTINUING EDUCATION

- OSHA 1910.120 Hazardous Waste Site Training - current
- Environmental Regulations Course - 1991

CITIZENSHIP	United States
COUNTRIES WORKED IN	United States
LANGUAGE PROFICIENCY	English

ROBERT LAMONICA

EDUCATION:

- B.A. in Geology, 1974, from State University of New York College at Cortland, New York.

REGISTRATION:

- Certified as Professional Geologist by the American Institute of Professional Geologists;
- Certified as Professional Geologist in Virginia;
- Licensed Geologist - North Carolina;
- Registered Geologist - South Carolina.

TECHNICAL SOCIETIES:

- American Institute of Professional Geologists (Member, Executive Committee, Northeast Section, 1979-1985, Vice President, 1985-1986; President, 1987-1988);
- Association of Ground-Water Scientists and Engineers (National Ground Water Association);
- Geological Society of America;
- New England Water Works Association (Member, Ground-Water Committee).

SUMMARY OF PROFESSIONAL EXPERIENCE:

1974:	(Summer) Hydrologic Field Assistant, Cortland County Planning Board, and Housing and Urban Development Agency.
1976-1979:	Hydrogeologist with Leggette, Brashears & Graham, Inc.
1980-1981:	Senior Hydrogeologist with Leggette, Brashears & Graham, Inc.
1982-1987:	Associate with Leggette, Brashears & Graham, Inc.
1987 to date:	Vice President and Director of Leggette, Brashears & Graham, Inc.

Bob Lamonica has had extensive experience in managing all types of ground-water investigations including those for water supply, for contamination by industrial chemicals and for contamination by free-phase and dissolved petroleum products. He has been the project manager on 5 major Superfund sites. The first of these involved free-phase heavier-than-water creosote in the ground-water system at a wood treating facility in South Carolina. A remedial investigation/feasibility study was performed, a contaminated ground-water recovery system designed and implemented. Another site involved ground water contaminated by organic chemicals and soils contaminated by PCB at a plastics manufacturing facility in New York. An RI/FS and Remedial Design Work Plan were prepared at this site, and remediation has been undertaken.

Mr. Lamonica's experience in ground-water supply includes the management of a county-wide study of recharge to a Sole-Source aquifer in New York. He has also investigated the long-term yield capabilities of a Coastal Plain aquifer in Virginia for a pulp and paper mill and the potential for salt-water intrusion. Mr. Lamonica is the consultant to a large water authority in New York evaluating a number of ground-water problems such as site-by-site yield potentials, salt-water intrusion threats and aquifer protection strategies.

CONTINUING EDUCATION:

- Health and Safety Operations at Hazardous Materials Sites, 29 CFR 1910.120(E) (2), 40 hours.
- IBM PC Applications in Ground-Water Pollution and Hydrology; Cleary and Pinder; AGWSE.

SPECIFIC EXPERIENCE IN GROUND-WATER CONTAMINATION:

- Niagara Falls, New York - Field supervision and client and regulatory coordination for a plant-wide, ground-water quality investigation. Supervised investigation of a hazardous waste landfill and its effect on water supply sources.

- Philadelphia, Pennsylvania - Field supervision, data analysis and reporting for a plant-wide, ground-water quality investigation at a chemical plant, with emphasis on possible plume release to the Delaware River.

- Hicksville, New York - Coordination of CERCLA investigations concerning past waste disposal practices at a manufacturing plant and at two offsite landfills located on a sole-source aquifer.

  The work at the manufacturing plant included preparation of a Remedial Investigation Report, a Focused Feasibility Study, and Remedial Design Work Plan. Supervision of soil remediation.

- Petroleum Hydrocarbons - Direct investigation and supervision of investigations and remediation at over 20 gasoline service stations and ten bulk loading facilities. Locations include sensitive geologic environments including sole source aquifers and bedrock aquifers tapped by residential wells.

- Great Neck, New York - Supervision of investigations and remedial design testing at a New York State Inactive Hazardous Waste site. The work included monitor-well, extraction-well, and recharge-well installation and testing, and installation and testing of a soil-vapor extraction system.

- Waterbury, Connecticut; Essex, Connecticut; Colorado Springs, Colorado; Shelton, Connecticut; Matamoros, Mexico; Juarez, Mexico; and Harlingen, Texas - Project manager of site investigations and remediation for property transfers of industrial properties. Remediation generally involved UST removal and soil excavation and land disposal.

- Milford, Connecticut - RCRA investigation, preparation of a Remedial Design Work Plan and supervision of remediation of a surface impoundment containing metal hydroxide sludge. Achieved clean closure through soil and ground-water removal.

- Chester, Connecticut - RCRA investigation involving a metal hydroxide sludge lagoon and solvent releases. Long-term monitoring and remedial planning.

- Florence, South Carolina - Coordination of field activities, interaction with regulatory agencies, data interpretation and report preparation for a facility-wide, ground-water quality investigation at a wood-treatment plant. Developed the ground-water section of the RCRA Part B permit application.

- Coventry, Rhode Island - Project management, report preparation and interaction with State and Federal regulatory agencies at a Superfund site. The project involved aquifer testing and design of a ground-water recovery and recharge system.

- Uncasville, Connecticut - Project supervision, regulatory interaction and report preparation for a ground-water quality investigation involving contamination of residential well supplies.

- Strang, Oklahoma - Supervised investigation into the effects of a liquid fertilizer pipeline break on residential well supplies for a pipe line company.

- Epping, New Hampshire - Project management and interaction with State and Federal regulatory agencies at a landfill site. The project included test drilling and surface geophysics to define the hydrogeologic framework and potential for contaminant migration.

- West Point, Virginia - Perform an aquifer evaluation study for a paper company including estimates of the potential for salt-water encroachment.

- Fredericksburg, Virginia - Design and implement an environmental sampling plan for a wood-treatment plant.

contamination/ctres1

JOHN M. BENVEGNA

EDUCATION:

- B.S. in Marine Geology, 1985, from Southampton College, Long Island University, Long Island, New York.

REGISTRATION:

- Certified Professional Geologist #8276 by the American Institute of Professional Geologists.

TECHNICAL SOCIETIES:

- American Institute of Professional Geologists, Member;
- Association of Engineering Geologists, Associate Member;
- Connecticut Ground-Water Association;
- Association of Ground-Water Scientists and Engineers (National Ground Water Association);

SUMMARY OF PROFESSIONAL EXPERIENCE:

1985:	Hydrogeologic Technician with Leggette, Brashears & Graham, Inc., (Cooperative Education Program).
1986-1988:	Hydrogeologist with Leggette, Brashears & Graham, Inc.
1988 to date:	Senior Hydrogeologist with Leggette, Brashears & Graham, Inc.

John Benvegna's experience includes basic data collection, drilling supervision and ground-water sampling at RCRA regulated facilities; design and implementation of pumping tests; fracture-trace analyses; design and implementation of site assessments; geologic logging; maintenance of hydrocarbon recovery systems; supervision of underground tank and hazardous soil removal; landfill monitoring and community water-supply monitoring.

He is responsible for overall project management including coordination of monitoring programs; management of field personnel; interacting with regulatory agencies.

He has extensive experience with the RCRA program which has led to consistent interaction with the hazardous waste, site remediation and water compliance units of the Connecticut Department of Environmental Protection.

CONTINUING EDUCATION:

- Health and Safety Operations at Hazardous Materials Sites, 29 CFR 1910.120(E) (2), 40 hours.
- Health and Safety Operations at Hazardous Materials Sites, 29 CFR 1910.120(E) (2), 8-hour supervisors course.

SPECIFIC EXPERIENCE IN GROUND-WATER CONTAMINATION:

- <u>Bridgeport, Connecticut</u> - (RCRA). Project manager since 1988. Supervised and coordinated quarterly ground-water monitoring program at a city landfill; prepared quarterly and annual reports; interact with regulatory agencies.

- <u>Brooklawn, New Jersey</u> - Supervised test drilling, monitor well installations and collection of ground-water samples. Identified the extent of hydrocarbon contamination at an operating gas station.

- <u>Chester, Connecticut</u> - (RCRA). Conducted quarterly ground-water sampling as part of an investigation into an organic chemical contamination problem at an operational manufacturing facility.

SPECIFIC EXPERIENCE IN GROUND-WATER CONTAMINATION:
(continued)

- Cranston, Rhode Island - Conducted routine monitoring of an operational gas station, including ground-water level measurements and sampling and maintenance of the hydrocarbon recovery system.

- Danbury, Connecticut - Conducted an investigation into sodium contamination of a municipal water supply, duties included data collection and interpretation in order to determine if a water-supply well was being affected by surface-water runoff and seasonal road salting.

- Derby, Connecticut - Supervised and coordinated quarterly ground-water/surface-water sampling at a city landfill as part of a landfill monitoring program.

- Devon, Middletown, Montville, Norwalk, Connecticut - (RCRA). Conducted slug-test analyses on monitor wells at four separate locations for the same company. The purpose was to determine aquifer characteristics underlying regulated surface impoundments in order to determine the rate and direction of flow of potential leakage from the regulated units.

- Florence, South Carolina - (RCRA). Supervised test drilling and installation of monitor wells as part of an investigation into an aquifer system contaminated by a spray field and surface impoundments used as part of a wastewater treatment system at a wood-treatment facility. Determined rate and direction of ground-water flow and evaluated ground-water monitoring data and extent of aquifer contamination.

- Hastings, New York - Conducted a soil and ground-water investigation at an abandoned tank farm, including supervision of monitor well installations, soil and ground-water sampling and a tidal influence study.

- Hicksville, New York - (Superfund) Conducted soil sampling as part of an investigation into subsurface PCB contamination at a former polymer manufacturing plant.

- Milford, Connecticut - (RCRA). Project manager since 1988. Coordinated closure efforts of surface impoundments regulated under RCRA including quarterly sampling program, interactions with regulatory agencies and preparation of closure plan.

- Mount Vernon, New York - Conducted routine monitoring of an operational tank farm. Monitoring included ground-water level measurements and sampling and maintenance of hydrocarbon recovery system.

- Newburgh, New York - Drilling supervision, ground-water sampling and slug-test analyses as part of an investigation into the extent of hydrocarbon contamination at an operating tank farm.

- Oaks, Pennsylvania - Conducted an electromagnetic survey as part of a subsurface investigation at a former resin processing plant. The purpose of the survey was to delineate the contaminant plume and locate buried metallic objects.

- Plainville, Connecticut - Project manager since 1988 in charge of all ground-water and soil investigations as part of a remedial investigation at a former wastewater lagoon. Coordinated ground-water, soil and NPDES sampling programs and designed a five-well hydrocarbon recovery system.

- Sag Harbor, New York - Conducted an investigation of hydrocarbon contamination at an abandoned tank farm. The investigation included ground-water sampling, soil sampling, soil-gas surveys and a tidal influence study.

- Wilton, Connecticut - Drilling supervision, soil and ground-water sampling and supervision of hazardous soil removal for a property transfer.

SPECIFIC EXPERIENCE IN GROUND-WATER CONTAMINATION:

(continued)

- Woodbridge, Connecticut - Project manager since 1988. Supervision and coordination of a quarterly monitoring program at a city landfill.

dmt
August 26, 1992
contamination/ctres2

MARSHA CULIK
QA MANAGER - IEA, INC.-CT

EDUCATION

1976 A.A.S. Medical Laboratory Technology	S.U.N.Y. at Alfred Alfred, New York

Professional Licenses

1984 Certified Grade 3 Water Treatment Plant Operator

1977 ASCP Registered MLT

EXPERTISE

Extensive development and "hands on" experience with Gas Chromatography, Atomic Absorption Spectrophotometry, Auto Analyzer, and some computer data stations.

PROFESSIONAL EXPERIENCE

1/91 to Present QA Manager

Quality Assurance Manager, responsible for monitoring the continuing compliance with the Corporate QA Program and to be a liaison between Corporate QA and laboratory staff.

Additional responsibilities include maintaining certification programs, coordination of external and internal audits, coordinate all inquiries relative to quality issues and follow-up on corrective actions as necessary, maintain files of all QA related documentation to include review and approval of all SOP's.

1986 to 1991 GC Group Leader

Supervisor of GC Group, responsible for analysis of environmental samples for pesticides/PCB's according to EPA/NYSDEC CLP Protocols, SW846 Methods and EPA "600" Series Methods. Additional responsibilities include analysis of samples via purge & trap/GC according to various protocols.

Other duties include analysis of air samples, charcoal absorbent tubes and other miscellaneous samples for any parameters requiring gas chromatography analysis. She is also responsible for supervision of the group including sample tracking, data review, etc.

1984 to 1986 Chemist

Experience in sample prep and GC analyses of Pesticides/PCB's in water, oil and soil samples.

American Waterworks Service Company

1981 to 1984 Laboratory Analyst

Experience performing complete laboratory analysis of raw, potable, and waste water including all miscellaneous include Volatile Organics, Trihalomethanes and Aromatics using Purge and Trap techniques; Pesticides and Herbicides by GLC; Transition and Heavy Metals by Flame and Graphite Furnace Atomic Absorption; and Nutrients by Automated and other various wet chemistry procedures. Assisted Lab Director in the development of many methods used in these analyses. Responsible for collection and interpretation of all quality control data.

Suffolk County Water Authority

1978 to 1981 Lab Technician

Laboratory experience in the analysis of potable water for a large water utility. Cooperative studies done in conjunction with state and local health agencies concerning water and wastewater quality. Also monitoring the chemical quality of water and seawater programs for the U.S.G.S Primary responsibilities were for the analysis of Halogenated and Aromatic organic compounds by Purge and Trap Gas Chromatography. Other areas of experience include the analyses of nutrients by Technicon Auto Analyzer, metals by Flame and Graphite Furnace Atomic Absorption, and microbiological testing using Millipore System.

Hooker Chemicals & Plastics

1976 to 1978 Lab Technician

Responsible for the analysis of vinyl chloride monomer in PVC Compounds, Resins and Food Packageability studies utilizing Gas Chromatography. Responsible for monitoring the air quality of the plant environment.

MANAGERIAL AND TECHNICAL TRAINING

Environmental Laboratory Management - Two-day seminar on Environmental Laboratory Management, John H. Taylor, Analytical Technology.

Performance Management Workshop - One-day seminar, Cynthia Barnet, Human Resources Consultant.

Interview Skills Workshop - One-day seminar, Cynthia Barnet, Human resources Consultant.

Leadership Development Workshop - Four-day workshop, William Frackler, Ingoldsby, Inc.

Mass Spectral Data Interpretation - One-day seminar, Dr. Frank Turecek, Cornell University.

Introduction to Analytical Separations - Four-day seminar, Dr. Dhea Habboush, Sacred Heart University.

MARY A. MCCANN
CLIENT SERVICES REPRESENTATIVE

EDUCATION

1980/1981	Rochester Community College Rochester, Minnesota

EXPERIENCE

IEA, Inc. - 5/88 to Present — Client Services Representative

Ms. McCann's responsibilities are to function as a liaison and oversee several large projects for the laboratory. These projects include the USEPA Inorganic and Organic CLP Contracts, and a dozen private clients.

Ms. McCann is familiar with both organic and inorganic CLP requirements and also has a good background in non-CLP work functions such as sample log-in and receipt, invoicing and responding to questions from both EPA and NYSDEC personnel.

10/86 to 5/88 — Inorganic Reporting Supervisor

During this time period Ms. McCann was in charge of CLP inorganic data reporting for a regional environmental laboratory. Her department grew from one person to the point where she was supervising four staff members and producing data packages including analyzing raw data for the entire inorganic CLP function.

ROCK J. VITALE

QUALITY ASSURANCE SPECIALIST

FIELDS OF COMPETENCE

- Utilizing theoretical and practical knowledge of all facets of quantitative analysis for organic and inorganic pollutants by EPA methodologies.
- Determining the adequacy of analytical data generated to support RI/FS, ECRA (property transfers), RCRA closures, RCRA Permit B, etc.
- Preparing Quality Assurance Project Plans (QAPPs).
- Serving as technical liaison between laboratories and consultants.
- Designing specific requirements and specifications for analytical services.
- Training and managing data review staff.
- Understanding the sampling design, sampling protocols, data validation and documentation for litigation, analytical/environmental chemistry and multimedia fate and transport mechanisms of pollutants.

CREDENTIALS

B.S., Environmental Science and Biology, Marist College, New York, 1981.
Additional Undergraduate Chemistry credits to satisfy B.S., Chemistry, Villanova University, Pennsylvania and Rider College, New Jersey 1982-1985.
M.S., Chemistry, Villanova University, Pennsylvania (Candidate).

EXPERIENCE SUMMARY

Mr. Vitale has four years analytical experience performing analyses for organic and inorganic contaminants in a variety of media by instrumental and classical methods, including research and development of analytical methodologies. He attended many analytical conferences as a technical representative marketing an environmental laboratory.

In addition, Mr. Vitale was the Quality Assurance Manager for a large environmental consulting firm with 26 offices nationwide. He designed and implemented a quality assurance and data validation program for all RI/FS, site inspections and RCRA closures. His responsibilities also included the preparation of QAPPs for Superfund studies in EPA Regions I, II, III and V. He also trained and managed a staff of five data reviewers. Mr. Vitale served as technical liaison between PRPs, laboratories and/or state/federal agencies.

Prior to that position, he had three years experience as a quality assurance chemist with a primary EPA Superfund contractor for U.S. EPA Region III. He provided quality assurance reviews for over 300 EPA site inspections, based upon rigorous examination of GC, GC/MS (high and low resolution), GFAA and ICP data. He has coauthored and provided peer review comments on several documents on the subject of data validation for both state and federal agencies.

PROFESSIONAL AFFILIATIONS

American Chemical Society
American Institute of Chemists
American Association for the Advancement of Science
Association of Official Analytical Chemists

KEY PROJECTS

- A contributing author of the "Functional Guidelines for Organic Data Validation" prepared for EPA Region III and currently used on a nationwide basis.
- Project chemist for over 300 CERCLA site inspections for the characterization of environmental samples obtained in and around landfills/dump sites. Quality assurance reviews for all organic and inorganic analytical data generated by 60 contract laboratories were submitted to EPA.

KEY PROJECTS (Cont.)

- Conceived, designed and implemented a comprehensive quality assurance program for a major environmental engineering firm. This included designing quality control requirements for all sampling investigations, a complete Chain-of-Custody and a sample tracking program and the performance of quality assurance reviews for all analytical data generated from sampling investigations, several of which involved litigation.

- Prepared many QAPPs, which are required for all Remedial Investigation/Feasibility Studies (RI/FS's). The preparation of these plans included providing input for sampling design and negotiations with the lead agency.

- Solicited and contracted five major laboratories to perform analytical services for a large environmental engineering firm (including 26 branch and affiliate offices). Contract negotiations involved designing specific requirements for laboratory performance. Acted as technical liaison between the laboratory and the consultant. Established specialized analytical methodologies to achieve project-specific goals.

- Trained and supervised five quality assurance chemists in the areas of qualitative and quantitative data validation. In addition, conducted frequent technical assistance and training seminars for various consultant groups on the East and Gulf Coasts.

- Performed numerous laboratory audits at the request of several large corporations or the laboratories themselves. Provided critical comments, performance evaluation reports and recommendations for improvement.

- At the request of several large corporation PRP (Potentially Responsible Party) committees, critically reviewed state or EPA enforcement-led RI/FS's to determine if an appropriate level of quality assurance was performed according to SARA guidelines and if the analytical data were properly validated.

- Prepared analytical requirements for laboratory RFPs prior to the initiation of 16 CERCLA site inspections for specific compounds/constituents which were known site contaminants but for which they did not routinely analyze (i.e., phosphorus herbicides).

- Served as project chemist for several major remedial investigations in which more than 2,000 samples were obtained. Performed validation of all analytical data, provided on-going changes in sampling design and provided technical input for the recommendation of additional analytical parameters, data presentation and the final report to EPA.

- Set up and maintained a quality assurance/quality control program for an independent environmental laboratory. This program is necessary to sustain EPA drinking water certification.

Environmental Standards, Inc.
Specialists in Environmental Risk Assessment and Data Validation

The Commons at Valley Forge, Unit 4, 1220 Valley Forge Rd
P.O. Box [illegible], Valley Forge, PA 19481 [illegible]

RUTH L. FORMAN

SENIOR QUALITY ASSURANCE CHEMIST

Education - B.A. Degree in Chemistry, December 1986, Franklin and Marshall College, Lancaster, PA 19604.

Work Experience

Senior Quality Assurance Chemist - Environmental Standards, Inc., 1220 Valley Forge Road, Valley Forge, PA 19481, from July 1989 to the present. Responsibilities include senior technical review of data validation reports, project management, coordination and client contact, laboratory audits, field audits and data validation training of staff quality assurance chemists.

Chemist - NUS Corporation, 999 West Valley Road, Wayne, PA 19087, from March 1987 to July 1989. Performed various duties including collecting environmental samples, assessing site conditions, reviewing analytical field data, performing quality assurance reviews of all aspects of field project activities and performing data validation.

Research Assistant - Syracuse University Department of Chemistry, Brown Hall, Syracuse, NY 13210, from June 1985 to January 1986. Assisted in research involving the decarbonylation of deuterioaldehydes with Wilkinson's catalyst.

Publications

Baldwin, J.E.; Barden, T.C.; Pugh-Forman, R.L.; Widdison, W.C. "Partial Loss of Deuterium Label in Wilkinson's Catalyst Promoted Decarbonylations of Deuterioaldehydes," *J. Org. Chem.*, 1987, 52, 3303.

Skills and Training

Basic computer language.
Knowledgeable in the operation of the following:

- Perkin-Elmer (PE) 1310 infrared spectrophotometer
- PER-32 and Varian T-60 NMR
- Hewlett-Packard 5790 Capillary GC
- Hewlett-Packard 5970B mass spectrometer interfaced to a 5890 series GC and 9336 computer

40-hour health and safety hazardous waste certification.
8-Hour refresher health and safety hazardous waste certification.
Lead auditor certification.

Environmental Standards-West, Inc.
[illegible]
1111 Kennedy Place, Suite 4
Davis, CA 95616 916/758-[illegible]

WILLIAM G. KAY

SENIOR QUALITY ASSURANCE CHEMIST

Education

B.S. in Chemistry, May 1986, B.S. in Physics, May 1986, Pennsylvania State University, University Park, PA 16802

M.S. in Chemistry, June 1988, University of California, Riverside, CA 92521

Work Experience

Senior Quality Assurance Chemist - Environmental Standards-West, Inc., 1111 Kennedy Place, Suite 4, Davis, CA 95616, from November 1992 to the present. Responsibilities include senior technical review of data validation reports, project management, coordination and client contact, laboratory audits and data validation training of staff quality assurance chemists.

Senior Quality Assurance Chemist - Environmental Standards Inc., 1220 Valley Forge Road, Valley Forge, PA 19481, from February 1990 to November 1992. Responsibilities included senior technical review of data validation reports, project management, coordination and client contact, laboratory audits and data validation training of staff quality assurance chemists.

Visiting Lecturer - Pennsylvania State University, Delaware County Campus, Media, PA 19063, from August 1988 to May 1992. Taught Introductory chemistry and physics courses.

Skills

Fortran and Basic Computer Languages

WordPerfect, Lotus 1-2-3, Excel and MathCAD Computer Software

Vacuum Technology

Analytical Techniques: HPLC, GC/MS, LEED, SIMS, EELS, XAFS and AES.

MEG A. CLARK

QUALITY ASSURANCE CHEMIST

Education

M.S. Degree in Organic Chemistry, January 1991, University of Pennsylvania, Philadelphia, PA 19104.

B.A. Degree in Chemistry, May 1989, Gettysburg College, Gettysburg, PA 17325. Senior laboratory project involved the synthesis of novel facially-capping ligands in order to prepare models for the binuclear iron protein Purple Acid Phosphatase. Skills were developed in spectroscopic techniques (^{1}H- and ^{13}C-NMR, FT-IR, UV-VIS, GC/MS).

Work Experience

Quality Assurance Chemist - Environmental Standards, Inc., 1220 Valley Forge Road, Valley Forge, PA 19481, from February 1991 to the present.

Research Chemist - University of Pennsylvania Department of Chemistry, Philadelphia, PA 19104, from May 1990 to January 1991. Research efforts were directed toward the total synthesis of detoxin D_1. Skills were developed in spectroscopic and separation techniques (^{1}H-NMR, IR, flash column chromatography).

Teaching Assistant - University of Pennsylvania Department of Chemistry, Philadelphia PA 19104, from September 1989 to December 1990. Responsible for overseeing organic laboratory experiments in a classroom environment and grading laboratory experiments and examinations.

Skills and Training

Working knowledge in the operation of the following:

- Hewlett Packard 5890 GC/MS
- IBM/Bruker AF 250 FT-NMR
- IBM NR/80 FT-NMR
- Mattson Polaris/Icon FT-IR
- Perkin-Elmer 281B IR
- Perkin-Elmer 552 UV-VIS

DAVID R. BLYE

QUALITY ASSURANCE SPECIALIST

FIELDS OF COMPETENCE

- Analytical data validation.
- Environmental chemistry.
- Assessment of waste disposal problems.
- Environmental impact analysis.
- Development of sampling and analytical plans.
- Methods of analysis for organic compounds and inorganic constituents.
- Analytical and sampling quality assurance.
- Analytical methods development.

CREDENTIALS

A.A.S.,	Ecology and Environmental Technology, Paul Smith's College of Arts and Science, 1981.
B.S.,	Environmental Chemistry, SUNY College of Environmental Science and Forestry, 1983. Cum Laude.

Certification for OSHA Hazardous Waste Requirements under 29 CFR 1910.120.

EXPERIENCE SUMMARY

Mr. Blye's more than nine years of experience in the field of environmental chemistry has included the performance of field data collection and environmental sampling and the planning, development and execution of field sampling and analytical projects. He specializes in the development of field procedures for the collection of representative ground water, surface water, soil, air and other multi-media samples and the interpretation of organic and inorganic data. He has generated site-specific sampling plans for more than 200 sites, including Quality Assurance Project Plans (QAPjP) for more than 37 state or federally supervised CERCLA, RCRA or DOD sites.

He has extensive experience in U.S. EPA organic and inorganic analytical methodology and analytical data validation. Mr. Blye has validated data analyzed according to 40 CFR part 136 requirements (600 series), drinking water regulations (500 series), RCRA requirements (SW846), and CERCLA/SARA requirements (CLP SOWs). He has overseen the validation efforts for more than 300 projects. He has developed internal and external training programs to teach data validation procedures according to U.S. EPA requirements.

Mr. Blye is also experienced in auditing laboratory facilities to evaluate compliance with analytical protocols and QAPjPs and to determine the facilities' capabilities. He has audited more than 25 laboratories, nine of which were participants in the CLP.

He is familiar with data management procedures for storing, retrieving and reporting field and analytical data. He has worked closely with several laboratories to identify specifications for delivery of analysis results electronically to facilitate data table production.

Prior to joining ESI, Mr. Blye was Quality Assurance Manager for a nationally affiliated environmental consulting firm. He was responsible for directing laboratory subcontractor analytical services, special analytical projects, field and laboratory quality assurance/quality control programs, and analytical data validation services. He managed and directed a staff of eleven quality assurance chemists whose primary duties were field quality assurance procedure development, analytical data management and analytical data validation.

PROFESSIONAL AFFILIATIONS

American Chemical Society
American Association for the Advancement of Science
National Environmental Laboratory Accreditation Coalition

KEY PROJECTS

- Evaluated impact of volatile organic compound contamination originating from an NPL site on 25 residential wells in the local vicinity. Assisted in design engineering, installation and monitoring point-of-entry treatment systems selected as contaminant remediation.

- Performed analytical data validation for numerous site investigations to determine analytical data outliers and data quality/usability.

- Prepared, documented and implemented Quality Assurance Project Plans for numerous state and federally led site investigations (CERCLA, RCRA, ECRA, DOD, USATHAMA and NEESA).

- Evaluated the validity of analytical data collected for use in the Hazard Ranking Score for selection of a Pennsylvania site for the NPL. The primary issue concerned the use of soil gas analyses performed using a field portable gas chromatograph.

- Interpreted volatile organic analytical data to identify the existence or potential existence of biological degradation of volatile compounds for several Pennsylvania and New Jersey site investigations.

- Developed a field methanol extraction procedure for soil samples to yield a more accurate collection of volatile organic compound data and to assist in defining background conditions prior to the start-up of site remediation. The methanol extract was analyzed following the CLP medium-level volatile protocol.

- Developed field soil gas survey procedures to monitor for volatile organic compounds using both organic vapor analyzers and portable gas chromatographs. Managed several soil gas surveys for clients as a means to inexpensively evaluate site background conditions and to cost-effectively implement traditional investigation methods.

- Directed analytical subcontract services for a major environmental consulting firm totaling in excess of $2.5 M annually. Responsible for all contracting, price negotiations and performance audits.

- Developed a Quality Assurance Project Plan for a large multi-national company to specify quality assurance/quality control requirements during the conduct of an Environmental Impact Statement (EIS) in Spain. A United Kingdom-based laboratory was audited and procedures were developed for the laboratory to conform to U.S. EPA analytical procedures. This project required significant coordination with the project team and laboratory to allow for the successful completion of the analytical program.

KEY PROJECTS (Cont.)

- Developed a Quality Assurance Project Plan for a large multi-national company to specify quality assurance/quality control requirements for a field investigation conducted in support of a Feasibility Study at a chemical manufacturing facility located in Wales, United Kingdom. Specific analytical requirements were prepared to allow the United Kingdom-based laboratory to comply closely with U.S. EPA analytical procedures.

- Developed analytical requirements for the analysis of propylene glycol, ethanol and glycerine in support of a stack emission test sampling program for a major tobacco processing company.

- Provided sampling and analytical oversight services to an insurance adjustor relative to contaminant remediation of tenant property as a result of a major high-rise fire which occurred in Philadelphia, PA. Fire soot was found to be contaminated with dioxins and PCBs.

- Developed a strict ground water, surface water and soil monitoring and analytical program to comply with a New Jersey State Administrative Consent Order for a major chemical manufacturer. Over 125 ground water samples were collected on an annual basis and monitored for various volatile organic compounds, total phenols and cumene. Sampling and analytical programs were developed to collect data necessary for a multi-disciplinary project team to assess potential risk at the site and develop remedial measures.

- Provided turn-key analytical services for a large chemical manufacturer according to State permit conditions during the installation of a deep Injection Well at a phenol/acetone production plant. The analytical data subsequently indicated phenol to be present at a depth of approximately 3,000 feet. The client was identified by the State regulatory agency as the potential responsible party for the contamination. Mr. Blye has reviewed and validated the complex organic and inorganic data collected from the injection well formation fluids for use by various technical experts and attorneys. He provided expertise in the analysis of environmental samples for use in the litigation.

- Provided analytical data validation services and litigation support to a West Virginia law firm. The law firm's client was filed with criminal felony charges by the U.S. Attorney General for alleged illegal disposal of a RCRA hazardous waste. Reviewed the Extraction Procedure (EP) Toxicity analysis data generated by the State of West Virginia for adherence to proper protocol and evaluated the sample collection procedures used.

PUBLICATIONS

"Point of Entry Systems for Removal of VOCs." Presented at the American Society of Civil Engineers Environmental Engineering Specialty Conference, Orlando, Florida, July 1987.

DONALD J. LANCASTER

SENIOR QUALITY ASSURANCE CHEMIST

Education - B.S. Degree in Chemistry, Minor in Mathematics, May 1986, University of Arizona, Tucson, AZ 85721. Senior laboratory project involved separation and identification of organic mixtures using NMR, MS, IR and wet chemical techniques.
Candidate for M.A. Degree in Mathematics, West Chester University, West Chester, PA 19383.

Work Experience

Senior Quality Assurance Chemist - Environmental Standards, Inc., 1220 Valley Forge Road, Valley Forge, PA 19481, from October 1989 to the present. Involved in various duties including senior technical review of data validation reports, project management, laboratory audits, field audits and data validation training of staff quality assurance chemists.

Data Validation Chemist - NUS Corporation, 999 W. Valley Road, Wayne, PA 19087, from October 1988 to October 1989. Responsibilities included data validation and the preparation of quality assurance reports for CERCLA site inspections performed in EPA Region III. Analytical data reviewed included those generated by GC/MS, GC, ICP and GFAA for the analysis of solid and aqueous samples for the Target Compound List volatiles, semivolatiles, pesticides/PCBs, dioxins and furans, metals and cyanide from all laboratories participating in the Contract Laboratory Program.

Research Chemist - University Analytical Center, University of Arizona, Tucson, AZ 85721, from February 1987 to September 1988. Primary responsibilities included analysis of aqueous and solid samples for metals by flame AA and GFAA. Also performed analysis of aqueous samples for phosphates by UV-VIS, and for fluoride, chloride, nitrate and sulfate using IC. Attended Thermo Jarrell Ash seminar on AAS, March 1988.

APPENDIX B

FORMS AND DIAGRAMS

MONITOR WELL DATA SHEET

PROJECT:

DATE:

RECORDED BY:

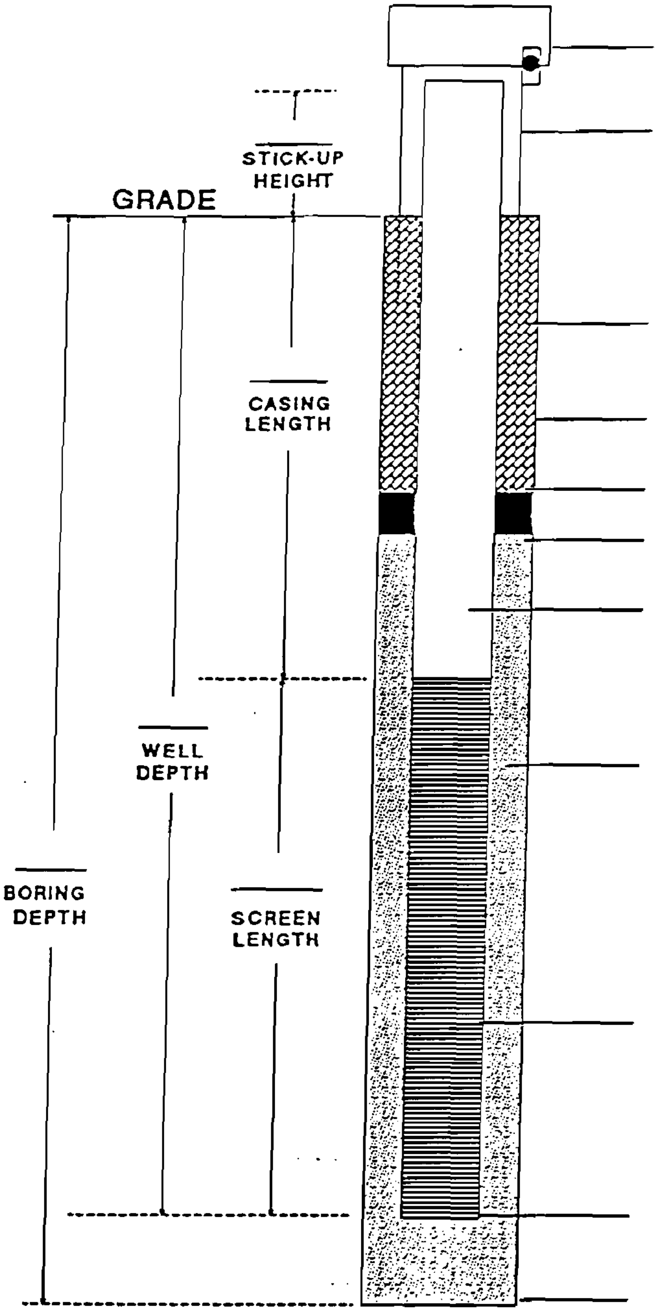
JOB CODE/CLIENT CODE:

MONITOR WELL NUMBER:

STATE WELL NUMBER:

GROUND ELEVATION:

CASING ELEVATION:



LOCKING CAP

KEY NUMBER

PROTECTIVE STEEL CASING
- DIAMETER AND TYPE
- TOTAL LENGTH
- HEIGHT ABOVE GROUND

TYPE OF GROUT
- VOLUME/BAGS USED

DIAMETER OF BOREHOLE

THICKNESS AND TYPE OF SEAL

DEPTH TO TOP OF FILTER SAND

DIAMETER AND TYPE OF CASING

TYPE OF SAND PACK
- VOLUME/BAGS USED

DEPTH TO STATIC WATER LEVEL

SCREEN
- DIAMETER AND LENGTH
- SLOT SIZE
- MATERIAL

DEPTH TO BOTTOM. OF WELL

DEPTH TO BOTTOM OF BOREHOLE

DRILLING STARTED:
DATE TIME

DRILLING COMPLETED:
DATE TIME

INSTALLATION STARTED:
DATE TIME

INSTALLATION COMPLETED:
DATE TIME

LEGGETTE, BRASHEARS & GRAHAM, INC.

GEOLOGIC LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

ST. PAUL, MINNESOTA

OWNER	
WELL NO.	
PAGE	OF PAGES

LOCATION	SCREEN TYPE
	DIAM. SLOT NO.
DATE COMPLETED	SETTING
DRILLING COMPANY	SAND PACK
DRILLING METHOD	CASING SETTING
SAMPLING METHOD	DEVELOPMENT
OBSERVER	DURATION
REFERENCE POINT (RP)	STATIC WATER LEVEL
ELEVATION OF RP	YIELD

REMARKS

DEPTH (FEET) FROM	TO	DESCRIPTION

OWNER

WELL NO. PAGE OF PAGES

DEPTH (FEET) FROM	TO	DESCRIPTION

CHAIN OF CUSTODY RECORD

PROJECT NAME

CLIENT NAME

SAMPLERS: *(Signature)*

LABORATORY NAME:

SAMPLE NO.	DATE	TIME	COMP	GRAB	SAMPLE LOCATIONS	NO. OF CON-TAINERS							REMARKS

RELINQUISHED BY: *(Signature)*	**DATE/TIME**	**RECEIVED BY:** *(Signature)*	**RELINQUISHED BY:** *(Signature)*	**DATE/TIME**	**RECEIVED BY:** *(Signature)*
RELINQUISHED BY: *(Signature)*	**DATE/TIME**	**RECEIVED BY:** *(Signature)*	**REPORT TO:**		
RELINQUISHED BY: *(Signature)*	**DATE/TIME**	**RECEIVED FOR LABORATORY BY:** *(Signature)*	**DATE/TIME**	**REMARKS / BILLING INFORMATION :**	

☐ LEGGETTE, BRASHEARS & GRAHAM, INC.
1210 WEST COUNTY ROAD E
ST. PAUL, MINNESOTA 55112
(612) 490 - 1405

☐ LEGGETTE, BRASHEARS & GRAHAM, INC.
4001 VALHALLA BLVD., SUITE 102
SIOUX FALLS, SOUTH DAKOTA 57106
(605) 361 - 6000

WHITE - PROJECT FILE YELLOW - LABORATORY PINK-

Table 15-1 Corrective Action Form

Date:

Job Name:

Initiator's Name and Title:

Problem Description:

Reported to:

Corrective Action:

Reviewed and Implemented By:

cc: Project Manager -

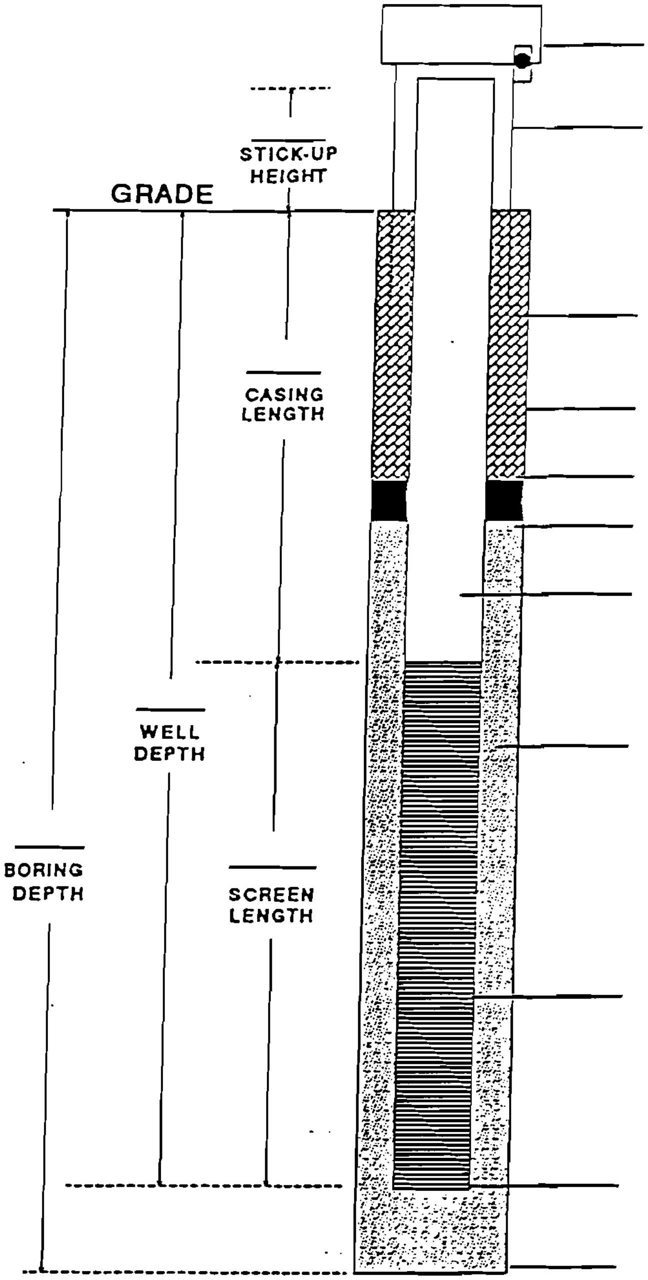
Project Quality Assurance Manager -

APPENDIX A

FORMS AND DIAGRAMS

MONITOR WELL DATA SHEET

PROJECT: ____________________ DATE: ____________________
RECORDED BY: ____________________ JOB CODE/CLIENT CODE: ____________________
MONITOR WELL NUMBER: ____________________ STATE WELL NUMBER: ____________________
GROUND ELEVATION: ____________________ CASING ELEVATION: ____________________



LOCKING CAP ____________
KEY NUMBER ____________
PROTECTIVE STEEL CASING
DIAMETER AND TYPE ____________
TOTAL LENGTH ____________
HEIGHT ABOVE GROUND ____________
TYPE OF GROUT ____________
VOLUME/BAGS USED ____________
DIAMETER OF BOREHOLE ____________
THICKNESS AND TYPE OF SEAL ____________
DEPTH TO TOP OF FILTER SAND ____________
DIAMETER AND TYPE OF CASING ____________
TYPE OF SAND PACK
VOLUME/BAGS USED ____________
DEPTH TO STATIC WATER LEVEL ____________
SCREEN
DIAMETER AND LENGTH ____________
SLOT SIZE ____________
MATERIAL ____________
DEPTH TO BOTTOM OF WELL ____________
DEPTH TO BOTTOM OF BOREHOLE ____________

DRILLING STARTED:
DATE TIME
DRILLING COMPLETED:
DATE TIME

INSTALLATION STARTED:
DATE TIME
INSTALLATION COMPLETED:
DATE TIME

LEGGETTE, BRASHEARS & GRAHAM, INC.

GEOLOGIC LOG

LEGGETTE, BRASHEARS & GRAHAM, INC.

ST. PAUL, MINNESOTA

OWNER	
WELL NO.	
PAGE OF PAGES	
LOCATION	SCREEN TYPE
	DIAM. SLOT NO.
DATE COMPLETED	SETTING
DRILLING COMPANY	SAND PACK
	CASING
DRILLING METHOD	SETTING
SAMPLING METHOD	DEVELOPMENT
OBSERVER	DURATION
REFERENCE POINT (RP)	STATIC WATER LEVEL
ELEVATION OF RP	YIELD

REMARKS

DEPTH (FEET) FROM	TO	DESCRIPTION

OWNER

WELL NO. PAGE OF PAGES

DEPTH (FEET) FROM	TO	DESCRIPTION

CHAIN OF CUSTODY RECORD

PROJECT NAME

CLIENT NAME

LABORATORY NAME:

SAMPLERS: *(Signature)*

SAMPLE NO.	DATE	TIME	COMP	GRAB	SAMPLE LOCATIONS	NO. OF CONTAINERS							REMARKS

RELINQUISHED BY: *(Signature)*	**DATE/TIME**	**RECEIVED BY:** *(Signature)*	**RELINQUISHED BY:** *(Signature)*	**DATE/TIME**	**RECEIVED BY:** *(Signature)*
RELINQUISHED BY: *(Signature)*	**DATE/TIME**	**RECEIVED BY:** *(Signature)*	**REPORT TO:**		
RELINQUISHED BY: *(Signature)*	**DATE/TIME**	**RECEIVED FOR LABORATORY BY:** *(Signature)*	**DATE/TIME**	**REMARKS / BILLING INFORMATION :**	

☐ LEGGETTE, BRASHEARS & GRAHAM, INC.
1210 WEST COUNTY ROAD E
ST. PAUL, MINNESOTA 55112
(612) 490 - 1405

☐ LEGGETTE, BRASHEARS & GRAHAM, INC.
4001 VALHALLA BLVD., SUITE 102
SIOUX FALLS, SOUTH DAKOTA 57106
(605) 361 - 6000

WHITE - PROJECT FILE   YELLOW - LABORATORY   PINK-

Table 15-1 Corrective Action Form

Date:

Job Name:

Initiator's Name and Title:

Problem Description:

Reported to:

Corrective Action:

Reviewed and Implemented By:

cc: Project Manager -

Project Quality Assurance Manager -

APPENDIX C

EQUIPMENT AND OPERATING PROCEDURES

STANDARD OPERATING PROCEDURE

HNU MODEL HW-101
PHOTOIONIZATION DETECTOR

Meter Use

1. Unclamp the cover from the main readout assembly and connect the probe cable to the 12 pin keyed connector on the readout assembly panel.

2. Screw the filter nozzle securely into the probe end cap.

3. Check the battery operation. Turn the function switch to the BATT position. If the battery is fully charged, the needle should move to the right and go into the green zone of the scale. If the needle is below the green zone or if the low battery indicator comes on, the batteries must be recharged.

4. Check the zero adjustment. Turn the function switch to the STANDBY position. The needle should align with the zero position on the scale. If this does not occur, then adjust the needle until a zero reading is achieved using the zero adjustment.

5. Select an appropriate operating range using the function switch. It is recommended that the user start with a 0 to 2,000 position and switch to a more sensitive range as required. Once the appropriate operating range has been selected, the instrument is now operational and ready for use.

Calibration Procedure

1. Attach the regulator to the calibration cylinder which has a mixture of 100 ppm isobutylene in pure air. Attach the analyzer directly to the output of the regulator using a short piece (butt connected) of flexible tubing.

2. Open the regulator and allow the calibrant gas to flow directly from the cylinder to the analyzer.

3. Unlock the span control knob on the main readout assembly by turning the locking mechanism counter-clockwise. Adjust the span control knob to read the required setting shown on the calibrant cylinder. (Note, the span knob should be set at 9.8 and the needle should read 57 ppm when the function switch is positioned on the 0 to 200 scale, using a 10.2eV lamp and 100 ppm isobutylene calibrant gas.) After setting the span knob to the correct setting, relock the knob by turning the locking mechanism clockwise.

4. After adjusting the span knob, set the function switch back to STANDBY position and recheck the zero setting. If the zero setting requires adjustment, complete the adjustment and recalibrate the span setting using the calibrant gas.

5. If the span setting is less than 9.0, after zero readjustments, or calibration cannot be achieved, then the lamp bulb must be cleaned.

Lamp Cleaning

1. The function switch must be in the off position prior to disassembling the instrument.

2. Disassemble the probe following directions outlined in Paragraph 6-2.1 of the operation manual.

3. Clean the lamp bulb with a mild detergent, rinse with deionized water and wipe dry with lens paper.

4. If rigorous cleaning of the lamp bulb is required, clean the lamp with special HNU cleaning compound supplied by the manufacturer.

5. Reassemble the probe and recheck the calibration of the analyzer.

lms
May 9, 1991
sop/hsp

STANDARD OPERATING PROCEDURE

PRESTO-TEK DSPH-3 pH/CONDUCTIVITY METER
(readings are automatically temperature compensated to 25°C)

Calibration

pH Mode

1. Remove protective bottle from pH probe.

2. Rinse pH probe with distilled water.

3. Measure temperature of buffer solution. Insert pH probe in pH 7 buffer. Allow probe to equilibrate to the temperature of the buffer.

4. Slide back the battery compartment cover to the first stop exposing the adjustment pots.

5. Adjust the CAL pot until the display reads the correct pH for the temperature of the buffer.

6. Remove probes, rinse with distilled water and insert in pH 4 or pH 10 buffer.

7. Adjust SLOPE pot until the display reads the correct value.

8. Repeat Steps 2 through 7 until no further adjustments are necessary.

9. Store pH probe in protective bottle with pH 4 buffer.

Conductivity Mode

1. Rinse probes thoroughly with distilled water.

2. Wipe off conductivity probe and allow to dry.

3. Once dry, conductivity should read 0 in air.

4. Adjust ZERO pot if reading is incorrect.

5. Immerse probes in 25°C conductivity standard solution of 447 umhos or 2,070 umhos, depending on the expected conductivities of the samples. Adjust SPAN pot to the correct value.

6. Rinse probes with distilled water.

Measurements

1. Remove protective bottle from pH probe.

2. Rinse probes with distilled water.

3. Immerse probes one-half their length in sample.

4. Allow probes to equilibrate with the temperature of the sample.

5. Record pH value once reading has stabilized.

6. Record conductivity value on the lowest range possible (0-200,000 umhos, 0-20,000 umhos, 0-2,000 umhos).

7. Thoroughly rinse probes with distilled water and install protective bottle or pH probe.

lms
May 9, 1991
sop/hsp

STANDARD OPERATING PROCEDURE

Y.S.I. MODEL 33 CONDUCTIVITY/SALINITY/TEMPERATURE METER

Setup

1. Adjust meter zero (if necessary) by turning the bakelite screw on the meter face so that the meter needle coincides with the zero on the conductivity scale.

2. Calibrate the meter by turning the MODE control to REDLINE and adjusting the REDLINE control so the meter needle lines up with the REDLINE on the meter face. If this cannot be accomplished, replace the batteries.

3. Plug the probe into the probe jack on the side of the instrument.

Temperature

Set the MODE control to TEMPERATURE. Allow time for the probe temperature to come to equilibrium with that of the water before reading. Read the temperature on the bottom scale of the meter in degrees Celsius.

Conductivity

1. To check calibration, immerse probe in 25°C conductivity standard solution of 447 umhos or 2,070 umhos, depending on the expected conductivities of the samples. If the reading is inaccurate, clean probe. If still inaccurate, replatinize probe.

2. Put probe into solution to be measured, switch to X100 scale. If the reading is below 50 on the 0-500 range (5.0 on the 0-50 mS/m range), switch to X10. If the reading is still below 50 (5.0 mS/m), switch to the X1 scale. Read the meter scale and multiply the reading appropriately. The answer is expressed in micromhos/cm. Measurements are not temperature compensated.

3. When measuring on the X100 and X10 scales, depress the CELL TEST button. The meter reading should fall less than 2 percent; if greater, the probe is fouled and the measurement is in error. Clean the probe and remeasure.

NOTE: The CELL TEST does not function on the X1 scale.

Salinity

1. Determine the sample temperature and adjust the temperature dial to that value.

2. Switch to X100. If the reading is above 500 micromhos/cm (50 mS/m), the salinity value is beyond the measurement range.

3. If the reading is in range, switch to SALINITY and read salinity on the red 0-40 ppt meter scale.

4. Depress the CELL TEST button. The fall in meter reading should be less than 2 percent; if it is greater, the probe is fouled and the measurement is in error. Clean the probe and remeasure.

lms
May 9, 1991
sop/hsp

APPENDIX D

NYSDEC LABORATORY AUDIT CHECKLIST

ON-SITE LABORATORY AUDIT IN RESPONSE TO WORK PERFORMED UNDER THE DIRECTION OF THE DIVISION OF HAZARDOUS WASTE REMEDIATION

Laboratory:____

Date of Audit:__________________

Evaluators	Qualifications

Type of Evaluation:____

Document No. of Auditors NYSDEC ASP____________________________________

Problems noted in review of trial CLP package:

INDEX

I. GENERAL INFORMATION

1. Does the laboratory maintain NYSDOH ELAP Certification in all categories of solid and hazardous wastes? ______________________________

____

2. Date of last ELAP audit ______________________________
Date of last NYSDEC audit ______________________________

3. Has the laboratory successfully analyzed a proficiency sample under either the NYSDEC program, NYSDOH ELAP program or EPA CLP program?

		What CLP Protocol
Date of proficiency (ELAP)______________	Score ________	____________
Date of proficiency (NYSDEC)______________	Score ________	____________
Date of proficiency (EPA)______________	Score ________	____________

4. Does the laboratory have a copy of the most recent NYSDEC Protocol and its updates?

____

____

Document No. #______________________________

5. Does the laboratory QA officer perform routine audits?______________________________

____

Date of last audit?______________________________
Have the corrective actions mentioned in the audit report been implemented by the bench chemists?______________________________

____

____

6. Does the laboratory intend to subcontract any analyses?______________________________

____

What type of analyses?______________________________

____

7. Can the subcontract laboratory comply with all holding times required by the NYSDEC ASP, keeping in mind VTSR starts at receipt by the prime laboratory?______________

____

8. Does the prime laboratory maintain a Chain-of-Custody on all samples sent to any subcontract laboratory?____

____

II. BUILDING AND FACILITY

1. Is the building kept in a neat and orderly manner?

2. Is an external security system used to protect the premises from intruders?

3. Does the laboratory have separate designated areas for sample submission, sample storage, extractions, volatile analysis, pesticide/PCB and semivolatile analysis, inorganic including wet chemistry and waste disposal?

4. Does the facility have an adequate supply of distilled/deionized water?

   Is the supply checked daily?

   What corrective actions are taken?

5. Is access to the laboratory limited to laboratory personnel only?

   Are all visitors escorted?

6. Does the laboratory have adequate hood space to perform extracts and metal digestions?

   Are the hoods kept clean?

   Is the airflow checked and recorded?

7. Is the temperature of the cold storage units recorded daily in logbooks?

8. Are chemical waste disposal policies/procedures adequate?

   Is hazardous waste stored away from the building in a secure area?

9. Are contamination-free areas provided for trace-level analytical work?____________

____

____

10. Can the laboratory supervisor document that trace-free water is available for preparation of standards and blanks?__________________________________

____

____

11. Is the instrumentation adequate to handle the projected workload of the program?_____

____

____

III. STAFFING

1. Does the laboratory have a separate and distinct Laboratory Manager and Quality Assurance Officer, Organic Preparation Manager, Inorganic Preparation Manager, GC Supervisor, GC/MS Supervisor, Inorganic Supervisor?

	NAME	EDUCATION	EXPERIENCE
Laboratory Manager			
Quality Assurance Officer			
Organic Prep Supervisor			
Inorganic Prep Supervisor			
GC Supervisor			
GC/MS Supervisor			
Inorganic Supervisor			

2. Does the laboratory have an active training program for all new employees?________

____

3. Do SOP's exist for the training program?________________________

4. Can the laboratory manager or Quality Assurance Officer provide evidence that all employees have received training and can demonstrate proficiency prior to analyzing samples under the NYSDEC ASP protocol (refer to Section A, 1989 NYSDEC ASP)?

____

5. Does the laboratory staff display the technical competence and experience to act as an expert witness in hearing proceedings?________________________

____

IV. SAMPLE RECEIPT AND STORAGE AREA

1. Does the laboratory have a designated sample custodian?______________________
Name of custodian:_______________________________________

2. Does the laboratory provide bottles of traceable quality (for example, ICHEM 300 bottles or equivalent)?____

3. Are the bottles cleaned and prepared/preserved in accordance with specific methods and parameters?____

4. Does the laboratory have SOP's available for the sample custodian, reflecting requirements of the current DEC protocol for bottle preparation, sample receipt, sample storage?____

5. Does the laboratory have a hood available to open high concentration samples?______

6. Does the sample custodian note the condition of the custody seal in a logbook?______

7. Does the sample custodian note the physical condition of a sample and the number of samples at receipt?____

8. How are discrepancies noted?____

9. Does the sample custodian generate a laboratory ID number for each sample?_______

10. Does the laboratory maintain an internal Chain-of-Custody on all samples and extracts?

11. Is it a routine practice for the sample custodian to sign the Chain-of-Custody forms?__
At what point are the Chain-of-Custody forms signed?___________________________

How does the laboratory determine VTSR?______________________________

____

Are samples being transferred to the lab in a timely manner?____________________

____

12. If samples are received on a Friday after work hours, when are they logged into the sample receipt log?____

    ____

13. Are samples maintained in a refrigerated, designated, locked and secure area?________

    ____

    ____

14. Are samples and extracts signed in and out of a locked refrigerator by the sample custodian or designated individual?____

    ____

    ____

15. Does the laboratory have on hand an adequate supply of bottles for the project?______

    ____

    ____

16. Does the laboratory have separate, secure storage for volatile samples?____________

    ____

    ____

17. Does the facility have adequate storage for the number of samples submitted under this project?____

    ____

    ____

V. GC VOLATILE ANALYSIS

1. GC/Volatile Staffing:

Name	Position	Education	Experience

2. Does the laboratory have instrumentation dedicated to volatile analysis?____________

Make Model #	Detector	Method Dedicated	Column	Inst. ID

3. Does the laboratory have the capability of analyzing both soil and water by purge and trap for the project-specific methods? (e.g., 502.1, 503.1, 601, 602, 8010, 8020)____

4. Does the laboratory have the Method Detection Limit (MDL) verification for all methods for review by the auditor?____________

   Has the laboratory compared the calculated MDL with the required CRQL and/or the method MDL?____________

   Are Instrument Detection Limits (IDLs) Studies available?____________

   When are IDL's updated?____________

5. Does the laboratory routinely perform screening for volatile samples?____________

6. Is the laboratory employing the method indicated GC detectors and columns?________

7. Have the instruments been modified in any way?________

8. Is sufficient dedicated glassware available to meet project needs?________

9. Are spare parts available (e.g., septums, columns, syringes, boards, etc.)?________

10. Does the laboratory have a service contract for each instrument?________

11. Does the laboratory maintain a bound instrument maintenance log for each instrument?

    ____

    Can verifications be made for septum changes, column changes, detector maintenance?

    ____

    Are all entries signed and dated?________

12. Does the laboratory maintain a bound instrument logbook for each instrument?________

    Can verification be made that initial calibrations are run after major instrument maintenance, e.g., column changes, etc.?________

    Has the analyst avoided obliterating entries?________

13. Has the supervisor of the individual maintaining the notebook personally examined and reviewed the notebook periodically, and signed his/her name therein, together with the data and appropriate comments as to whether or not the notebook is being maintained in an appropriate manner?________

14. What solvents are present in the laboratory?________

15. Does the laboratory routinely analyze a holding blank for volatile analysis?__________

16. Does the volatile laboratory maintain a bound logbook for standards preparation?_____

Can all standards be traced back to a source and lot number?__________

Are all entries signed, dated and reviewed by the supervisor?__________

17. Are laboratory-specific SOP's developed for standards preparations, water and soil analysis (both low-level and medium-level) for all methods, instrument maintenance and data acquisition and data processing?__________

Are the SOP's unique to the laboratory?__________

Are they current and consistent with the requirements of the current NYSDEC protocol?

Do all employees sign that they have read and understand these SOP's?__________

18. At what frequency are fresh analytical standards prepared?__________

Does this meet project needs and is it consistent with good QA?__________

19. Are all samples routinely analyzed within 7 days VTSR?__________

20. Are blanks routinely run following the analysis of a highly contaminated sample to prevent carryover?__________

21. Are QC samples properly labeled and is a copy of the labeling system available to each analyst?__________

22. Does the volatile laboratory have a separate refrigerated storage area for volatile samples?__________

Is this area separate from the standards storage area?

23. Are the analyst's initials on the chromatograms and quant. reports consistent with the run log and traceable to the individual actually performing the analysis?

24. Do supervisory personnel review the data and QC results?

Are corrective actions, if needed, taken in a timely manner to assure analysis will be completed within the required holding times?

25. Are control charts for calibration standards maintained?

Where are they stored?

26. Does the lab reanalyze samples when surrogates are not within recovery limits?

Does the lab reanalyze samples when matrix spike/matrix spike duplicate compounds are not within recovery limits?

27. For instruments operating with computer data systems, are all raw data stored on magnetic media?

28. Is there a log of these computer records?

29. Are computer programs validated before use?

VI. GC/MS VOLATILE ANALYSIS

1. GC/MS Volatile Staffing:

Name	Position	Education	Experience

2. Does the laboratory have instrumentation dedicated to volatile analysis?____________

Make Model #	Detector	Method Dedicated	Column	Inst. ID

3. Does the laboratory have the capability of analyzing both soil and water by purge and trap for the project-specific methods? (e.g., 524.2, 1624, 624, 8240, CLP 89-1)_____

4. Does the laboratory have the Method Detection Limit (MDL) verification for all methods for review by the auditor?____________

Has the laboratory compared the calculated MDL with the required CRQL and/or the method MDL?____________

Are Instrument Detection Limits (IDLs) studies available?____________

When are IDL's updated?____________

5. Is the laboratory employing the method indicated columns?____________

6. Does the laboratory have an updated in-house NBS library?____________

7. Have the instruments been modified in any way?____________________

8. Is sufficient dedicated glassware available to meet project needs?________________

9. Are spare parts available (e.g., septums, columns, syringes, boards, etc.)?__________

10. Does the laboratory have a service contract for each instrument?________________

11. Does the laboratory maintain a bound instrument logbook for each instrument?______

Can verifications be made for septum changes, column changes, ion source cleaning, etc.?____________________

Are all entries signed and dated?____________________

12. Does the laboratory maintain a bound instrument logbook for each instrument?______

Can verification be made that initial calibrations are run after major instrument maintenance, e.g., column changes, ion source cleaning, etc.?________________

Has the analyst avoided obliterating entries?____________________

13. Has the supervisor of the individual maintaining the notebook personally examined and reviewed the notebook periodically and signed his/her name therein, together with the data and appropriate comments as to whether or not the notebook is being maintained in an appropriate manner?____________________

14. What solvents are present in the laboratory?____________________

15. Does the laboratory routinely analyze a holding blank for volatile analysis?__________

16. Does the volatile laboratory maintain a bound logbook for standards preparation?_____

Can all standards be traced back to a source and lot number?

Are all entries signed, dated and reviewed by the supervisor?

17. Are SOP's developed for standards preparations, water and soil analysis (both low-level and medium-level) for all methods, instrument maintenance and data acquisition and data processing?

    Are the SOP's unique to the laboratory?

    Are they current and consistent with the requirements of the current NYSDEC protocol?

    Do all employees sign that they have read and understand these SOP's?

18. At what frequency are fresh analytical standards prepared?

    Does this meet project needs and is it consistent with good QA?

19. Are all samples routinely analyzed within 7 days VTSR?

20. Have instrument calibrations been met for BFB every 12 hours?

21. Can the laboratory document the use of three separate calibration curves for volatile sample analysis (water, low soil, medium soil)?

22. Are blanks routinely run following the analysis of a highly contaminated sample to prevent carryover?

23. Are QC samples properly labeled and is a copy of the labeling system available to each analyst?

24. Does the volatile laboratory have a separate refrigerated storage area for volatile samples?

Is this area separate from the standards storage area?

25. Are the analyst's initials on the chromatograms and quant. reports consistent with the run log and traceable to the individual actually performing the analysis?

26. Do supervisory personnel review the data and QC results?

Are corrective actions, if needed, taken in a timely manner to assure analysis will be completed within the required holding times?

27. Are control charts for calibration standards maintained?

Where are they stored?

28. Does the lab reanalyze samples when surrogates are not within recovery limits?

Does the lab reanalyze samples when matrix spike/matrix spike duplicate compounds are not within recovery limits?

29. Are screening procedures routinely performed by the volatile laboratory?

If so, is there a dedicated instrument for this analysis?

30. When doing method 524.2, does the laboratory use a dedicated instrument?

If not, how can the laboratory assure the data user that they can meet the required MDL on the chosen instrument?

31. When doing method 524.2, does the laboratory prepare calibration standards for the 524.2 parameter list or for the TCL?

32. Does the laboratory have a designated GC/MS Systems Manager?

33. Does the laboratory have trained staffing backup for the systems manager?

34. At what frequency is a system backup performed?

35. Does the Systems Manager perform a manual check between files on the disk and files that have been archived to ensure that files have not been lost?

36. Does the laboratory provide secure storage for magnetic data tapes?

37. How long does the laboratory routinely retain these tapes?

38. Are computer programs validated before use?

VII. ORGANIC SAMPLE PREPARATION

1. Staffing:

Name	Position	Education	Experience

2. Equipment:

Type	Methods Dedicated

3. Is sufficient dedicated glassware available to meet project needs?

4. Are laboratory-specific SOP's developed for Organic preparation for water, soils and other matrices and standards for all project-specific methods (e.g., VOA, BNA, Pest/Herb/PCBs, etc.)?

5. Are SOP's readily available to technicians?

6. Are all prep and internal standard logs kept in a bound notebook?

   Are all entries signed and dated by prep technicians and reviewed by their supervisors?

   Can all standards be traced back to a source and lot number?

7. Are samples and standards stored separately?

Are all standard solutions verified prior to use?

Is a hood available for opening samples?

Is there sufficient dedicated hood space to perform method-specific extractions (e.g., BNAs, Pest/Herb/PCB, etc.)?

Is there sufficient hood space for concentrations?

8. Does the laboratory routinely perform analytical cleanups on samples and extracts?

What types of cleanups can the laboratory perform?

9. Does the laboratory have spike recovery studies available for review to demonstrate their competence in the cleanup method?

10. Are Base/Neutral and Acid extracts combined or analyzed separately?

11. Are all BNAs and Pest/Herb/PCBs routinely extracted and concentrated within 5 days VTSR?

12. Does the laboratory split the extract between the pesticide/PCB fraction and BNA fraction or perform a separate extraction?

13. What type of instrument is the BNA screening performed on?

14. Does the laboratory have adequate capability of performing sample cleanups by different techniques?

Name techniques:

15. Is a GPC instrument present?____________________
Are logs kept in a bound notebook recording the fractions in which specific analytes elute off of the GPC column?____________________
____
Are all entries signed and dated and reviewed by the supervisor?____________________
____

16. Are method blanks and matrix spike blanks routinely performed with every sample set?
____
____

17. Are the samples spiked at the method-indicated concentrations?____________________
____
____
What concentrations are used?____________________
____

18. Are corrective actions taken and documented when anomalies are noted and are samples reprepped as appropriate?____________________
____
____

19. If holding times are exceeded, are proper procedures followed to notify the QA officer and the client?____________________
____
____

VIII. GC PESTICIDE/HERBICIDE/PCB ANALYSIS

1. GC Pesticide/Herbicide/PCB Analysis Staffing:

Name	Position	Education	Experience

2. Does the laboratory have instrumentation dedicated to Pest/Herb/PCB analysis?______

Make Model #	Detector	Method Dedicated	Column	Inst. ID

3. Does the laboratory have the Method Detection Limit (MDL) verification for all methods for review by the auditor?______

   Has the laboratory compared the calculated MDL with the required CRQL and/or the method MDL?______

   Are Instrument Detection Limits (IDLs) Studies available?______

   When are IDLs updated?______

4. Is the laboratory employing the method-indicated GC detectors and columns?______

5. Have the instruments been modified in any way?______

6. Is sufficient dedicated glassware available to meet project needs?______

7. Are spare parts available (e.g., septums, columns, syringes, boards, etc.)?

8. Does the laboratory have a service contract for each instrument?

9. Does the laboratory maintain a bound instrument logbook for each instrument?

Can verifications be made for septum changes, column changes, detector maintenance?

Are all entries signed and dated?

10. Does the laboratory maintain a bound instrument logbook for each instrument?

Can verification be made that initial calibrations are run after major instrument maintenance, e.g., column changes, etc.?

Has the analyst avoided obliterating entries?

11. Has the supervisor of the individual maintaining the notebook personally examined and reviewed the notebook periodically and signed his/her name therein, together with the data and appropriate comments as to whether or not the notebook is being maintained in an appropriate manner?

12. What solvents are present in the laboratory?

13. Does the GC laboratory maintain a bound logbook for standards preparation?

Can all standards be traced back to a source and lot number?

Are all entries signed, dated and reviewed by the supervisor?

14. Are laboratory-specific SOP's developed for standards preparations, water and soil analysis (both low level and medium level) for all methods, instrument maintenance, data

acquisition and data processing?

Are the SOP's unique to the laboratory?

Are they current and consistent with the requirements of the current NYSDEC protocol?

Do all employees sign that they have read and understand these SOP's?

15. At what frequency are fresh analytical standards prepared?

Does this meet project needs and is it consistent with good QA?

16. Are all samples routinely analyzed within 40 days VTSR?

17. Are blanks routinely run following the analysis of a highly contaminated sample to prevent carryover?

18. Are QC samples properly labeled and is a copy of the labeling system available to each analyst?

19. Does the GC laboratory have a separate refrigerated storage area for Pest/Herb/PCB samples?

Is this area separate from the standards storage area?

20. Are the analyst's initials on the chromatograms and quant. reports consistent with the run log and traceable to the individual actually performing the analysis?

21. Are control charts for calibration standards maintained?

Where are they stored?

22. Does the lab reanalyze samples when surrogates are not within recovery limits?

Does the lab reanalyze samples when matrix spike/matrix spike duplicate compounds are not within recovery limits?______________________________________

23. Does the laboratory keep a record of retention time window studies in the area?______

Does the laboratory calculate standard deviation of three absolute retention times for the retention time windows?______________________________________

How often are they updated?______________________________________

24. When does the laboratory use GC/ECD confirmation on a sample?_______________

25. When does the laboratory use GC/MS confirmation on a sample?_______________

Are tuning and mass calibration criteria met prior to undertaking Pesticide/PCB confirmation?______________________________________

26. Do supervisory personnel review the data and QC results?____________________

Are corrective actions, if needed, taken in a timely manner to assure analysis will be completed within the required holding times?__________________________________

27. For instruments operating with computer data systems, are all raw data stored on magnetic media?______________________________________

28. Is there a log of these computer records?________________________________

29. Are computer programs validated before use?______________________________

IX. GC/MS BNA ANALYSIS

1. GC/MS BNA Staffing:

Name	Position	Education	Experience

2. Does the laboratory have instrumentation dedicated to volatile analysis?______________

____

____

Make Model #	Detector	Method Dedicated	Column	Inst. ID

3. Does the laboratory have the Method Detection Limit (MDL) verification for all project-specific methods for review by the auditor?______________

____

Has the laboratory compared the calculated MDL with the required CRQL and/or the method MDL?______________

____

Are Instrument Detection Limits (IDLs) studies available?______________

____

When are IDL's updated?______________

4. Is the laboratory employing the method-indicated columns?______________

____

5. Does the laboratory have an updated inhouse NBS library?______________

____

6. Have the instruments been modified in any way?______________

____

7. Is sufficient dedicated glassware available to meet project needs?

8. Are spare parts available (e.g., septums, columns, syringes, boards, etc.)?

9. Does the laboratory have a service contract for each instrument?

10. Does the laboratory maintain a bound instrument logbook for each instrument?

    Can verifications be made for septum changes, column changes, ion source cleaning, etc.?

    Are all entries signed and dated?

11. Does the laboratory maintain a bound instrument logbook for each instrument?

    Can verification be made that initial calibrations are run after major instrument maintenance, e.g., column changes, ion source cleaning, etc.?

    Has the analyst avoided obliterating entries?

12. Has the supervisor of the individual maintaining the notebook personally examined and reviewed the notebook periodically, and signed his/her name therein, together with the data and appropriate comments as to whether or not the notebook is being maintained in an appropriate manner?

13. What solvents are present in the laboratory?

14. Does the BNA laboratory maintain a bound logbook for standards preparation?

    Can all standards be traced back to a source and lot number?

    Are all entries signed, dated and reviewed by the supervisor?

15. Are SOP's developed for standards preparations, water and soil analysis (both low-level and medium-level) for all methods, instrument maintenance and data acquisition and data processing?

Are the SOP's unique to the laboratory?____________________
Are they current and consistent with the requirements of the current NYSDEC protocol?
____
Do all employees sign that they have read and understand these SOP's?__________
____

16. At what frequency are fresh analytical standards prepared?____________________
____
Does this meet project needs and is it consistent with good QA?____________________
____

17. Have instrument calibrations been met as outlined in the method SOP's?__________
____

18. Have initial and continuing calibrations been met as outlined in the method SOP's?___
____

19. If the system does not meet calibration criteria of the method, is the system recalibrated?
____
____

20. Are all samples routinely analyzed and/or re-extracted within method-specific holding times?____
____
____

21. Are blanks routinely run following the analysis of a highly contaminated sample to prevent carryover?____
____

22. Are QC samples properly labeled and is a copy of the labeling system available to each analyst?____
____

23. Does the BNA laboratory have a separate refrigerated storage area for BNA extracts?_
____
____
Is this area separate from the standards storage area?____________________
____

24. Are the analyst's initials on the chromatograms and quant. reports consistent with the run log and traceable to the individual actually performing the analysis?________________
____

25. Do supervisory personnel review the data and QC results?____________________
____

Are corrective actions, if needed, taken in a timely manner to assure analysis will be completed within the required holding times?

26. If holding times are exceeded, are proper procedures followed to notify QA and the client?

27. Are control charts for calibration standards maintained?

Where are they stored?

28. Does the lab reanalyze samples when surrogates are not within recovery limits?

Does the lab reanalyze samples when matrix spike blank compounds are not within recovery limits?

29. Are screening procedures routinely performed by the BNA laboratory?

If so, is there a dedicated instrument for this analysis?

30. Does the laboratory have a designated GC/MS Systems Manager?

31. Does the laboratory have trained staffing backup for the systems manager?

32. At what frequency is a system backup performed?

33. Does the Systems manager perform a manual check between files on the disk and files that have been archived to ensure that files have not been lost?

34. Does the laboratory provide secure storage for magnetic data tapes?

35. How long does the laboratory routinely retain these tapes?

X. INORGANIC SAMPLE PREPARATION

1. Preparation Staffing:

Name	Position	Education	Experience

2. Equipment:

Type	Make	Methods Dedicated

3. Are metals glassware cleaning SOP's available?

   Followed?

4. Is sufficient dedicated glassware available to meet project needs?

   Is glassware acid washed?

5. Are SOP's developed for Inorganic preparation for water, soils and standards for all project-specific methods (e.g., AA, ICP, furnace, cyanide, mercury, etc.)?

6. Are laboratory-specific SOP's readily available to technicians?

7. Are digestion logs kept in a bound notebook?
   Are all entries signed and dated by prep technicians and reviewed by their supervisors?

8. Are all water, soil, EP Tox extracts and TCLP extracts digested prior to analysis?

9. At what frequency are LCS and Prep Blanks prepared?
Is a distinct ID number assigned to correlate these to the corresponding samples?

10. At what frequency are Spike and Duplicate Samples prepared?

11. Are Standards for the LCS and Spike identified so as to be traceable to a source?

12. Are separate standards used to verify the concentration of working standards?

13. Are all reagents traceable to the source?

Are ultra pure acids used?

14. Are all standards labeled with concentration, preparation date, expiration date, preparer's initials, solute and other pertinent information?

At what frequency are they prepared?

15. Is a hood available for opening samples?

Are digestions/distillations performed in the hood?

Is there sufficient dedicated hood space and dedicated glassware available for project-specific needs?

16. Are all digestates labeled with a unique sample number during digestions?

17. What corrective actions are taken if a sample evaporates to dryness?

18. Are Anomalies reported to lab QA?________________________

Are these reports written or verbal?________________________

19. Are digestates returned to secure storage?____________________

20. Are percent solids determinations done in this area?________________

If not, where?____________________________

21. Is a pH meter available in the sample prep room?________________

Is SOP available for pH calibration and reading?________________

Is a bound logbook kept of calibration records?________________

22. Are waste disposal procedures documented and followed?____________

23. Are lab notebooks/benchsheets signed and dated with each use?__________

24. Are logbooks maintained in a manner consistent with GLP (single-line crossouts, dates, initials, etc.)?________________________

25. Are lab notebooks/benchsheets reviewed periodically as indicated by the signature/date/comments of the reviewer?________________

26. Have the corrective actions identified in the last QA audit been implemented?______

27. Comments on overall cleanliness of the area:____________________

28. Additional comments:

XI. INORGANIC ANALYSIS

A. ICP/AA

1. Preparation Staffing:

Name	Position	Education	Experience

2. Instrumentation:

Make Model #	Inst. ID

3. Are bound instrument maintenance logs kept for each instrument?

   Is each entry signed and dated?

4. Are bound sample analyses logs kept for each instrument?

   Is each entry signed and dated?

5. Has the supervisor of the individual maintaining the notebook personally examined and reviewed the notebook periodically, and signed his/her name therein, together with the data and appropriate comments as to whether or not the notebook is being maintained in an appropriated manner?

6. Are IDL studies updated quarterly and available for review by the auditor?

7. Are control charts maintained for the ICV and CCV?____________________

8. Does the laboratory maintain a bound logbook for standards used in calibrations, ICV and CCV?____________________

9. At what frequency are ICV and CCV analyzed?____________________

Does this meet method requirements?____________________

10. At what frequency are ICB and CCB analyzed?____________________

Does this meet method requirements?____________________

11. Are sensitivities monitored, or absorbances for standards recorded and monitored?____

12. Are the CRQL Standards analyzed at correct frequency?____________________

Are control charts used?____________________

13. Does each instrument have a dedicated recording system for output?____________________

14. Are sufficient spare parts available?____________________

15. Are operating manuals available for each instrument?____________________

16. Does the laboratory have a service contract for each instrument?____________________

17. Do supervisory personnel review the data and QC results?____________________

Are corrective actions, if needed, taken in a timely manner to assure analysis will be completed within the required holding times?______________________

18. Are out-of-range samples diluted and reanalyzed?______________________

19. Is every sample analyzed with a replicate exposure (minimum) and an analytical spike?

20. Is the sample tray covered to prevent contamination during the analytical run?______

21. Are waste disposal procedures documented and followed?______________________

22. Are lab notebooks/benchsheets signed and dated with each use?______________________

23. Are logbooks maintained in a manner consistent with GLP (single-line crossouts, dates, initials, etc.)?______________________

24. Are lab notebooks/benchsheets reviewed periodically as indicated by the signature/date/comments of the reviewer?______________________

25. Have corrective actions identified in the last QA audit been implemented?__________

26. Comments or overall cleanliness of the area:______________________

27. Additional comments:

B. Furnace

1. Staffing:

Name	Position	Education	Experience

2. Instrumentation:

Make Model #	Inst. ID

3. Are bound instrument maintenance logs kept for each instrument?______

Is each entry signed and dated?______

4. Are bound sample analyses logs kept for each instrument?______

Is each entry signed and dated?______

5. Has the supervisor of the individual maintaining the notebook personally examined and reviewed the notebook periodically, and signed his/her name therein, together with the data and appropriate comments as to whether or not the notebook is being maintained in an appropriate manner?______

6. Are IDL studies updated quarterly and available for review by the auditor?______

7. Are control charts maintained for the ICV and CCV?____________________

8. Does the laboratory maintain a bound logbook for standards used in calibrations, ICV and CCV?____________________

9. At what frequency are ICV and CCV analyzed?____________________

Does this meet method requirements?____________________

10. At what frequency are ICB and CCB analyzed?____________________

Does this meet method requirements?____________________

11. Are sensitivities monitored, or absorbances for standards recorded and monitored?____

12. Are duplicate injections for GFAA samples done?____________________

13. Are all percent recoveries monitored for each analytical spike on every GFAA sample?

Is the analytical spike for the GFAA at 2× CRQL?____________________

14. Are the CRQL Standards analyzed at correct frequency?____________________

Are control charts used?____________________

15. Does each instrument have a dedicated recording system for output?____________

16. Are sufficient spare parts available?____________________

17. Are operating manuals available for each instrument?

18. Does the laboratory have a service contract for each instrument?

19. Do supervisory personnel review the data and QC results?

Are corrective actions, if needed, taken in a timely manner to assure analysis will be completed within the required holding times?

20. Are out-of-range samples diluted and reanalyzed?

21. Is every sample analyzed with a single burn (double burn for CLP) and an analytical spike on graphite furnace?

22. Are samples that demonstrate poor instrument spike recovery by GFAA reanalyzed using Method of Standard Additions (MSA)?

23. Is the sample tray covered to prevent contamination during the analytical run?

24. Are waste disposal procedures documented and followed?

25. Are lab notebooks/benchsheets signed and dated with each use?

26. Are logbooks maintained in a manner consistent with GLP (single-line crossouts, dates, initials, etc.)?

27. Are lab notebooks/benchsheets reviewed periodically as indicated by the signature/date/comments of the reviewer?

28. Have corrective actions identified in the last in house QA audit been implemented?___

29. Comments on overall cleanliness of the area:___

30. Additional comments:___

C. Mercury-Cold Vapor

1. Staffing:

Name	Position	Education	Experience

2. Instrumentation:

Make Model #	Inst. ID

3. Are bound instrument logbooks kept for each instrument?

Is each entry signed and dated?

4. Are bound sample analyses logs kept for each instrument?

Is each entry signed and dated?

5. Are IDL studies updated quarterly and available for review by auditor?

6. Has the supervisor of the individual maintaining the notebook personally examined and reviewed the notebook periodically, and signed his/her name therein, together with the data and appropriate comments as to whether or not the notebook is being maintained in an appropriate manner?

7. Are control charts maintained for the ICV and CCV?

8. Does the laboratory maintain a bound logbook for standards used in calibrations, ICV and CCV?

9. At what frequency are ICV and CCV analyzed?

Does this meet method requirements?

10. At what frequency are ICB and CCB analyzed?

Does this meet method requirements?

11. Are ultra-pure acids and reagents used?

12. Is the purge vessel and related analytical "glassware" cleaned after each sample?

How?

13. Are all sample values reported within the calibration range?

14. Is the calibration linearity verified prior to analysis?

15. Are the CRQL Standards analyzed at correct frequency?

16. Are control charts used?

17. Does each instrument have a dedicated recording system for output?

18. Are sufficient spare parts available in the event of instrument failure?

19. Are operating manuals available for each instrument?

20. Does the laboratory have a service contract for each instrument?

21. Do supervisory personnel review the data and QC results?

Are corrective actions, if needed, taken in a timely manner to assure analysis will be completed within the required holding times?

22. Are out-of-range samples diluted and reanalyzed?

23. Are sensitivities monitored, or absorbances for standards recorded and monitored?

24. Is the sample tray covered to prevent contamination during the analytical run?

XII. EP TOX

1. EP Tox Staffing:

Name	Position	Education	Experience

2. Equipment:

Make and Model #	ID Number

3. Does the laboratory maintain a bound equipment logbook?____________________
____
Is each entry signed and dated?______________________________________

4. Are SOP's developed for this procedure?_______________________________
Are the SOP's signed by the analyst?___________________________________

5. Are sample extraction and pH logs maintained in a bound notebook?____________
____
Are entries signed and dated by the analyst?_____________________________
____

6. Are extracts digested?____

7. Is an EP Tox Duplicate routinely prepared and analyzed?___________________
____

8. Are extraction blanks run?_______________________________________

9. Are MSA and/or post extraction/pre-digestion spike analyses provided for the extracts?
____

10. Does the laboratory have a separate labeling system for EP Tox Extracts for inorganic and inorganic analyses?____

____

11. Can the laboratory track for Chain-of-Custody purposes the EP Tox extracts?________

____

XIII. RCRA CHARACTERISTICS AND WET CHEMISTRY

1. Wet Chemistry Staff:

Name	Position	Education	Experience

2. Equipment:

Make and Model #	ID Number

3. Does the laboratory maintain a bound equipment logbook?____________________
____
Is each entry signed and dated?______________________________

4. Are SOP's developed for these procedures?______________________________
Are the SOP's signed by the analyst?______________________________

5. Are Pensky-Martens closed cup tester (or equivalent), pH logs, etc. records maintained in a bound notebook?______________________________
Are entries signed and dated?______________________________

6. Are records maintained for ovens in a bound notebook?____________________
Are these entries signed and dated?______________________________

XIV. CYANIDE

1. Staffing:

Name	Position	Education	Experience

2. Instrumentation:

Make Model #	Inst. ID

3. Are bound instrument maintenance logs kept for each instrument?

   Is each entry signed and dated?

4. Are bound sample analyses logs kept for each instrument?

   Is each entry signed and dated?

5. Are manual and semi-automated spectrophotometric IDL studies updated quarterly and available for review by the auditor?

6. Has the supervisor of the individual maintaining the notebook personally examined and reviewed the notebook periodically, and signed his/her name therein, together with the data and appropriate comments as to whether or not the notebook is being maintained in

an appropriate manner?

7. Are control charts maintained for the ICV and CCV?

8. Does the laboratory maintain a bound logbook for standards used in calibrations, ICV and CCV?

9. Does the laboratory maintain a bound logbook for reagent preparation?

10. Are all samples checked regularly with lead acetate paper for sulfide presence?

11. At what frequency are CCV analyzed?

Does this meet method requirements?

12. Does each instrument have a dedicated recording system for output?

13. Are sufficient spare parts available?

14. Are operating manuals available for each instrument?

15. Does the laboratory have a service contract for each instrument?

16. Do supervisory personnel review the data and QC results?

Are corrective actions, if needed, taken in a timely manner to assure analysis will be completed within the required holding times?

17. Are out-of-range samples diluted and reanalyzed?

18. Are sensitivities monitored, or absorbances for standards recorded and monitored?

19. Is the sample tray covered to prevent contamination during the analytical run?

XV. DATA PACKAGE ASSEMBLY

Staffing:

1. Does the laboratory have dedicated staff for data package assembly?

2. Does the laboratory have checklists and SOP's for data package assembly?

3. How many quality assurance checks do the data receive prior to release from the laboratory?

XVI. EVALUATION OF AUDITOR

Conclusions of Audit and Justification for Use:

____

____

____

____

____

____

____

____

____

____

____

____

I, ______________________________, having the aforementioned experience, have visited ______________________________________ laboratory, interviewed staff, examined laboratory procedures and protocols and deem the laboratory technically capable of producing a complete and compliant data package in compliance with the 1989 NYSDEC ASP.

APPENDIX E

LABORATORY QAPP

IEA
An Aquarion Company

200 Monroe Turnpike
Monroe, Connecticut 06468

Phone 203 261 4458
Fax 203 268 5346

1992 QUALITY ASSURANCE PROGRAM PLAN (QAPmP)

FOR

IEA, INC.-CONNECTICUT

MONROE, CONNECTICUT 06468

Revised: July 20, 1992

Sunrise, Florida 305·846·1730
Schaumburg, Illinois 708·705·0740
N. Billerica, Massachusetts 617·272·5212
Whippany, New Jersey 201·428·8181
Research Triangle Park, North Carolina 919·677·0090
Essex Junction, Vermont 802·878 5138

TABLE OF CONTENTS

APPENDIX A

IEA, Inc. Policy Statement on Business Ethics and Conduct

IEA, Inc.-CT Organization Chart

IEA, Inc.-CT Floor Plan

IEA, Inc.-CT Capital Equipment Inventory

IEA, Inc.-CT Corrective Action Report/Case Narrative Report (CAR)

APPENDIX B

Laboratory Detection Limits

1992 QUALITY ASSURANCE PROGRAM PLAN (QAPmP)

FOR

IEA, INC.-CONNECTICUT

MONROE, CONNECTICUT 06468

1.0 INTRODUCTION

This Quality Assurance Program Plan (QAPmP) covers laboratory operation at Industrial and Environmental Analysts, Inc.-Connecticut (IEA, Inc.-CT) located at 200 Monroe Turnpike, Monroe, Connecticut. The purpose of this general QAPmP is to provide information on laboratory operations as required for specific Quality Assurance Project Plans (QAPjPs), and to provide the basis for the Quality Assurance Program at IEA, Inc.-CT.

This QAPmP is based upon USEPA guidelines as are specified in the following EPA documents:

1) NPO and ORD QAPP Guidance, Quality Assurance Management Staff (QAMS), USEPA, September, 1987.

2) QAMS-004/80, Guidelines and Specifications for Preparing Quality Assurance Program Plans. Quality Assurance Management Staff (QAMS), USEPA, 1979.

The second document is also available as EPA publication, EPA-600/8-83-024. Regulatory guidance for preparing QAPmPs is given in CFR part 30, #30.503, paragraph (e).

2.0 QUALITY ASSURANCE (QA) POLICY STATEMENT

It is the policy of IEA, Inc.-CT that the Quality Assurance (QA) Program will be appropriate to assure that all data collected and reported will be of known and documented value.

The objective of the QA Program (QAPmP) is to ensure, assess and document that all data collected, stored and reported are scientifically valid, defensible and of the precision and accuracy required to meet the objectives of our clients.

It is the goal of IEA, Inc.-CT to provide the best laboratory services to our clients. To accomplish this, the product which we produce, analytical measurement data, must be of defined quality and at the same time conform to government regulations and requirements.

All laboratory activities, from sample receipt to analysis to final report generation, must adhere to the laboratory Standard Operating Procedures (SOPs) which have been developed to provide quality environmental data with adequate documentation to be legally defensible and hence of maximum use by our customers.

Laboratory SOPs form the framework of the Quality Assurance Program Plan (QAPmP) at IEA, Inc.-CT. The purposes of the QAPmP are basically to ensure that our SOPs fulfill all government and/or private client requirements, that proper documentation of all quality control (QC) activities is accomplished, and that the SOPs are followed by the laboratory staff.

It is the policy of the laboratory, therefore, to build the quality control requirements into our SOPs. By adhering to the SOPs, laboratory management is thereby assured that the quality of the data produced will provide the basis for long term relationships with our clients through customer satisfaction.

documentation of all quality control (QC) activities is accomplished, and that the SOPs are followed by the laboratory staff.

It is the policy of the laboratory, therefore, to build the quality control requirements into our SOPs. By adhering to the SOPs, laboratory management is thereby assured that the quality of the data produced will provide the basis for long term relationships with our clients through customer satisfaction.

3.0 MAJOR MISSION ELEMENTS REQUIRING QUALITY ASSURANCE

The primary focus of the laboratory is measurement of specific analytes in environmental samples (air, soil and water). All elements of laboratory measurements are subject to the requirements of the laboratory's QAPmP. The major types of laboratory operations affected are as follows:

- Characterization of waste samples per the Resource Conservation and Recovery Act (RCRA) for either disposal or delisting purposes.
- Analysis of drinking water samples in support of the Safe Drinking Water Act.
- Analysis of environmental samples in accordance with contracts with the USEPA CLP program and various state agencies.
- Analysis of environmental samples for contaminants such as those compounds found on the EPA priority pollutant list, target compound list, etc. for site assessment purposes.

4.0 PLANNING FOR ENVIRONMENTAL DATA COLLECTION ACTIVITIES (EDCAs)

According to EPA's QAMS[1], IEA, Inc.-CT is defined as an "Analytical Support Group". EPA's QAMS defines an "Analytical Support Group" as "any group -- section, branch, or entire laboratory -- that provides physical, chemical or biological sampling or analysis on a service basis". According to QAMS, such analytical support groups do not manage the EDCA projects but only provide services. IEA, Inc.-CT, as an analytical support group, does not determine or write Data Quality Objectives (DQOs) or Quality Assurance Project Plans (QAPjPs).

4.1 Adherence to Data Quality Objectives (DQOs)

Data Quality Objectives (DQOs) have been specified by EPA as the process of defining that type of data will be required by the client for a site or project. The following two steps of defining DQOs must be taken before a project begins:

1) "...the user (of data) must first specify the quality of data he needs, then..."
2) "...the degree of quality control necessary to assure that the resultant data satisfy his specifications must be determined."

The laboratory is in the business of measuring environmental samples in order to generate data which is to be used by our customers to make sound decisions in relation to site contamination (or lack of), water/air/soil quality, public health concerns and the environment in general. Some of the sites have formal QAPjPs with specified DQOs, however, most sites do not have a formal QAPjP.

Each sample analyzed from a given site can present a set of unique analytical problems which potentially fall outside the realm of established methodologies and protocols. It is the goal of the laboratory to produce data which is 100 percent usable to the client but in the real world this is not always possible. For some projects or sites, achieving 50 percent usable data may be considered an excellent achievement by the laboratory while at another site, achieving 90 percent usable data may be considered barely adequate.

It is the policy of IEA, Inc.-CT to meet the requirements of DQOs in QAPjPs when the laboratory has contracted to provide measurement data in support of an on-going client contract. These DQOs must be clearly defined by the client to the laboratory.

4.2 Guidance for the Preparation of Standard Operating Procedures (SOPs)

Routine analytical work will be performed according to standard operating procedures (SOP's must satisfy the requirements of the regulations for which they were developed). All measurements will be made using methods developed in the laboratory or methods mandated by regulatory or legal/ contractual requirements. No method will be used to obtain data until it is known to be applicable and competence has been gained in its use. If it appears that available techniques are not sufficient to obtain reliable measurements, the user will be informed and advised of any research required and the estimated cost. The attainment of statistical control is a prerequisite for reporting any data. Any deviations from SOPs must be supportable and documented in the case narrative in the final report to the client.

Existing SOPs must be reviewed and updated as required but at a minimum of once per year.

The QA Manager will maintain an index of all SOPs in use.

RCRA has proposed in SW846, 3rd Edition, 1st Update, a standardized 10 element format for all revised RCRA methods. In light of RCRA's new requirements, the following SOP format should be employed when new measurement SOPs are written or when major rewrites are made to SOPs.

All SOPs should provide complete documentation as to how each sample was measured for each parameter. This formal documentation in the form of sample preparation logs, standard preparation logs, instrument logs, corrective action reports/case narrative reports (CARs), Quality Control Approval Reports (QCARs), and similar logs must provide an immediate, complete and long-term description of how samples were measured and what problems were encountered. It is the laboratory policy to retain laboratory measurement records for a minimum period of five years. It is very important that all measurement records be well organized and that they provide a complete description of how each sample was measured.

Of special importance in writing good SOPs is that each SOP meet the regulatory requirements of both the method and of any governing contract(s). It is important that IEA, Inc.-CT have SOPs prepared and ready to use for each of the environmental regulations which we support. This means that some groups may have four or five SOPs to cover one type of measurement (all five SOPs could be printed separately or compiled into one SOP).

New SOPs are developed by line supervisors and/or their designated staff when any sampling, or analytical procedure is recognized to be repetitive and routine. The Quality Assurance (QA) Manager will be available to assist in the development of SOPs.

Newly developed SOPs shall be reviewed by the analytical group, the group leader and by laboratory management and contain a sign off page.

The following outline lists some of the necessary elements that should be covered in most measurement SOPs. SOPs should cover each element. If a listed element in the outline does not apply, then the element should still be listed with the additional descriptor, "Not Applicable".

1) Introduction

IEA, Inc. Policy on Business Ethics and Conduct

State in the beginning of each SOP that "It is the intent of this procedure to comply with the IEA business ethics policy". Each member of the group/section should read and understand this ethics policy statement. It is the responsibility of all division managers to communicate and train employees about the requirements of the IEA, Inc. Policy on Business Ethics and Conduct to ensure compliance with this policy. A copy of the IEA Ethics Policy is in Appendix A of this QAPmP.

2) Scope and Application - Generally describe the SOP and its general application.
    a) Other related SOPs and analytical methods
    b) Water samples
    c) Soil/sediment samples
3) Summary of Method - Summarize the method in one paragraph.
4) Interferences - Describe any interferences to the method.
5) Apparatus and Materials - List in detail.
6) Reagents
    a) Inventory of Reagents, Standards and Solvents

It is laboratory policy that each measurement group set up and maintain a system to inventory all standards, reagents and solvents used in measurements. The inventory system should record the date the item was received and the lot/batch number. A unique IEA inventory number should be given to each item in the inventory. A set of index cards or a computer spread sheet (with hard copy and magnetic backup) may be used to maintain inventory records and updates. Each inventoried item should be marked with the date of receipt and an inventory record number. Self-sticking sample seals may be used as labels. The inventory system should also provide for documentation of the date the material was opened and used up. It is the section/group leader's responsibility to maintain an inventory system of reagents, standards and solvents.

b) Quality of Solvents, Reagents and Standards

Traceability of Calibration Standards - It is laboratory policy to purchase standards for organics and inorganics measurements which have been previously traced to reference standards.

If traceable standards are not available, then the measurement group traces the non-certified standard to EPA or NBS reference standards or other certified standards.

Assay of Purity - The chemical purity of the reagents and chemicals should be specified in the SOP. Any assays of materials should be kept in a central file.

Recordkeeping Requirements - Strict control of reagents used in laboratory operations shall be maintained to minimize contamination or degradation. Dilutions and solutions prepared from them will be initialed, dated and clearly labeled as to content. All reagents will be appropriate to the operation performed. A record will be maintained of all reagents used. Laboratory records should be kept organized and accessible for five years (minimum).

7) Sample Collection, Preservation and Handling

a) Preservation Requirements and Procedures - Each measurement SOP should clearly specify the preservation and holding time requirements of the regulatory method. Specify a system in the SOP to ensure that preservation and holding time requirements are met and documented. Corrective action reports should be used to document all preservation blank problems, contamination, etc.

b) Regulatory Holding Times - Clearly list all holding times for environmental samples and extracts.

For samples:

. water samples

. soil/sediment samples

. other matrixes

For extracts and concentrates

8) Procedure

a) Safety - General safety rules as outlined in the <u>IEA Health and Safety Manual</u> shall be followed. Use of gloves, eye protection and lab coats is required for work with dangerous chemicals. Hazardous materials with high vapor pressures should only be opened under hoods.

The responsibility of following good safety practices is everyone's. No employees should be using hazardous chemicals without proper training and safety equipment.

b) Sample and Data Chain of Custody Procedures - Upon receipt of the samples in the laboratory the sample custodian and the sample control group are responsible for obtaining all necessary shipping documentation and verification of all data entered in the laboratory sample custody records.

The specific procedures and requirements for receiving samples are specified in the SOP for sample control. In general the group signs and dates all shipping records, verifies the samples are in good condition and properly preserved, verifies the field chain of custody documents (if present) are in order, and assigns laboratory sample numbers to the incoming samples and stores the samples according to the requirements of the analytical protocols (refrigeration).

Each measurement SOP should specify procedures for maintaining sample and data chain of custody records. It is the responsibility of the group leader to ensure that chain of custody records are signed and maintained.

Any and all deviations from established laboratory chain of custody procedures must be noted on the CARs and also documented in the case narrative for the job.

c) Sample Preparation - Each and every sample received by the laboratory will be handled in a conscientious manner. All aspects of sample preparation will be performed according to an approved SOP. The integrity of each sample shall be maintained through appropriate chain of custody procedures. Any limitations on analytical results due to the sample will be specified in the case narrative. All preparation methods shall include a QCAR which states the minimum quality control requirements of the SOP.

d) Sample Screening

e) Standards Preparation Log - It is the laboratory policy to provide full and complete documentation on the use and composition of all standards used for preservation or measurement or spiking of all environmental samples. This includes lot numbers of solvents, reagents, and standards used and the date and initials of the analyst who prepared the standard.

Specify instructions in the SOP (or a separate SOP) on the maintenance of a standards preparation log notebook. Lot numbers, weights, volumes and the initials of the analyst should be recorded. Assign an IEA preparation code number to each and every standard prepared including dilutions of standards. Use the following labeling convention: group:date:page number (of standards prep book).

f) Calibration - Each analytical method has its own set of calibration procedures and verification. Each measurement SOP must specify calibration requirements of the method. For specific procedures, each SOP must be consulted.

If the measurement requires the use of RCRA procedures, then the following general guidelines apply:

- <u>Volatile Organics (VOA) GC/MS</u> - Instrument tuned to BFB.

5-point initial calibration verified every 12 hours per SW846/CLP protocols.

- Semi-Volatile Organics (GC/MS): Instrument tuned to DFTPP. 5-point initial calibration verified every 12 hours per SW846/CLP protocols.

- Organochlorine Pesticides/PCB's (GC/ECD): Calibration per SW846/CLP protocols. Verification every 10 samples. Dual column confirmation.
- Metals (ICP, GFAAS and FAAS): Calibration per SW846/CLP protocols. Verification every 10 samples.
- Miscellaneous: Calibration and verification per method.

g) Measurement of Samples - It is laboratory policy that all measurements be made using appropriate SOPs. All SOPs shall be in writing and available for review. Any significant changes to or deviations from a SOP shall be documented in case narratives and include the reasons for any changes.

Laboratory measurement SOPs are based upon the following regulatory methods:

- Test Methods for Evaluating Solid Wastes, RCRA SW846 Methods (both 2nd and 3rd editions).
- Methods for Chemical Analysis of Water and Wastes, EPA 600/4-79-020. Revised March, 1983.
- USEPA "Contract Laboratory Program Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration," SOW

7/88, Revisions 2/89 and 6/89 and 3/90.

- USEPA "Contract Laboratory Program Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration," SOW 2/88 and CLP SOW OLM01.8.
- Methods for the Determination of Organic Compound in Finished Drinking Water and Raw Source Water, EPA EMSL/CI, September, 1986.

h) Quantitation of Results - The SOP should clearly state the requirements of the method concerning the calculation of results. Provide examples as to how results are determined.

i) Qualitative Decisions (if any) - SOPs that require the identification of Tentatively Identified Compounds (TICs) must specify the EPA CLP procedures that must be followed in order to properly identify non-target compounds. CLP SOW guidelines for the identification of TICs are currently being evaluated by EPA. SOPs must require that the current CLP guidelines be followed. The QA Manager will audit TIC data for conformance to these written guidelines.

9) Quality Control

a) Quality Control Approval Reports (QCARs) - The laboratory group and section leaders are responsible for the data their groups generate. As such, all data must be reviewed and approved prior to release. This is documented in Quality Control Approval Reports (QCARs) which must accompany each data package as it is submitted to the data management group.

The laboratory Quality Assurance Manager will periodically examine data packages at random to ensure that all QCARs are present and to ascertain that the data package meets the requirements as stated in the SOP. These findings are transmitted to laboratory management via QA Progress Reports.

b) Required Method QC Limits - Each SOP explains the type and frequency of quality control checks. This includes such items as analysis of EPA reference standards, matrix spikes, laboratory duplicates, blanks, the use of internal standards and surrogate spikes, etc. In general all calibration are checked before an analysis can begin. If the analytical system does not pass the initial QC limits, then the system is determined to be out of control, and cause of the problem is determined before measurements can continue. Once the problem is corrected, QC measurements are repeated to verify the calibration. If the system is still out of control, the instrument is re-examined until the problem is corrected. The following are examples of typical method QC items.

- Tuning and/or Calibration of Instrument
- Other Types of Calibration
- Laboratory Reagent Blank (LRB) - The laboratory measures a reagent blank sample at the frequency required by the method. These LRBs must be within required QC limits before sample analysis can begin.
- Internal Standard Precision
- Surrogate Spike Analysis - Surrogate spikes are added to

all organics samples prior to extractions or analysis. Results of these are checked to verify the recoveries meet the requirements of the SOP. If the recoveries are out, the sample is reanalyzed to prove that the system is in control.

- Laboratory Fortified Blank (LFB)
- Laboratory Fortified Matrix Sample (LFM) - In general the laboratory performs a matrix spike/matrix spike duplicate for organic QC and a duplicate/matrix spike for inorganic QC. The results of these analyses are used to generate control charts to monitor the precision and accuracy of each parameter analyzed.
- Quality Control Sample (QCS)
- Laboratory Duplicates (LD1 and LD2)

c) Preventive Maintenance of Equipment - The policy of the laboratory is to have service contracts for all of its major instruments. These contracts provide routine preventive maintenance according to the manufacturer's requirements. Additionally the laboratory maintains an inventory of expendable parts and supplies to minimize downtime and to allow laboratory personnel to make minor repairs if necessary.

Each measurement SOP must list the preventive maintenance schedule for each instrument which is to be followed by in-house and extramural repair contractors. In addition, each measurement group must maintain a log of all in-house and extramural preventive maintenance activities.

10) Method Performance

   a) Regulatory Requirements - Each regulatory method requires different approaches in determining method performance. SOPs must state the basis for the measurement and documentation of method performance for each method of analysis.

      The laboratory is constantly assessing the changing Method Performance requirements of EPA regulations. For example, proposed drinking water organics methods may require a new approach to mandatory quality control. These new method performance requirements may require new software and computer hardware to meet the mandatory QC requirements of the regulatory methods.

   b) Method Detection Limits (MDLs) - It is laboratory policy to determine MDLs for all methods prior to implementation of SOPs. Requirements for the determination of MDLs are specified in each regulatory method.

   c) Accuracy of the Method - In order to routinely assess the precision and accuracy of the data generated, the laboratory performs monthly statistical analysis of the spike and spike duplicate data as part of our QA program. These results are used to generate control charts based upon the EPA Handbook of Analytical Quality Control for Environmental Laboratories. These charts allow for trend analysis to identify potential problems prior to their occurrence.

   d) Precision of the Method

11) Data Reduction and Data Handling

a) Recordkeeping Procedures - It is the responsibility of all members of the laboratory to maintain complete records of all operations performed. All records shall be neat and organized. All laboratory records are the property of the laboratory and shall not be removed from the premises without permission from supervisors. All records are considered confidential and shall be safeguarded. Unauthorized changes, loss or destruction of records can be grounds for dismissal from the laboratory. Consult the <u>IEA, Inc. Ethics Policy</u> regarding integrity of data and employee conduct.

All measurement data will be recorded in logbooks or on pre-printed log sheets in permanent ink. Transcriptions will be avoided whenever possible. The record will reflect the measurement performed and all appropriate details for conclusions related to the measurement. The record shall be signed and dated by the individual performing the measurement of the day the measurement is performed. Corrections shall be made by drawing a single line through the error, and initialing and dating the error.

As described above, all SOPs should provide complete documentation as to how each sample was measured for each parameter. SOPs should not permit measurement data or QC results to be routinely recorded in personal lab notebooks. Measurement records must be recorded in preprinted record logs or preprinted measurement logs. This policy will facilitate the organization and archiving of all laboratory data for future reference.

All injection forms, instrumentation forms, sample prep forms and QC forms which are used to process samples and measurement results should be described and attached to the SOP. The SOP should specify where these records and forms are cataloged and stored.

b) Data Validation - At a minimum, all data will be subject to supervisory review. Sensitive data requires higher level review and release. All releases must be in writing. Oral preliminary releases are prohibited unless prior permission of the appropriate supervisor(s) is granted and provided that they are subsequently followed by written confirmation of review results.

c) Delivery Times for Reporting Results

d) Preparation of Final Report - Each analytical group in the laboratory is responsible for generating the data for all analyses the group performs. In general the data must first meet all the specific QA/QC associated with the SOP that was used for the analysis prior to any release of the data. The analytical group leader (supervisor) is responsible for the final verification of the data from the analysis.

The laboratory employs a system of QA sign-off sheets called Quality Control Approval Reports (QCARs), where each analyst must sign off that their respective part of the analysis is complete and meets the QA/QC requirements of the governing SOP. QCARs are signed and placed in each job folder along with any CARs which detail any problems which were encountered in the measurement of samples. Any deviations in SOPs are noted on CARs and explained in the case narrative which is incorporated into the final report. The group leader has final sign-off responsibility on the QCAR and is responsible for assuring the overall quality of the data.

12) Special Procedures

13) Use of Other Required SOPs

14) Documentation of Problems

   a) Corrective Action Reports - Include and attach to each measurement SOP a copy of the most recent revision of the IEA, Inc./CT Corrective Action Report(CAR). Provide instructions as to when a CAR should be completed. The CAR provides a routine written communication vehicle to describe most types of problems which may occur throughout the laboratory. In many cases, CARs should be used instead of memos or notes. Most problems described in case narratives should be supported by a CAR. Each group/section may also have additional unique CARs which are specific for the group/section.

   The CAR system requires that the provider of the corrective action (solution to the problem) sign and date the CAR and send secondary copies of the solution to the problem back to the originator of the CAR and to the QA Manager.

   The system requires that the originator of the CAR be the person who is responsible to see that a solution is found to the documented problem. Each originator of CARs will report to the QA Manager if corrective actions have not been taken by the designated provider of solutions.

Under the CAR system, the QA Manager will monitor and log the progress of CARs and will report in the Quarterly QA Progress Report the status of major corrective actions taken. It is the QA Manager's responsibility to see that laboratory problems are documented and solved in a timely manner.

b) Case Narratives - It is laboratory policy that any and all problems related to client samples and the measurement of client samples be documented in the case narrative of the final laboratory report which goes to the client. The mechanism for documenting problems which should be included in the case narrative are described above in Section a (above). It is the responsibility of the data management group to see that information on CARs be included in the final case narrative.

15) References for SOP

5.0 THE AUDIT/REVIEW PROGRAM

5.1 Categories of Audits and Reviews - EPA has classified audits of a QAPmP into four categories. According to NPO and ORD QAPP Guidance, Quality Assurance Management Staff, USEPA, September 1987, audits are classified into the following areas:

- Management System Reviews (MSRs)
- Audits of Data Quality (ADQs)
- Technical Systems Audits (TSAs)
- Performance Evaluations (PEs)

5.2 Management System Reviews (MSRs) - Management System Reviews (MSRs) "assess the effectiveness of the implementation of the approved QAPmP(s). MSRs evaluate a specific group's QA program associated with environmental data collection activities to either affirm or to identify areas where additional attention would bring significant benefits". MSRs have been historically a review of one's organizations QA management system. This type of review of IEA, Inc.-CT's QA management system by IEA, Inc.-CT will continue, however, the laboratory will may have MSRs conducted by outside organizations and contractors.

5.3 Audits of Data Quality (ADQs) - ADQs are normally conducted by the end user of the data to determine if specific data of QAPjP meets the requirements of the data quality objectives (DQOs).

At IEA, Inc.-CT, ADQs are conducted by both external auditors and internal auditors. The results from external ADQs is usually a report submitted to the laboratory with a request for corrective actions. The QA Manager reviews the external ADQs and issue requests for corrective actions of deficiencies. The QA Manager will look for both technical and managerial causes of QA deficiencies and will make recommendations to the Laboratory Operations Manager (LOM) for corrective actions. It is the responsibility of the LOM to implement these corrective actions.

Internal ADQs are normally initiated by a QA Manager. The results of the audit are reviewed by the QA Manager and corrective actions similar to those described above are submitted by the QA Manager to the LOM for implementation.

5.4 Technical Systems Audits (TSAs) - According to EPA QAMS[2] "Technical Systems Audits (TSAs) focus on the actual quality control and environmental measurement data collection systems. A TSA entails an examination of calibration records, sampling and measurement procedures, general laboratory cleanliness, support systems, equipment and facilities, maintenance and repair records, control charts, etc. TSA auditors must be competent scientists who are familiar with the particular data collection technology and quality control procedures".

At IEA, Inc.-CT, TSAs are performed by both external and internal auditors. Externally auditors are from EPA, state and private client organizations.

The QA Manager may conduct a TSA on any project or group in the laboratory at any time. Internal TSAs by the QA Manager are essential to the QA program of the laboratory. The results of any deficiencies noted in all TSAs must be addressed by the LOM and his staff.

5.5 Performance Evaluation Audits (PEs) - According to EPA QAMS[2], "A Performance Evaluation (PE) is the means of evaluating the performance of laboratory technicians and the instrumentation or analytical systems on which they work. A PE is accomplished by providing PE samples containing specific pollutants (in appropriate matrices) unknown to the technician in their concentration and/or identity. PEs are implemented by the QA Managers, project officers (POs) or laboratory management".[1]

At IEA, Inc.-CT, PEs are conducted routinely by a number of external organizations. The QA Manager may submit internal PEs to any group in the laboratory at any time. Internal PEs by the QA Manager are essential to the QA program of the laboratory. The results of any deficiencies noted in all PEs must be addressed by the LOM and his staff. QA Managers routinely submit additional PE samples to groups who show deficiencies in measurement accuracy or quality of data.

5.6 External Management System Reviews (MSRs)

External Audit Program - On an annual basis, IEA, Inc. will conduct audits of all groups at IEA, Inc.-CT. The results of this comprehensive QA audit will be reported as an External Management Systems Audit Report (EMSAR) to corporate and laboratory management.

The above audit will review the entire, current QAPmP at IEA, Inc.-CT and make recommendations to corporate and laboratory management in the following areas:

- The quality of the existing QAPmP.
- Current procedures for developing, revising and approving SOPs.
- Overall data quality and technical capability.
- Procedures and criteria for designing and conducting audits.
- Recommendations for changes to the IEA, Inc.-CT QAPmP.

5.7 Audits Program - The results of all external audits will be reported by the QA Manager in their monthly QAPR. These would include all state, federal and private client on-site inspections.

5.8 Internal Audits of Data Quality - On a regular basis the QA Manager will review data to check for compliance to SOPs. Additionally the QA Manager will review SOPs to ensure they meet the requirements of the methodologies and applicable regulations.

5.9 Internal Technical System Audits - On a periodic basis the QA Manager will perform unannounced TSAs. The purpose of this will be to determine if the laboratory staff is following the SOPs, if the SOPs need revision, proper documentation through corrective action reports, case narratives, etc. and conformance to identified critical control points.

5.10 Internal Performance Evaluation Audits - On a quarterly basis the QA Manager will submit blind QC samples to the laboratory. The purpose of this will be to check the accuracy of results, assess data quality, assess documentation and completeness of data reporting.

5.11 Audit Reports

Quality Assurance Progress Report - Each quarter the QA Manager will issue a report to corporate and laboratory management summarizing all QA/QC activities from the previous month.

6.0 QUALITY ASSURANCE AUTHORITIES AND RESPONSIBILITIES

6.1 Organization Chart - The IEA, Inc.-CT Functional Organizational Chart is also attached. This chart indicates the chain of command for each of the managers and groups at IEA, Inc.-CT.

6.2 Facilities and Equipment - A list of facilities and equipment is attached in Appendix A.

7.0 TRAINING

7.1 Technical Training - All laboratory personnel must have adequate education, training, and experience to carry out their responsibilities at IEA, Inc.-CT. To ensure that each laboratory member has acquired both sufficient and applicable knowledge to carry out their tasks, the QA Managers and the Laboratory Management will periodically review the training needs of the staff and make recommendations for any additional training needs.

8.0 REFERENCES

1) NPO and ORD QAPP Guidance, Quality Assurance Management Staff (QAMS), USEPA, September, 1987.

2) QAMS-004/80, Guidelines and Specifications for Preparing Quality Assurance Program Plans. Quality Assurance Management Staff (QAMS), USEPA, 1979.

ATTACHMENTS

APPENDIX A

IEA, Inc.-Connecticut

IEA, INC.

ETHICS POLICY

The management of IEA corporation recognizes our responsibility to clients and fellow employees to ensure that fair and ethical business practices are followed at all facilities.

Our clients have placed their trust in our organization to continually provide high quality data which is valid, defensible and represents sound professional judgement at all times. In order to meet this responsibility it is imperative that high ethical standards be maintained at all times by all employees.

The management and staff are committed to maintaining a carefully controlled analytical environment which assures the consistent generation of accurate data which meets the data quality objectives of our clientele.

The following represents the IEA ethics policy which has been adopted to clearly identify the corporate position on ethical practices. Failure to comply with this policy cannot and will not be tolerated.

The Company and All its Employees will:

- Fully comply with all applicable federal, state, and local laws and regulations.
- Produce analytical products that are accurate, defensible and which represent sound professional judgement at all times.
- Provide employees with guidance and an understanding of the ethical and quality standards required in the environmental industry. In this regard, all employees should feel free to identify any ethical misconduct without fear of retribution. Any employee involved in any form of ethical misconduct will be subject to immediate disciplinary action including potential termination of employment.
- Present services to clients in a confidential, honest and forthright manner and strive to deliver quality products at a fair price.

IEA, INC.

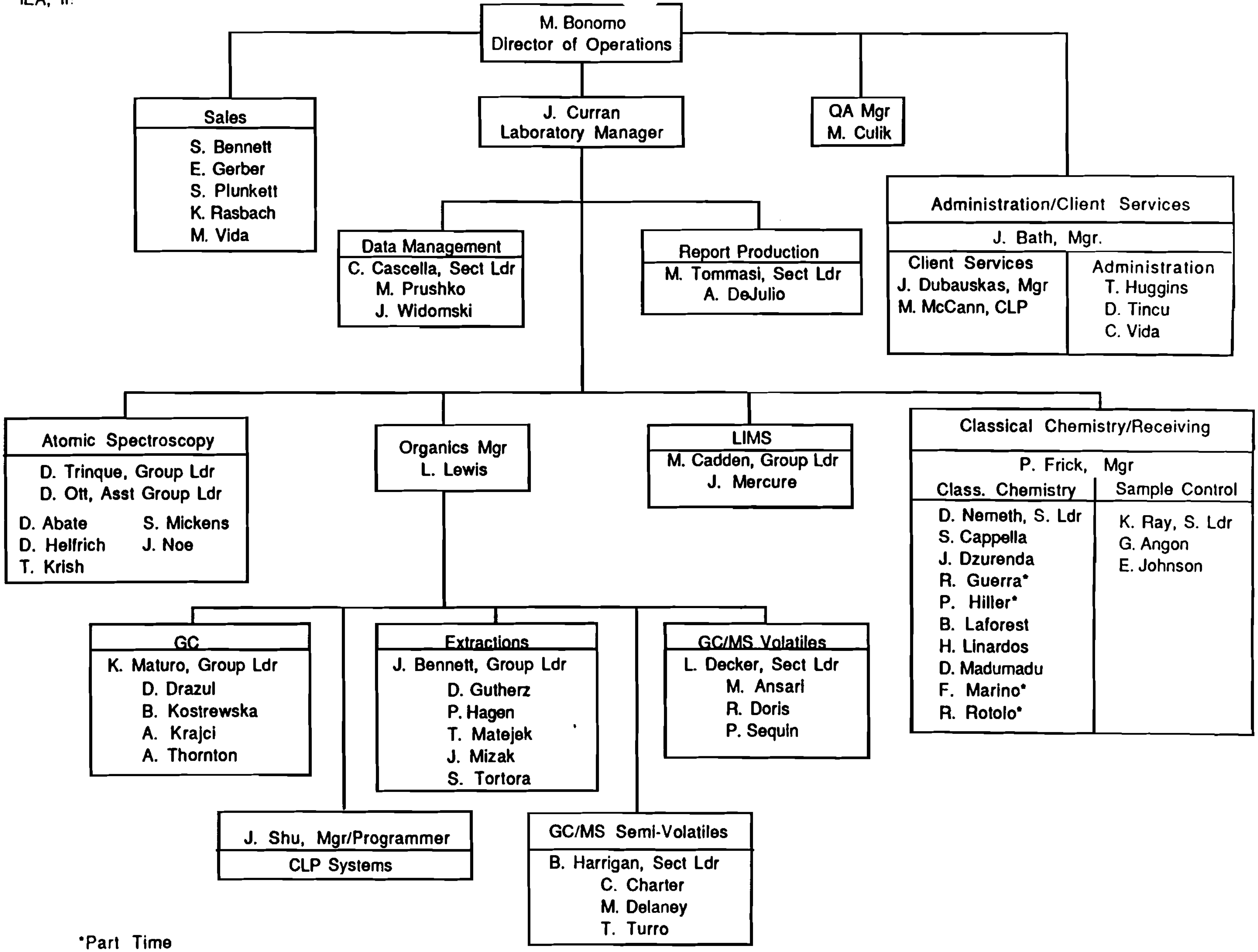
ETHICS POLICY -Continued...

- Treat employees equitably by compensating them fairly, acknowledging their scientific contributions, and providing them opportunities for professional growth and development.
- Offer employment opportunities to qualified candidates regardless of their race, creed, color, sex or age.
- Be a responsible corporate citizen of the community by operating in an environmentally sound manner at all times.
- Maintain all facilities in a safe and professional manner through maintenance of a safety awareness program and provide the necessary safety equipment and training to protect all employees from preventable injury and chemical exposure.

Attached is an "Ethics and Data Integrity Agreement" which is utilized to ensure communication of the company's position on this important issue. Upon completion, a copy of the agreement is maintained in the employee's personnel folder.

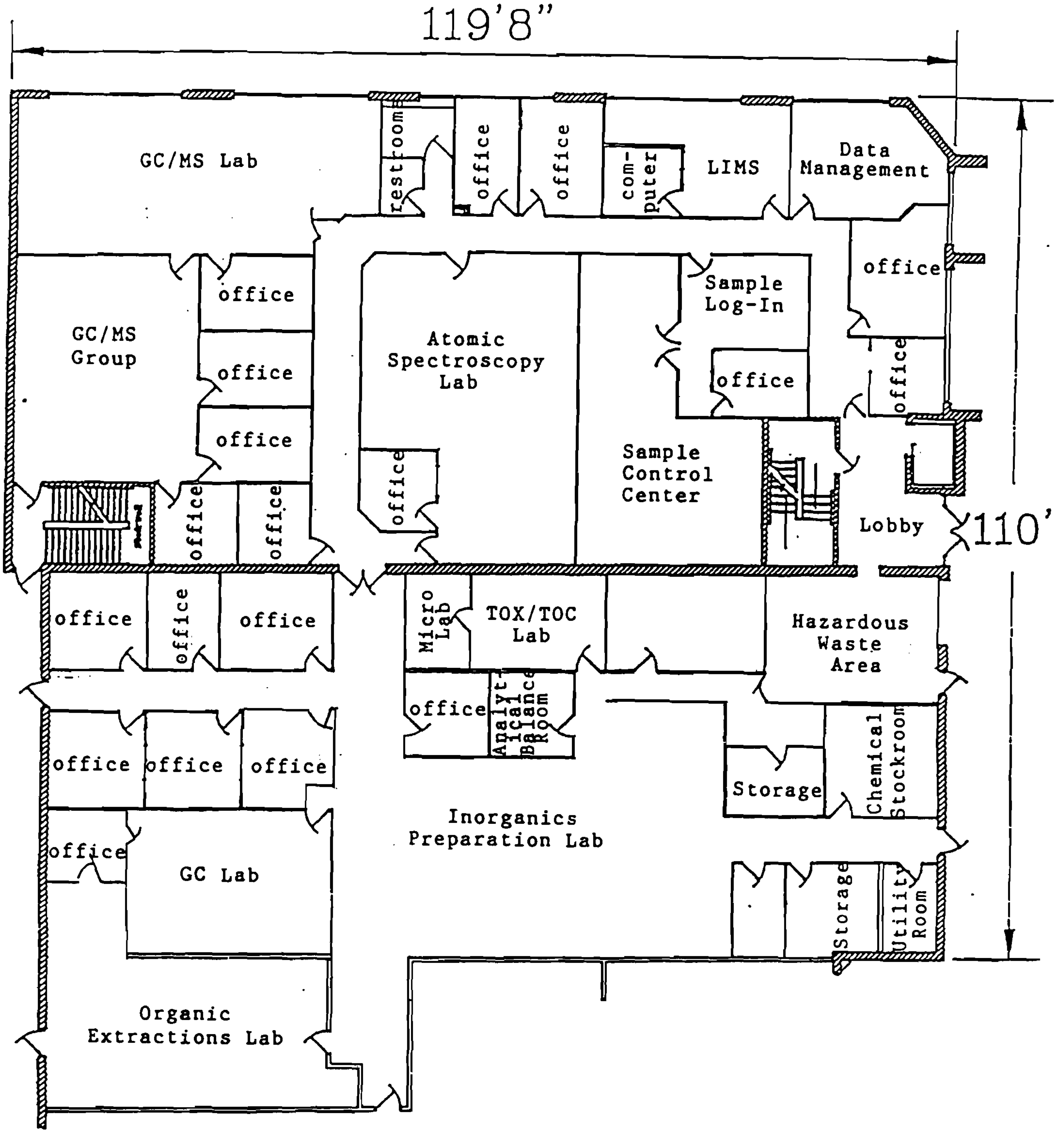
If an employee is concerned about potential ramifications of reporting an incident, it is suggested that a notice (anonymous, if desired) be provided to the local QA Manager or Corporate QA Director. The QA department will investigate the allegation and ensure that appropriate action is taken.

IEA, I



- M. Bonomo, Director of Operations
  - Sales
    - S. Bennett
    - E. Gerber
    - S. Plunkett
    - K. Rasbach
    - M. Vida
  - J. Curran, Laboratory Manager
    - Data Management
      - C. Cascella, Sect Ldr
      - M. Prushko
      - J. Widomski
    - Report Production
      - M. Tommasi, Sect Ldr
      - A. DeJulio
    - Atomic Spectroscopy
      - D. Trinque, Group Ldr
      - D. Ott, Asst Group Ldr
      - D. Abate
      - D. Helfrich
      - T. Krish
      - S. Mickens
      - J. Noe
    - Organics Mgr L. Lewis
      - GC
        - K. Maturo, Group Ldr
        - D. Drazul
        - B. Kostrewska
        - A. Krajci
        - A. Thornton
      - J. Shu, Mgr/Programmer – CLP Systems
      - Extractions
        - J. Bennett, Group Ldr
        - D. Gutherz
        - P. Hagen
        - T. Matejek
        - J. Mizak
        - S. Tortora
      - GC/MS Semi-Volatiles
        - B. Harrigan, Sect Ldr
        - C. Charter
        - M. Delaney
        - T. Turro
      - GC/MS Volatiles
        - L. Decker, Sect Ldr
        - M. Ansari
        - R. Doris
        - P. Sequin
    - LIMS
      - M. Cadden, Group Ldr
      - J. Mercure
    - Classical Chemistry/Receiving
      - P. Frick, Mgr
        - Class. Chemistry
          - D. Nemeth, S. Ldr
          - S. Cappella
          - J. Dzurenda
          - R. Guerra*
          - P. Hiller*
          - B. Laforest
          - H. Linardos
          - D. Madumadu
          - F. Marino*
          - R. Rotolo*
        - Sample Control
          - K. Ray, S. Ldr
          - G. Angon
          - E. Johnson
  - QA Mgr M. Culik
  - Administration/Client Services
    - J. Bath, Mgr.
      - Client Services
        - J. Dubauskas, Mgr
        - M. McCann, CLP
      - Administration
        - T. Huggins
        - D. Tincu
        - C. Vida

*Part Time



IEA, INC.-CONNECTICUT
200 MONROE TURNPIKE MONROE, CONNECTICUT 0646
FLOOR PLAN
5/

iea
an environmental testing company
200 Monroe Turnpike
Monroe, Connecticut 06468
(203) 261-4458
FAX (203) 268-5346

CORRECTIVE ACTION REPORT

QA:111086:5
Rev. 06/20/91

Client : ____________________ Date : ____________

Job/Case : ______________ Analyst: ________________

Sample(s): ____________________ Group : ________________

Category of Problem:

____ Preservative
____ Sample Matrix
____ Holding Time
____ Communication
____ Other ______________________________
____ Protocol
____ Missing Sample
____ Re-extraction

Description of Problem / Recommended Corrective Action :

Group(s) To Provide Corrective Action : ____________________
Reply To Originator Required ? : ______

Corrective Action Taken :

Miramar, Florida 305-989-0928	Schaumburg, Illinois 708-705-0740	N. Billerica, Massachusetts 617-272-5212	Whippany, New Jersey 201-428-8181	Cary, North Carolina 919-677-0090	Essex Junction, Vermont 802-878-5138

2/92

IEA, INC. - CONNECTICUT

EQUIPMENT LIST

Equipment Name	Manufacturer	Model Number	Serial Number
Spectrophotometer, UV-VIS	Perkin-Elmer	Hitachi 200	522-5
IR-Spectrophotometer	Perkin-Elmer	1310	134423
Turbidimeter	Hach Company	2100A	851017142
TOC Analyzer	Xertex-Dohrmann	DC-80	HF2029
TOX Analyzer	Xertex-Dohrmann	MC3 A,B	MF 2106
Fluorometer	Sequoia-Turner Corp.	112-003	D 01491
pH/ISE Meter	Orion	SA 720	SR45A
Conductivity Meter	Cole-Parmer Instrument	1484-20	1421
Flash Point Apparatus	Precision Scientific	Pensky-Martin	10 Au-12
Oven	Fisher Scientific	55G	291
Incubator	Blue M Electric	100 A	IN1-1362
Bio Refrigerator	Frost Queen	R20/L	00029
Centrifuge	Garver Manufacturing	549	10883
Water Bath	Blue M Electric	MW-1220	MX-2520
D.O. Meter	YSI	51A	0241
Autoclave	Market Forge	STM-E	034200
Gas Chromatograph	Perkin-Elmer	8320	83N546502
Gel Permeation Chromatotograph	ABC	1002B	7323
frigerator	WW	4EF	F3978U
ven	ASP	D 1142	144011
Oven	ASP	D 1162	149010
Sonicator	Sonics & Materials	SM500	6892
Sonicator	Tekmer	TM500	7264
Mercury Analyzer	Spectro-Products	HG4	4708
ICP-Sequential	Perkin-Elmer	6500	128238
ICP-Semiultaneous	Jarrell-Ash	JA61	67782
Flame AA	Perkin-Elmer	2380	126443
Furnace AA	Perkin-Elmer	Z3030	3131
Furnace AA	Perkin-Elmer	Z5100	130911
Furnace AA	Perkin-Elmer	Z5100 PC	135141
Computer	NEC	Power Mate2	77000690B
Gas Chromatograph	Hewlett Packard	5890	7518A05422
Gas Chromatograph	Hewlett Packard	5890	2728A14615
Auto Sampler	Hewlett Packard	7673A	2607A02438
Auto Sampler	Hewlett Packard	76732A	2441A03468
Mass Selective Detector	Hewlett Packard	5970	2513A00923
Mass Selective Detector	Hewlett Packard	5970	2716A10638
Computer Terminal	Hewlett Packard	150 II	2528A05525
Computer Terminal	Hewlett Packard	2623A	---
Computer Terminal	Hewlett Packard	150 II	2720Y05798
Computer Terminal	Hewlett Packard	150 II	2720Y03266

uipment Name	Manufacturer	Model Number	Serial Number
Scanning Interface	Hewlett Packard	59824A	---
Scanning Interface	Hewlett Packard	59824A	---
Tape Drive	Hewlett Packard	9144	---
Disc Drive	Hewlett Packard	7958	---
9 Track Magnetic Tape	Hewlett Packard	7970E	---
9 Track Magnetic Tape	Hewlett Packard	7970E	---
Computer	Hewlett Packard	HP1000A	---
Computer	Hewlett Packard	HP1000	---
Disc Drive	Hewlett Packard	7914	---
Disc Drive	Hewlett Packard	7914	---
P&T	Tekmar	LSC-2	227
P&T	Tekmar	4000	192
P&T	Tekmar	4000	398
P&T	Tekmar	14-2000-000	88068001
P&T	Tekmar	LSC-2	1324
P&T	Tekmar	ALS	679
P&T	Tekmar	14-2962-200	88061015
P&T	Tekmar	ALS	494
P&T	Tekmar	ALS	1068
GC/MS	Hewlett Packard	5995B	2217A00358
GC/MS	Hewlett Packard	5995C	2413A00659
GC/MS	Hewlett Packard	5995C	2413A00430
Terminal	Hewlett Packard	45849A	2530A13541
rminal	Hewlett Packard	35751	2643A07666
.T	Hewlett Packard	35731A	8633K26810
rinters (partial list)	Hewlett Packard	2934A	2635A32940
Printers	Hewlett Packard	2934A	2715A43948
Printers	Hewlett Packard	2225A	2512S30379
Printers	Hewlett Packard	2225A	2510S32359
Terminal	Hewlett Packard	35751	2630A06622
CRT	Hewlett Packard	35731A	8610K20516
Magnetic Tape Unit	Hewlett Packard	7970E	N/A
Scanning Interface	Hewlett Packard	59824A	N/A
Scanning Interface	Hewlett Packard	59824A	N/A
Cart. Tape Unit	Hewlett Packard	7914	N/A
5010 Auto Desorber	Tekmar	14-2150-000	133-GT
Cart. Tape Unit	Hewlett Packard	7914	N/A
GC Analyzer	Perkin-Elmer	Sigma 1	0815150019
GC data System	Perkin-Elmer	Sigma 1-data system	081515001019
Auto Sampler	Perkin-Elmer	AS100	94975
Satellite Integrator	Perkin-Elmer	SI316	N4397071
Satellite Integrator	Perkin-Elmer	SI316	316N671510
Integrator/Plotter	Perkin-Elmer	LCI-100	N431931C
Integrator/Plotter	Perkin-Elmer	LCI-100	P5490100

ipment Name	Manufacturer	Model Number	Serial Number
C	Perkin-Elmer	Sigma 3	093317002180
AutoSampler	Perkin-Elmer	AS100 B	95234
Data Station	Perkin-Elmer	7500	901732
Printer	Perkin-Elmer	P-132	052597
Plotter	Perkin-Elmer	GP100	062005
GC	Hewlett-Packard	5890	2541A06301
GC	Hewlett-Packard	5890	2750A14840
GC	Hewlett-Packard	5730A	1609A00459
Autosampler	Hewlett-Packard	7673A-Dual Tower	2546A00709
Autosampler	Hewlett-Packard	7673A	2718A0653A
Integrator	Hewlett-Packard	3396A	2804A01106
Integrator	Hewlett-Packard	3393A	2332A00D80
Integrator	Hewlett-Packard	3392A	2736A11930
Auto Analyzer	LaChat	Quikchem Ion Analyzer	---
GC	Varian Hall/PID	3300	---
GC	Hewlett-Packard	5890A	---
Data System	Hewlett-Packard	HP1000A	3020A05230
Autosampler	Hewlett-Packard	7673	---
Terminals (3)	Hewlett-Packard	35741A	---
Printers (2)	Hewlett-Packard	35741A	---
GC/MS	Hewlett-Packard	5890A	---
MSD	Hewlett-Packard	5971A	3040A01426
Autosampler	Hewlett-Packard	7673	---
Terminal	Gateway	2000	---

APPENDIX B

IEA, Inc.-Connecticut

TABLE 1.0
VOLATILE TARGET COMPOUND LIST

Compound Name	CAS#	Precision	Accuracy	Low Level Water Limits (ppb)	
				CRQL	MDL*
Chloromethane	74873	±37	99	10	3
Bromomethane	74839	±27	99	10	4
Vinyl Chloride	75014	±28	107	10	3
Chloroethane	75003	±23	97	10	3
Methylene Chloride	75092	±16	105	5	3
Acetone	67641	±64	106	10	3
Carbon Disulfide	75150	±108	138	5	1
1,1-Dichloroethene	75354	±16	109	5	2
1,1-Dichloroethane	75343	±16	109	5	1
1,2-Dichloroethene (total)	540590	±16	106	5	1
Chloroform	67663	±92	170	5	1
1,2-Dichloroethane	107062	±17	112	5	1
2-Butanone	78933	±29	102	10	3
1,1,1-Trichloroethane	71556	±17	86	5	3
Carbon Tetrachloride	56235	±17	103	5	1
Vinyl Acetate	108054	±4	90	10	1
Bromodichloromethane	75274	±18	97	5	1
1,2-Dichloropropane	78875	±18	97	5	1
cis-1,3-Dichloropropene	10061015	±39	122	5	1
Trichloroethene	79016	±15	104	5	1
Dibromochloromethane	1244812	±22	109	5	1
1,1,2-Trichloroethane	79005	±19	99	5	1
Benzene	71432	±15	98	5	1
trans-1,3-Dichloropropene	10061026	±26	128	5	1
Bromoform	75252	±17	102	5	1
4-Methyl-2-Pentanone	108101	±20	114	10	2
2-Hexanone	591786	±25	112	10	3
Tetrachloroethene	127184	±13	106	5	2
1,1,2,2-Tetrachloroethane	79345	±18	101	5	1
Toluene	108883	±10	102	5	1
Chlorobenzene	108907	±15	100	5	1
Ethylbenzene	100414	±13	98	5	1
Styrene	100425	±18	90	5	1
Xylene (total)	1330207	±24	97	5	2

Low Level Soil CRQLs and MDLs are the same as above.
Medium Level Soil CRQLs and MDSs are 125 times higher.

* The reference to the MDL calculation is _Federal_ _Register_ 40 CFR Part 136 Appendix B, October 26, 1984.

TABLE 2.0

TARGET COMPOUND LIST (TCL) AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)*

	Semi-Volatiles	Case Number	Precision	Accuracy	Quantitation Limits (water ug/L a,b ** +)	
					CRQL	MDL
1.	Phenol	108-95-2	±6	37	10	2
2.	bis(2-Chloroethyl)ether	11-44-4	±14	82	10	1
3.	2-Chlorophenol	95-57-8	±11	77	10	2
4.	1,3-Dichlorobenzene	541-73-1	±13	67	10	1
5.	1,4-Dichlorobenzene	106-46-7	±13	68	10	1
6.	Benzyl alcohol	100-51-6	±21	77	10	1
7.	1,2-Dichlorobenzene	95-50-1	±13	71	10	1
8.	2-Methylphenol	95-48-7	±11	72	10	5
9.	bis(2-Chloroisopropyl)ether	108-60-1	±14	81	10	1
10.	4-Methylphenol	106-44-5	±10	66	10	4
11.	N-Nitroso-di-n-dipropylamine	621-64-7	±14	81	10	1
12.	Hexachloroethane	67-72-1	±14	60	10	1
13.	Nitrobenzene	98-95-3	±12	81	10	1
14.	Isophorone	78-59-1	±14	87	10	1
15.	2-Nitrophenol	88-75-5	±11	83	10	2
16.	2,4-Dimethylphenol	105-67-9	±15	69	10	8
17.	Benzoic acid	65-85-0	±20	27	50	16
18.	bis(2-Chloroethoxy)methane	111-91-8	±13	87	10	1
19.	2,4-Dichlorophenol	120-83-2	±12	84	10	2
20.	1,2,4-Trichlorobenzene	120-82-1	±14	75	10	1
21.	Naphthalene	91-20-3	±12	77	10	1
22.	4-Chloroaniline	106-47-8	±36	65	10	1
23.	Hexachlorobutadiene	87-68-3	±15	67	10	1
24.	4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	±15	82	10	2
25.	2-Methylnaphthalene	91-57-6	±11	72	10	1
26.	Hexachlorocyclopentadiene	77-47-4	±11	28	10	1
27.	2,4,6-Trichlorophenol	88-06-2	±12	88	10	2
28.	2,4,5-Trichlorophenol	95-95-4	±14	90	50	6
29.	2-Chloronaphthalene	91-58-7	±10	83	10	1
30.	2-Nitroaniline	88-74-4	±16	91	50	1
31.	Dimethylphthalate	131-11-3	±23	49	10	1
32.	Acenaphthylene	208-96-8	±9	85	10	1
33.	2,6-Dinitrotoluene	606-20-2	±13	97	10	2
34.	3-Nitroaniline	99-09-2	±19	109	50	3
35.	Acenaphthene	83-32-9	±9	86	10	1
36.	2,4-Dinitrophenol	51-28-5	±30	74	50	4
37.	4-Nitrophenol	100-02-7	±20	22	50	4
38.	Dibenzofuran	132-64-9	±10	91	10	1
39.	2,4-Dinitrotoluene	121-14-2	±19	104	10	1
40.	Diethylphthalate	84-66-2	±21	80	10	2
41.	4-Chlorophenyl-phenyl ether	7005-72-3	±10	94	10	1
42.	Fluorene	86-73-7	±12	93	10	1
43.	4-Nitroaniline	100-01-6	±42	90	50	4
44.	4,6-Dinitro-2-methylphenol	534-52-1	±18	70	50	2

TABLE 2.1

TARGET COMPOUND LIST (TCL) AND CONTRACT REQUIRED QUANTITATION LIMITS (CRQL)*(Continued)

	Semi-Volatiles	Case Number	Precision	Accuracy	Quantitation Limit (water ug/L a,b **	
					CRQL	M
45.	N-nitrosodiphenylamine	86-30-6	+15	99	10	2
46.	4-Bromophenyl-phenylether	101-55-3	±9	91	10	
47.	Hexachlorobenzene	118-74-1	±10	93	10	
48.	Pentachlorophenol	87-86-5	±19	68	50	
49.	Phenanthrene	85-01-8	±10	90	10	
50.	Anthracene	120-12-7	±9	87	10	
51.	Di-n-butylphthalate	84-74-2	±12	88	10	
52.	Fluoranthene	206-44-0	±13	88	10	
53.	Pyrene	129-00-0	±13	91	10	
54.	Butylbenzylphthalate	85-68-7	±15	93	10	
55.	3,3'-Dichlorobenzidine	91-94-1	±6	68	20	
56.	Benzo(a)anthracene	56-55-3	±11	91	10	
57.	Chrysene	218-01-9	±11	95	10	
58.	bis(2-Ethylhexyl)phthalate	117-81-7	±13	96	10	
59.	Di-n-octylphthalate	117-84-0	±16	102	10	
60.	Benzo(b)fluoranthene	205-99-2	±14	88	10	
61.	Benzo(k)fluoranthene	207-08-9	±30	86	10	
62.	Benzo(a)pyrene	50-32-8	±11	87	10	
63.	Indeno(1,2,3-cd)pyrene	193-39-5	±13	98	10	
64.	Dibenz(a,h)anthracene	53-70-3	±12	94	10	
65.	Benzo(g,h,i)perylene	191-24-2	±13	94	10	

a. Low soil/sediment contract required quantitation limits (CRQL and MDL's) for semi-vol
tile TCL compounds are 33 times the individual water CRQL and MDL.

b. Medium soil/sediment contract required quantitation limits (CRQL and MDL) for semi-vol
tile TCL compounds are 60 times the individual low soil/sediment CRQL and MDL.

* Specific quantitation limits are highly matrix dependent. The quantitation limi
listed herein are provided for guidance and may not always be achievable.

** Quantitation limits listed for soil/sediment are based on wet weight. The quantitati
limits calculated by the laboratory for soil/sediment, calculated on dry weight basis
required by the contract, will be higher.

\+ The reference to the MDL calculation is <u>Federal</u> <u>Register</u> 40 CFR, Part 136 Appendix
October 26, 1984.

The reference to the Precision and Accuracy is SW846, 3^{rd} Edition, Chapter One, Secti
1.1.8.

Table 3.0

Instrument ID: GC4A/GC4B

Laboratory: IEA-CT - MDL

EPA PRIORITY POLLUTANT AND TCL PESTICIDES/PCB'S LIST AND MDL

All values are ug/L.

	Replicate Analyses								
Compound	R_1	R_2	R_3	R_4	R_5	R_6	R_7	SD	MDL^{1,2}
alpha-BHC	0.093	0.101	0.099	0.093	0.096	0.097	0.100	0.0032	0.010
beta-BHC	0.090	0.104	0.097	0.090	0.091	0.095	0.103	0.0059	0.019
gamma-BHC	0.074	0.083	0.080	0.074	0.080	0.079	0.082	0.0036	0.011
delta-BHC	0.089	0.100	0.095	0.090	0.090	0.093	0.097	0.0041	0.013
Heptachlor	0.088	0.095	0.092	0.088	0.090	0.092	0.093	0.0026	0.008
Aldrin	0.088	0.104	0.092	0.084	0.084	0.091	0.098	0.0073	0.023
4,4'DDE	0.105	0.118	0.118	0.102	0.101	0.106	0.110	0.007	0.022
Dieldrin	0.219	0.127	0.120	0.113	0.108	0.111	0.114	0.0396	0.124
4,4'DDD	0.437	0.445	0.445	0.449	0.455	0.455	0.455	0.0069	0.022
Endrin Aldehyde	0.082	0.091	0.092	0.094	0.098	0.096	0.091	0.0051	0.016
4,4'DDT	0.500	0.517	0.503	0.503	0.531	0.507	0.498	0.0117	0.037
alpha-Chlordane	0.498	0.485	0.515	0.503	0.495	0.482	0.495	0.011	0.035
gamma-Chlordane	0.511	0.500	0.533	0.507	0.504	0.487	0.509	0.014	0.044
Endosulfan I	0.102	0.138	0.156	0.115	0.117	0.120	0.149	0.0198	0.062
Endosulfan II	0.493	0.502	0.497	0.503	0.518	0.509	0.497	0.0085	0.027
Endosulfan Sulfate	0.590	0.616	0.630	0.597	0.610	0.605	0.590	0.015	0.046
Endrin	0.397	0.465	0.471	0.473	0.474	0.484	0.483	0.0302	0.095
Heptachlor Epoxide	0.103	0.143	0.141	0.111	0.107	0.117	0.127	0.0161	0.051
Methoxychlor	0.421	0.510	0.509	0.493	0.515	0.532	0.500	0.0357	0.112
Endrin Ketone	0.479	0.470	0.491	0.485	0.478	0.469	0.0490	0.0089	0.028
Toxaphene	0.784	0.8327	0.7776	0.8637	0.8236	0.7826	0.8226	0.0321	0.101
PCB-1016	1.558	1.383	1.492	1.463	1.520	1.697	1.452	0.0995	0.313
PCB-1221	1.655	1.307	1.342	1.618	1.411	1.311	1.326	0.1494	0.470
PCB-1232	1.451	1.553	1.548	1.437	1.406	1.384	1.325	0.0837	0.263
PCB-1242	1.483	1.514	1.440	1.467	1.552	1.520	1.440	0.0426	0.134
PCB-1248	1.442	1.465	1.619	1.508	1.656	1.544	1.514	0.0780	0.245
PCB-1254	1.287	1.054	1.244	1.368	1.332	1.665	1.260	0.1837	0.577
PCB-1260	1.280	1.411	1.694	1.358	1.628	1.413	1.256	0.1670	0.525

Table 3.1

[1] The reference to the MDL calculation is Federal Register 40 CFR Part 136 Appendix B, October 26, 1984.

The reference to the Precision and Accuracy is from SW 846 - 3rd Edition Chapter One Section 1.1.8

[2] Low and Medium soil/sediment MDL for Pesticides/PCB TCL compounds are 160 and 2400 times the individual low water MDL respectively.

Instrument ID: **GC4A/GC4B** **Laboratory:** York/CT - MDL

EPA PRIORITY POLLUTANT AND TCL PESTICIDES/PCB'S

Compound	Precision	Accuracy
alpha-BHC	±10	107
beta-BHC	±17	109
gamma-BHC	±15	100
delta-BHC	±15	101
Heptachlor	±16	84
Aldrin	±38	70
4,4'DDE	±35	91
Dieldrin	±21	105
4,4'DDD	±41	104
Endrin Aldehyde	±5.5	92
4,4'DDT	±36	109
alpha-Chlordane	±14	108
gamma-Chlordane	±11	115
Endosulfan I	±28	103
Endosulfan II	±26	92
Endosulfan Sulfate	±16	115
Endrin	±15	103
Heptachlor Epoxide	±11	115
Methoxychlor	±23	94
Endrin Ketone	±1.7	96
Toxaphene	±4	81
PCB-1016	±6.6	151
PCB-1221	±11	142
PCB-1232	±5.8	144
PCB-1242	±22	117
PCB-1248	±5.1	154
PCB-1254	±14	132
PCB-1260	±18	114

Table 4.0

ICAP INSTRUMENT DETECTION LIMITS (IDL'S)

ELEMENT	IDL(ug/l)	ROUNDED IDL (ug/l)	CRDL(ug/l)
Ag	3.4	4.0	10.0
Al	104	104	200.0
Ba	1.3	2.0	200.0
Be	0.2	1.0	5.0
Ca	14.0	14.0	(1000.0) 5000.0
Cd	0.9	1.0	5.0
Co	1.6	2.0	50.0
Cr	2.2	3.0	10.0
Cu	3.2	4.0	25.0
Fe	57.3	58.0	100.0
K	449.0	449.0	(1000.0) 5000.0
Mg	17.6	18.0	(1000.0) 5000.0
Mn	0.8	1.0	15.0
Na	73.5	74.0	(1000.0) 5000.0
Ni	4.1	5.0	40.0
Pb	14.4	15.0	(100.0)
Sb	17.8	18.0	60.0
Se	35.6	36.0	(500.0)
V	1.9	2.0	50.0
Zn	2.8	3.0	20.0
Ti	1.8	2.0	(20.0)
Mo	3.0	3.0	(20.0)
Sn	7.6	8.0	(100.0)
As	18.0	18.0	(300.0)

CRDL's in parenthesis are either normally run by graphite furnace, or are not typically reported by the metals department and represent the detection limits employed in reporting these parameters.

Table 4.1

FURNACE INSTRUMENT DETECTION LIMITS

			PARAMETERS in ug/l	
INSTRUMENT	As	Se	Tl	Pb
Perkin Elmer 3030	---	---	(1.6)2.0	(1.0)1.0
Perkin Elmer 5100	(0.4)1.0	(1.1)2.0	(0.6)1.0	(0.9)1.0
Perkin Elmer 5100N	(0.4)1.0	(0.8)1.0	(0.7)1.0	(0.7)1.0

Values in parentheses are the unrounded values. These are used whenever NYSDEC '87 protocols are requested. However whenever CLP 7/88 protocols are requested, the rounded values are employed.

Table 4.2
IEA INC.-CT

ELEMENT	PRECISION*	ACCURACY**
ALUMINUM	7.7	101.2
ANTIMONY	13.3	94.9
ARSENIC	19.1	90.4
BARIUM	6.1	98.7
BERYLLIUM	8.2	98.9
CADMIUM	7.9	99.5
CALCIUM	8.6	93.3
CHROMIUM	7.1	96.8
COBALT	7.3	94.4
COPPER	8.5	95.8
IRON	7.8	107.9
LEAD	13.6	98.0
MAGNESIUM	7.5	91.3
MANGANESE	10.3	97.1
MERCURY	14.1	101.9
NICKEL	6.2	96.8
POTASSIUM	2.4	98.3
SELENIUM	9.7	96.8
SILVER	6.5	98.9
SODIUM	1.7	97.7
VANADIUM	6.2	95.2
ZINC	6.1	99.5

* PRECISION = %RELATIVE STANDARD DEVIATION
%RSD = (RSD/AVERAGE % RECOVERY)*100

** ACCURACY = AVERAGE SPIKE RECOVERY

TABLE 5.0

COMMON CLASSICAL CHEMISTRY DETECTION LIMITS

All concentrations are mg/L.

Parameter	Method	RDL	MDL	Precision[1]	Accuracy[2]
Ammonia-Nitrogen	350.1	0.04	0.01	±8.2	91.4
Chloride	325.1	3.0	0.43	±7.6	92.6
Chemical Oxygen Demand	410.1	10.0	4.7	±13.3	94.1
Cyanide	CLP	0.010	0.008	±5.1	97.8
Cyanide	335.2	0.005	0.001	±10.1	98.3
Fluoride	340.2	0.10	0.02	±14.0	94.5
Nitrate-Nitrogen	353.2	0.10	0.02	±9.8	97.7
Phosphorus, total	365.2	0.15	0.06	±13.1	95.8
Sulfate	375.3	10.0	6.70	±3.9	103.2
Total Organic Carbon	415.2	0.50	0.28	±1.7	105
Total Organic Halides	450.1	0.010	0.008	±9.2	105
Phenols	420.2	0.005	0.005	±4.6	96.1
Total Kjeldahl Nitrogen	351.2	0.100	0.058	±3.8	97.4

[1] Percent RSD
[2] Average spike recovery (percent)